Reflections on Recent Target Date Glide-Path Research

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“Studies of the best things, such as you bring forward, ought to be calm and tranquil.”
~Marcus Tullius Cicero

Target date portfolios are popular default investment options within defined contribution plans. These products may be thought of as diversified investment strategies prepackaged together with a plan for adjusting the investor’s exposure to risk over time. This packaging is beneficial because many individual investors lack the knowledge, willingness, or time to develop and maintain a retirement investing plan on their own. By design, these products serve a mass audience—they are not tailored to each individual investor. While individually tailored investment strategies allow for a greater level of efficacy than conventional target date portfolios, individualized service is also more costly to manage and deliver.

The investment strategies used in these portfolios are specified as predetermined “glide paths” that stipulate the asset allocation of the portfolio throughout all points in the intended investor’s retirement life cycle, including both the working/saving years and the post-retirement spending years. This glide path is generally said to be “downward sloping” in that the risk profile as depicted by the allocation to risky assets, such as stocks, tends to decline over time as the investor ages. For some target date providers, the risk profile of the glide path “flattens out” after the targeted retirement date (target date). For other providers, it continues to decline well after the target date.1 Regardless, the glide paths of every target date product on the market that we are aware of can all be described as generally downward sloping—their allocations to equities falls, but never rises.

1T. Rowe Price target date glide paths for retirement continue to decline for 30 years after the target retirement date.
As the amount invested in these portfolios has soared,² their investment strategies have drawn increasing attention from investment researchers in both the academic and practitioner communities. Some of this research appears motivated by an intention to advance the level of knowledge and understanding about the strategies used by these products—academic research tends to fall into this camp. Other research appears motivated by the ostensible desire to take a stand for what the researcher believes is the best glide-path design methodology—practitioner research tends to fall into this camp. Regardless of motivation, a growing number of research papers have been written recently that take issue with conventional downward-sloping glide paths, proclaiming the superiority of:

- U-shaped glide paths that slope downward before the target date and upward after the target date,
- “Reverse sloping” glide paths that slope upward both before and after the target date, or
- Flat glide paths that do not slope at all (i.e., static mixes).

These papers tend to focus on a purely quantitative modeling of economic outcomes with little attention to behavioral considerations. In the sections that follow, I examine the most recent research advocating upward-sloping glide paths, compare the authors’ modeling approaches and results with that of our own quantitative modeling, and discuss two factors largely overlooked by the research that argues against upward-sloping glide paths: investor risk preferences and behavioral risk biases.

**Pfau and Kitces (2014)**

Pfau and Kitces begin with a review of previous literature and focus their study solely on the postretirement phase of the glide path, concluding that glide paths that slope upward after the targeted retirement date can improve retirement income sustainability. It bears noting that this study’s sole focus on the postretirement decumulation phase only is limiting given that it makes the “starting” equity allocation at retirement a free parameter, which is not true in reality—a holistic evaluation of glide-path efficacy must also account for the preretirement accumulation phase, which actually starts about 40 years earlier.³ This limitation of the research method does not necessarily invalidate the findings with regard to the postretirement phase, however. For the purpose of evaluating Pfau and Kitces, let us assume that the end of the preretirement phase of a glide path would be designed to align with the beginning of the postretirement phase at the target date. Such a glide path would appear U-shaped, sloping downward before the target date and sloping upward afterward.

The authors assume that retirees wish to finance an inflation-indexed spending goal for either 20, 30, or 40 years using a systematic withdrawal strategy in which the initial withdrawal from the portfolio is defined as a percentage of the asset balance at retirement, with subsequent withdrawals adjusted by the rate of inflation each year. The initial withdrawal rates tested are 4% and 5%. They use Monte Carlo simulation to evaluate glide paths along four outcome measures:

1. The failure rate of sustaining a given withdrawal rate over a given horizon,
2. The potential magnitude of failure in those cases where failure occurs,
3. Upside potential in terms of median residual wealth with respect to the investor’s account balance at the end of the horizon, and
4. The maximum sustainable withdrawal rate supported at the 10th percentile of outcomes (i.e., the highest withdrawal rate that provides a 90% probability of success over the horizon).

The authors find that greater equity exposure leads to higher returns on average and is generally more appealing from the perspective of higher median wealth (and therefore, median potential income) regardless of whether the glide path slopes upward, downward, or not at all. From the perspective of the potential magnitude...
See, for example, Fullmer (2008) and Fullmer (2009). Of failure, however, optimal portfolios exhibit less equity exposure and perform best when the glide path slopes upward after the target retirement date.

