Defeasing Retirement: A New Approach to Retirement Asset Allocation

By Morgan Pearsall, CFP®, CIMA®
This article presents an alternative methodology for determining an appropriate retirement asset allocation and rebalancing strategy based on matching the suitable asset class to the identified cash flow. It starts with three observations: (1) the major financial risk to a successful retirement is early bad outcomes; (2) over rolling 15-year periods a stock combination of one-third small cap and two-thirds large cap has never had a negative return dating back to 1926; and (3) forecasting annual cash flow is easier than forecasting annual returns. This methodology was not tested on pre-retirement time frames, but it looks at the time frame of a newly retired investor.

**INTRODUCTION**

I was motivated to play with a new approach after reading Muralidhar (2020), which discusses how the focus on trying to maximize expected returns, as promulgated by Harry Markowitz and others, has possibly led us astray. Rather, Muralidhar argues, we should focus on cash-flow achievement. This change of perspective led me to experiment with a liability-matching approach that drives an altogether different asset allocation and rebalancing strategy. Muralidhar’s article resonated with me because I frequently think of creating a retirement portfolio much as an insurance company would address matching its actuarial liabilities. They often match a calculated future liability (say, death benefits to be paid in 2035) by using appropriate maturities of Treasuries. In reconsidering this, it struck me that we could take advantage of the lower variance of return for long-term holding periods for stock. This, coupled with the knowledge that sequence risk is the number-one investment issue for retirees, led me to experiment with this different approach.

Pfau and Kitces (2014) and Kitces and Pfau (2015) have done significant work with glide-path allocations that start out conservatively and increase in equity over time. These approaches used simple and accelerated annual increases to equity allocation, or equity glide paths, as well as dynamic equity allocations based on initial equity valuations at the time of retirement (e.g., high equity valuations induced lower initial equity allocations). Their research showed that increasing equity allocation over time during retirement had the nonintuitive effect of improving retirement outcome modestly as measured by both the rate of failure and the earliest failure dates compared to a static 60-percent equity/40-percent bond portfolio. With respect to improving initial withdrawal rates using valuation metrics, the results were less robust for the glide path approach but more robust for dynamic allocation, especially in low-valuation environments. Although Safemax withdrawals were slightly better when valuations were high compared to the static 60-percent equity/40-percent bond mix, they were not significantly better and came at the cost of lower residual values for potential heirs in most all other valuation environments.

Of note, in their approach, the authors limited, or capped, maximum equity allocation. In essence, they were attempting to loosely mimic overall the lifetime equity exposure that a static 60/40 portfolio would maintain. When they “unbound” the equity allocation in their dynamic approach they got meaningfully better results in a low-valuation environment by starting with a 75-percent equity allocation (Safemax of 5.8 percent). However, they noted that it might be difficult to convince a new retiree to be so aggressive at the start of a retirement based on the planner’s view that markets are cheap.

Building on this research and challenged by Muralidhar (2020), I explored letting the cash flow dictate the beginning allocation for a retiree wherein I match each year’s expense (portfolio withdrawal need) with its appropriate asset class. This is the ultimate “bucket” approach.

I created an allocation worksheet that matches the expected cash-flow need by year with its appropriate asset class. For example, for the initial year’s need, I assume no risk and use only cash. For years 2 through 11, I use various short- and intermediate-term fixed income. And only in year 12 and beyond do I begin to deploy equity. In the worksheet, each year’s cash-flow need is discounted back to the present by a conservative real-return expectation for the matching asset. The cash flow drives the asset allocation, not the other way around. Further, once the initial asset allocation is set, there is no rebalancing. Rather, each year’s cash flow is taken from the sleeve of the asset class used to match the need. For example, in year 2 the
short-term investment sleeve comprises T-bills, whereas for year 20, the cash flow is taken from the equity sleeve. Conceptually, it is like matching each year’s cash flow with the appropriate maturity of Treasury bills/bonds. But in this instance, we can confidently substitute higher returning assets for Treasuries for the later years.

SUMMARY OF RESULTS
I tested a 60–percent U.S. equity/40–percent intermediate-term bond portfolio (traditional portfolio) against a liability–driven asset allocation over rolling 30-year retirement periods (e.g., retiring at age 65 and covering a 30-year retirement) using monthly data sourced from Ibbotson’s from 1926 through December 2019. This provided 769 rolling 30-year periods to test. In all cases, the U.S. equity portfolio comprises 60–percent U.S. large cap and 40–percent U.S. small cap for both the liability–match strategy and the traditional portfolio (this is the U.S. large-cap/U.S. small-cap ratio used by Bengen when he established his 4.5–percent SafeMax withdrawal rate). I used as my spending goal inflation–adjusted spending targets ranging from $45,000 to $54,000 starting with a $1-million portfolio, i.e., initial withdrawal rates of 4.5 percent to 5.4 percent. Taxes are implicitly assumed to be a part of the spending distribution.

The results were encouraging. For example, with the traditional portfolio and $47,000 spending level, the average ending inflation–adjusted wealth was $2.1 million with a 2.7–percent failure rate defined as the portfolio running out before the end of the 30-year period. With the liability–match allocation, the average ending inflation–adjusted wealth was $3.5 million with zero failures. The lowest ending amount in inflation–adjusted dollars was $123,589 for the 30 years ending November 1998. This compares to a $505,083 loss for the traditional portfolio. On average, the final wealth for the liability–match portfolio was 67.5 percent greater. Further, the liability–match approach provided superior ending balances in 94.0 percent of the 30-year rolling periods at the $47,000 spend rate.

More importantly, the earliest failure rate of the liability–match portfolio was much later than for the traditional portfolio across all spending levels. In all cases, when there was a failure of the liability–match portfolio to last 30 years, it still provided on average 6.6 years more retirement, e.g., at a $50,000 initial withdrawal rate, the earliest failure year for the liability–match portfolio was year 26.1 (26 years and one month), whereas for the traditional portfolio it was year 19.4 (19 years and 5 months).

Another improvement was in what it takes to correct an early bad outcome. For example, at the $49,000 initial distribution level, the failure rate for liability match was 0.52 percent and 4.42 percent for the traditional portfolio. By reducing spending 4 percent at the start of year 6 (in response presumably to a very poor start to retirement returns), the liability–match failure rate went to 0 percent, while the traditional portfolio failure rate was still 2.9 percent. In this case, it took an 18–percent reduction to obtain 100–percent success for the traditional portfolio. At a $52,000 initial rate, the reductions required in year 6 were 11 percent and 25 percent, respectively, to obtain 0–percent failure.

Figure 1 summarizes the actual results for all rolling 30-year periods for both the traditional portfolio and the liability–match portfolio starting with a $45,000 initial spending level and increasing to $54,000.

CONSTRUCTION OF LIABILITY–MATCH ALLOCATION
I use an investment portfolio that includes cash, T-bills, intermediate-term government bonds, and a blend of U.S. large-cap and U.S. small-cap equity. Each investment category is used as a sleeve. I match each year of expense to its appropriate investment sleeve as follows: For the initial year, 100 percent of the expense is allocated to cash. For years 2–4, I allocate 100 percent to T-bills. Years 5–7 are funded with a 50/50 blend of T-bills and intermediate-term government bonds; years 8–11 are funded with 100–percent intermediate-term government bonds. I start to employ equity beginning in year 12. I assume 80 percent of that year’s expense is allocated to intermediate-term government bonds and 20 percent to stock. In each subsequent year,
I reduce the allocation to intermediate-term government bonds by 20 percent and increase the allocation to equity by a like amount. By year 16 and beyond, 100 percent of the expense is allocated to stock. As further explained below, I chose year 16 to use only equity due to its consistently superior returns compared to bonds and bond/equity mixes. By contrast, the feathering in of equity after year 11 and completed by year 16 was done to be conservative and to avoid the potential negative outcomes that even a 10-year stretch can have in equities.