While finding that a U-shaped glide path may be optimal and lead to improved sustainability on average, the authors acknowledge that the approach may not align with investor risk preferences. In addition, a closer look at the study’s results suggests that, for equity weights commonly used by target date portfolios in the retirement years (say, in the range of 20%–60% equity), the effect of glide-path slope is rather marginal. For example, consider two postretirement glide paths—one that slopes upward from 20% to 60% equity and one that slopes downward from 60% to 20% equity. Table 1 shows some key statistics of the authors’ research, using a checkmark to indicate the strategy with the better result for each measure shown. The historical maximum sustainable withdrawal rate at the 10th percentile measured over a 30-year horizon is fairly similar: 4.3% for the upward-sloping strategy and 4.2% for the downward-sloping strategy. The upward-sloping strategy shows a slightly better chance of sustaining a 4% withdrawal rate but a somewhat worse chance of sustaining a 5% withdrawal rate.

Table 1: 30-Year Retirement, Historical Average Capital Market Expectations

<table>
<thead>
<tr>
<th>Measure</th>
<th>Upward Sloping 20%–60% Equity</th>
<th>Downward Sloping 60%–20% Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum sustainable withdrawal rate (10th percentile)</td>
<td>✓ 4.3%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Probability of sustaining a 4% real withdrawal rate</td>
<td>✓ 95%</td>
<td>93%</td>
</tr>
<tr>
<td>Probability of sustaining a 5% real withdrawal rate</td>
<td>70% ✓ 76%</td>
<td></td>
</tr>
</tbody>
</table>

Source: Pfau and Kitces (2014)

Arnott, Sherrerd, and Wu (2013)

Arnott, et al., take a different approach in evaluating only the preretirement accumulation phase of an assumed 41-year working career. They pronounce conventional glide paths to be “flawed” and back up their claim by using historical returns to evaluate three glide paths—one that slopes continually downward, one that is perfectly flat, and one that slopes continually upward. Using historical calendar year returns from 1871 to 2011, the authors find that the downward-sloping glide path results in a lower balance at retirement, even in the bottom tail of the distribution (i.e., even for the worst outcomes). This is explained by the fact that although the time-weighted average allocation is the same for all three glide paths, the dollar-weighted average allocation is more equity-centric in the flat and upward-sloping glide paths (especially the latter). The authors further assume that postretirement income is provided (or at least measured) by the purchase of an inflation-indexed lifetime payout annuity at the target date. This assumption obviates the need to model anything after the target date.

Estrada (2013) extends Arnott, et al., by applying the historical returns of market indices in 19 different countries to the same three glide paths, finding that the results in each country are directionally the same as in the Arnott, et al., study. However, he stops well short of proclaiming conventional downward-sloping glide paths to be flawed. Rather, he acknowledges that other factors may influence the appropriateness of life-cycle asset allocation strategies. In particular, he states that “this controversy perhaps ultimately comes down to how risk is defined.”

Our View

The findings of these papers with respect to glide-path slopes are useful in contributing to the body of public knowledge. Many readers may find the results surprising, although they are not surprising to many of us in the target date research and development community. To wit, I began writing about the rationale for upward-sloping portfolio risk profiles during the retirement years more than five years ago.4 We do not disagree with the primary finding of Pfau and Kitces. In fact, our own quantitative research supports it. That being said, we believe the marginal improvement in efficacy with U-shaped glide paths is not significant enough to overcome what we view as the drawbacks of that design. Perfectly good rationales can be made for downward-sloping glide paths, too. Indeed, depending on the formulation of the investment objective and the constraints imposed upon it, one can easily justify glide paths that slope either upward or downward or remain flat. The relevant question, then, is whether the presumed objectives and constraints match the preferences of actual investors.

4 See, for example, Fullmer (2008) and Fullmer (2009).
Ah, investor risk preferences…yes, they matter. We agree with Estrada that how one defines risk is critical. However, we would take this statement a step further by saying that how one defines risk depends on how one perceives risk. Thus, we believe that investor perceptions, preferences, and behaviors play a key role in glide-path design. One's assessment of glide-path efficacy principally comes down to:

- How one defines the objectives to be achieved,
- How one measures investor risk preferences with regard to those objectives, and
- The extent to which behavioral risk biases are taken into account.