Each year’s cash flow is discounted back to a present value by the investment sleeve’s assumed discount rate. To determine the assumed discount rate for expenses covered by T-bills, I discount each year’s withdrawal by inflation plus 0.68 percent, the historical average real return for T-bills since 1950. To discount expenses covered by intermediate-term government bonds, I use inflation plus 2.637 percent, the historical average real return for intermediate-term government bonds over rolling five-year periods since 1950.

I decided to use a rolling five-year average for the intermediate-term government bond sleeve versus the annual average because this sleeve will not be used for the first five years. Therefore, the annual volatility is not as relevant—similar in logic to using 15-, 20-, and 30-year rolling periods for the equity allocation as explained next. As for using fixed income data from 1950 versus 1926: In reviewing the data, the real return on bonds in the 1940s (more accurately the real losses) was unusually high. This was in part due to interest rates not being allowed to float and the ravages of funding World War II. Although rates were not allowed to float until the 1979 change in Federal Reserve policy, interest rates between 1950 and 1979 were not as greatly stressed. So, the data was not as out of bounds.

To determine the assumed discount rate on the equity blend sleeve, I start with the 90-percent confidence level for 15-year rolling average real return for large-cap and small-cap stock of 1.15 percent and 5.43 percent. I apply the 66-percent/34-percent ratio of the two real returns to my assumed 3.0 percent inflation rate (technically, it is a multiplication, \[1.03 \times (1 + (0.66 \times 0.0115 + 0.34 \times 0.0543)) - 1\]). As time goes on, I increase my real rate of return in increments from year 15 to year 20 such that the year 20 return is at the 90-percent confidence return for rolling 20-year periods. Similarly, I increase the expected real return from year 20 by increments to the return of the rolling 30-year average real return at the 90-percent confidence level. Table 1 shows the exact discount rate applied to 15-, 20-, and 30-year withdrawals.

From the net present value calculations, the initial asset allocation is set. The case of an initial drawdown of $45,000 (4.5 percent) is as follows: 4.5-percent cash, 20.0-percent short-term fixed income (100-percent T-bills), 32.8-percent intermediate-term government bonds, and 42.7-percent U.S. equity. Note that short-term and intermediate-term fixed income have the 50/50 shared return for years 5-7.

Except for rebalancing the large- and small-cap equity sleeve annually, the initial allocation is never rebalanced. So, although equity makes up only 42 percent of the allocation in the first year, by the start of year 16 equity makes up 100 percent of the allocation for the remaining withdrawal period. A different cash-flow assumption would yield a different asset allocation. (The greater the initial withdrawal rate, the slightly lower the equity allocation. For example, at a 4.5-percent initial rate of distribution the equity allocation is 42.7 percent. At 5.0 percent, it declines slightly to 42.2 percent.)

One technical note: The initial starting balance is assumed to be $1 million. However, the net present value (NPV) of the above process does not perfectly equal $1 million; it is always lower. Because of this and because of my desire to cover the first year’s expense with cash, I divide the year 1 cash sleeve by the actual portfolio value but divide the NPV of the T-bill and intermediate-term government bond investment sleeves by the calculated NPV of the above discount process. The equity allocation, then, is simply 100 percent less the amounts (percentages) allocated to cash, T-bills, and intermediate-term government bonds. By making this choice, I was again trying to be more conservative in the early years because the percentage of short-term and intermediate-term bonds will be greater if the denominator is smaller.

My objective for the above liability-match approach is to match each year’s portfolio withdrawal with the safest but highest-earning asset. Over short periods of time such as one to seven years, longer-term fixed income and equity have too much volatility and potential negative return—something that we wish to avoid early in retirement. However, as years go by the odds of a negative return on more-volatile assets such as longer-term fixed income and, especially, equity diminishes. As noted above, by the time 15 years go by there has never been a real loss on an equity portfolio

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Rolling 15</th>
<th>Rolling 20</th>
<th>Rolling 30</th>
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<tbody>
<tr>
<td>U.S. Large-Cap</td>
<td>1.15%</td>
<td>2.34%</td>
<td>4.92%</td>
</tr>
<tr>
<td>U.S. Small-Cap</td>
<td>5.30%</td>
<td>6.79%</td>
<td>7.81%</td>
</tr>
<tr>
<td>66/34 Blend</td>
<td>2.41%</td>
<td>3.85%</td>
<td>5.90%</td>
</tr>
<tr>
<td>With 3.00% Inflation</td>
<td>5.68%</td>
<td>6.97%</td>
<td>9.08%</td>
</tr>
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</table>
comprising 66%-percent large cap and 34%-percent small cap. So, at that point it does not make sense to allocate any lower returning asset class to meet the distributions.

Think of each year’s future withdrawal as having its own portfolio. In the early years, the portfolios comprise solely fixed income. In middle years, it is a combination of fixed income and equity, but in the later years each year’s portfolio comprises equity only.

CONSTRUCTION OF TEST

In testing the above approach, I started with a $1-million portfolio and a $45,000-initial withdrawal. In my allocation worksheet, I assumed a steady 3%-percent inflation rate. In the test worksheet, I adjust each year’s distribution by the actual inflation experienced in the prior year. For example, if my 30-year test was for 1930–1959, in 1930 the distribution would be $45,000. In 1931, the distribution would increase by the inflation experienced in 1930 and so on.

Because I want to be able to create allocations based on cash flows that might be uneven, say higher at the start and lower later on, my worksheet adjusts the allocation worksheet figure (which was calculated using a 3%-percent annual inflation assumption) by discounting its future value by the assumed inflation rate and then increasing the value by the actual inflation rate for that time period. For example, if the period being tested was 1950–1979, and I wish to calculate the withdrawal for 1960, I discount the 1960 value in the allocation worksheet by 3 percent per annum, then multiply that figure by the compound inflation from 1950 through 1959 (e.g., $60,476.24 / 1.03^10 = $45,000 × 1.243—the historical inflation factor for 1950–1959 for a withdrawal of $55,935.00 in 1960).

The worksheet has a column for cash, T-bills, intermediate-term government bonds, and equity. Each year’s inflation-adjusted withdrawal is subtracted from the appropriate column. (Recall that in years 5–7 we are pulling one-half of the withdrawal from T-bills and one-half from intermediate-term government bonds, and in years 12–15 we are pulling from intermediate-term government bonds and equity in a sliding-scale manner as explained above.) If an investment column runs short, then any shortfall is pulled from the next column. For example, if at the end of the third year there was a shortfall in the T-bill sleeve, the shortfall is subtracted from the intermediate-term bond sleeve and so forth. Any remaining surplus in each column in the last year of that column is added to the next column over.

WHY DOES THIS WORK?

In a word: probabilities. In a few more words: probabilities and mean reversion. Although it is clearly not intuitive that a 100%-percent equity allocation can ever be safe for a retiree, the fact is that over time the return for that sleeve of equity allocated for that year’s withdrawal 15 or more years out always has been positive after accounting for inflation, and meaningfully so. As shown in table 2 (all rolling periods from 1926–2020), after 10 years of compounding, an all-equity portfolio composed of 60%-percent U.S. large cap and 40%-percent U.S. small cap outperforms a portfolio composed of 60%-percent equity and 40%-percent bonds 81 percent of the time and only gets better with longer periods.

By having the first third of retirement allocated to safe investments that rarely experience loss, and if experienced the loss is smaller, we allow the equity portion to grow unencumbered. That is, we do not subject the portfolio to a monetization of equity loss. So, equity’s annual volatility impact diminishes and eventually becomes meaningless because it is never realized. Historically, by the time equity has been allowed to grow for 10, 15, or more years, the chance of loss becomes remote. Think about this: Even in a year that shows a 38%-percent loss, either it happens early on and so we have years to recoup the loss for our positive real return, or it comes after many years of accumulation such that the cumulative return post the loss is still positive, i.e., the client got ahead in the game—had a great first three quarters and held on in the fourth.

An example might make this clearer. For both the liability-matching method and traditional method, the worst 30-year period was the 30 years ending November 1998. This period was most impacted by the high inflation of the early to mid-1970s and extremely high inflation of the late 1970s and early 1980s, which decimated real returns for both bonds and equity. At the $45,000 distribution level, the 60/40 portfolio failed by year 24 while the liability-matching portfolio did not fail. But of interest is where the portfolios were by year 15 of the distribution period. At the end of year 15, the traditional portfolio in inflation-adjusted terms was down to $311,900. By contrast, the liability-matching portfolio in inflation-adjusted terms was worth $504,800, or 62 percent more. Also, mean reversion comes into play here. The real rate of return for the traditional portfolio for the first 10 years was -2.0 percent and -0.4 percent per annum for the first 15 years. The liability-matching real rate of return for the first 10 years was -0.7 percent and +1.5 percent per annum for the first 15 years, improvements of 1.3 percent and 1.9 percent per annum, respectively, over the traditional portfolio. Over the full 30-year period the real returns were 2.7 percent and 5.2 percent per annum.
respectively, a compound annual advantage of 2.5 percent to liability matching.

By having the greater allocation to fixed income in the early years, the impact of the poor equity returns in the first 10 years was diminished for the liability-matching portfolio compared to the traditional portfolio. Then with the rebound in returns after the first 10 years (mean reversion), the greater allocation to equities (up to 69 percent of the liability-matching portfolio at the end of year 10 and 100 percent by end of year 15) further improved results, leading to a successful retirement for the liability-matching investor compared to failure for the traditional investor.

This approach addresses nonlinear cash flows much better, such as for a retiree who has chosen to delay Social Security for five years to maximize that benefit. The allocation will reflect the need for greater distributions upfront and lower distributions six years out matching the investments to the timing of the cash-flow need. Using a static portfolio because the client is simply retired fails to take into consideration the wide variance in cash-flow needs each client may have (deferred compensation payouts, delayed pension or Social Security, a meaningful inheritance down the road, or downsizing of residence). These should all play a role in how we allocate a portfolio but are completely ignored in a static portfolio world. Neither the glide path nor dynamic equity allocation address this issue either. Trying to predict what the markets will look like in year 7 or 10 of a retirement when a significant cash-flow event might happen is beyond our capabilities. But incorporating that event into our liability-matching analyses is not.

This approach remains emotionally challenging for risk-averse clients. However, it has two advantages over a simple glide path or dynamic allocation based on the initial market conditions discussed above. First, in the early years where both risk and perception of risk are highest, the equity allocation is more conservative, providing comfort should early returns run amiss. Second, by the time the equity allocation begins to significantly rise above a traditional 60/40 portfolio (10 or more years forward), the account balances in all cases where equity got off to a poor start will be significantly better at the midpoint than would have been the case in a traditional static allocation. This allows for a bucket presentation to assuage concerns of a rising equity allocation, that is, comparing where they would have been to where they are and noting that as time goes on equity’s dominance over bonds only becomes stronger. Should early results be average or above average, the client will have significant excess and should be able to take some risk off the table and reallocate back to bonds and still come out ahead.

These initial results suggest that Muralidhar may be onto something. The results with a cash-flow-centric allocation are far more robust than a target mean-variance allocation with rebalancing. Further, we do not have to predict future return paths, which is extremely difficult, but can focus on meeting cash-flow needs—a difficult but much more manageable task.

**FURTHER GILDING THE LILY**

I experimented with increasing the stock allocation from large cap to small cap. In the original trials I used a 60–percent large-cap/40–percent small-cap blend. (Note, I used a 66–percent/34–percent blend for determining the target asset allocation, but in running the tests, I started with a 60–percent/40–percent blend.) In reviewing the historical data, table 3 notes outperformance of small cap over large cap for all rolling 15-, 20-, and 30-year periods going back to 1926.

Given the significant outperformance in favor of small cap, I reran the spending tolerances using a 50/50 U.S. large-cap to small-cap blend, a 35/65 blend, and a 20/80 blend. However, I did not change the allocation. The equity return assumptions used in setting the allocation targets remained at 66–percent U.S. large/34–percent U.S. small throughout. This was a result of varying the equity allocation down and up in 3–percent increments in the allocation worksheet and always getting an inferior result when tested. I have not explored whether there is an optimal equity allocation.

The results are summarized in table 4. In brief, the greater the allocation to small cap, the less risk of portfolio failure and a significant increase in the average inflation-adjusted ending portfolio value. Combining liability matching and a large (80–percent) allocation to small cap improves the spend rate for 0.0–percent failure from slightly under $45,000 (4.5–percent initial withdrawal rate) for our traditional 60/40 portfolio to $51,000 (5.1–percent initial withdrawal rate) for the liability-matching portfolio. That is a 13.3–percent increase in safe lifetime spending. Further, liability matching had an ending inflation-adjusted value greater than the traditional portfolio 93.0 percent to 94.5 percent of the time depending on the small-cap allocation and spend rate.

**CONCLUSION**

Can we trust the data? Is 95 years enough? The above liability-matching approach relies heavily on the historical long-term superior performance of equity over cash and fixed income and reflects mean reversion. In most all cases (more than 75 percent) where the ending value of the traditional mix

### Table 3

<table>
<thead>
<tr>
<th>Period</th>
<th>Outperformance</th>
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<tbody>
<tr>
<td>15 years</td>
<td>78.9%</td>
</tr>
<tr>
<td>20 years</td>
<td>88.2%</td>
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<tr>
<td>30 years</td>
<td>97.1%</td>
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outperformed the liability-matching approach it was for 30-year periods ending in 2008–2013. This reflects the extraordinary decline in interest rates from the late 1970s and early 1980s when inflation ran above 10 percent and yields on Treasuries were in the double digits. The following 30 years provided the greatest bond boom ever witnessed, not a scenario likely to repeat over the next 30 years. The very poor U.S. equity returns during the 2008–2009 Great Recession undoubtedly played a role in the traditional outperformance also. Again, the liability-matching portfolio provided a superior maximum, average, and minimum balance—a later fail date if you will—at all distribution levels. So, expecting equities to continue to outperform over the long term is not unreasonable.

As for mean reversion, is it an anomaly in the data or a fact of investing? I lean toward a fact of investing. In the real world where investment returns are influenced by random events (global pandemic anyone?) and human reaction and interpretation, it is not surprising we see overreactions on both positive and negative news. For valuations that become inflated, I would argue it reflects either human complacency (nothing has gone wrong in a while so we forget the future is not a sure bet), or optimism—tech will solve all. On the opposite side, when things go wrong, we don’t just sit around. We do something. Central banks provide monetary support, governments provide fiscal support, and chief executive officers adjust labor and costs to restore profit. There is a lag effect to this such that markets over-shoot on the downside but later recover to reflect the reality that all is not lost. This is mean reversion at its finest.

I would have loved to test a broader equity mix including developed non-U.S. markets and emerging markets, but our data is lacking. The most difficult periods for both the liability-matching approach and the 60/40 traditional approach were 30-year periods ending in the late 1990s (December 1997–May 1999). Perhaps the less-correlated performance of developed and emerging markets may have steadied the equity sleeve during this very difficult time for U.S. equities.

Lastly, the lower correlation between U.S. small cap and developed non-U.S. and emerging markets compared to U.S. large cap suggests that an equity allocation heavily oriented to U.S. small cap combined with Europe, Australasia, and the Far East (EAFE) and emerging market allocations might result in superior results to that presented here. I note that our tendency toward recency bias colors our view of U.S. large cap because it has been the superior asset class for the past 15 years. However, look at the 15-year period ending as recently as 2017 and you will see that U.S. small cap outperformed U.S. large cap 11.2 percent per annum to 9.9 percent per annum, and emerging markets beat them both at 12.7 percent per annum.

Morgan Pearsall, CFP®, CIMA®, is a principal advisor with JMG Financial Group. He earned a BA in mathematics, French, and philosophy from the University of North Dakota and an MBA from the University of Chicago Booth School of Business. Contact him at morganp@jmgfin.com.

ENDNOTES

1. See also Blanchett et al. (2013, 2014).
2. SafeMax is the highest sustainable withdrawal rate for the worst-case retirement scenario in the historical period.
3. See, for example, Bengen (2020).

REFERENCES


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