Recall that target date portfolios are not just an investment strategy, but rather an investment strategy prepackaged with a plan for adjusting the investor’s exposure to risk over time. Naturally, these portfolios should incorporate features consistent with the preferences of the intended investor, including risk preferences. Retirement investors face multiple dimensions of risk. Examples include:

- Savings adequacy risk—Will my level of savings be adequate to meet my living expenses?
- Inflation risk—Will my retirement income keep pace with my living expenses?
- Longevity risk—Will I outlive my anticipated life span?
- Market risk—Will my investment returns be unfavorable at a time when I am most vulnerable?
- Behavioral risk—Will a feature of the investment strategy or the perception of a change in any of the above risks influence the investor to make a bad investment decision at some point?

The first four risks listed above lend themselves nicely to mathematical portfolio optimization frameworks since assumptions for the variables in question (saving, inflation, mortality, and market volatility) can be readily made. The fifth—behavioral risk—is not so easily accommodated by the optimization process. Yet investor behavior is a key contributor to the success or failure of an individual’s retirement savings program. Examples of poor behavior include performance chasing and panic selling. Thus, glide-path design should not be thought of simply as an exercise in mathematically solving an optimization problem. Pfau and Kitces (2014) acknowledge this by thoughtfully pointing out “the clear caveat of this [upward-sloping glide-path] approach is that it may create concerns for seniors in their later years. Seniors may not be comfortable, from a risk tolerance perspective, handling the greater equity exposures implied by this approach.” This brings to mind the Roman statesman Cicero who philosophized more than 2,000 years ago, “The pursuit, even of the best things, ought to be calm and tranquil.” Even the best portfolio strategy does little good if uncomfortable investors abandon it at an inopportune time. Glide-path design should take this kind of behavioral risk into account.

Arnott, et al., take an aggressive stance in pronouncing the “flawed implementation” and “basic design flaws of the glidepath solution.” Such judgments seem harsh indeed and largely unfounded. One could just as easily assail their approach for using a single assumption for the contribution rate of all investors or for using a real (inflation-indexed) payout annuity as the hurdle in which to measure the resulting trade-off between risk and reward despite the fact that (A) inflation-indexed annuities are uncommon in the marketplace, and (B) individuals tend to behaviorally shun illiquid, irrevocable products such as payout annuities. At T. Rowe Price, we place a heavy emphasis on the belief that glide paths should be designed to reflect actual investor choices and preferences. Thus, the ability to purchase a theoretical real annuity that is not actually available to most retirement plan participants (and likely would not be purchased by them anyway based on the low adoption rates of those annuity products that are available) is not the primary measure against which we evaluate glide-path efficacy.

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5 This better-known quote attributed to Cicero may have come from an alternative translation of the quote that opens this paper, which may be found in Peabody (1886).
6 Having said this, I actually like the approach of using real annuities in the objective function of retirement research and, in fact, have used that framework myself on numerous occasions as can be seen in Fullmer (2007) and Fullmer (2009). Our mutual appreciation of this technique does not necessarily imply that other approaches are necessarily flawed, however.
7 LIMRA reports that when annuities and other guaranteed retirement income products are available within plans, the annuity election rate of participants is only 3 percent. Source: LIMRA, Retirement Income Reference Book 2012.
Determining investor risk preferences is notoriously challenging. Thus, we rely heavily on empirical evidence. Our study of investor behavior from T. Rowe Price recordkeeping data strongly suggests that investors prefer to de-risk their portfolios over time throughout their entire lifetimes.8 This evidence is a primary reason that our glide paths continue to decline even after retirement. We believe that the high level of market acceptance of target date portfolios may be attributed at least in part to the notion that declining glide paths align well with the changing risk preference of investors as they age. This behaviorally friendly design encourages participation and deters the destructive decision-making often observed in individual investors when left to make their own asset allocation decisions. Conversely, upward-sloping glide paths may hasten the behavioral risk that unsophisticated investors, who often exhibit the tendency to sell near market troughs and buy again near market peaks, may bail out of the investment strategy during bear markets to potentially disastrous results.

**The Myth of Optimality Under Significant Behavioral Heterogeneity**

The aforementioned studies make specific assumptions for investor behavior and then seek to find the so-called optimal glide path under those specific assumptions. For example, Pfau and Kitces model constant real portfolio spending strategies using initial withdrawal rates of 4% and 5%. Their research reveals a subtly important fact: The optimal glide path can (and will) differ significantly depending on which withdrawal rate is chosen. In fact, it will differ depending on a host of assumed variables. Alas, no single glide-path strategy is optimal in all circumstances.

This would not be a significant issue if most investors behaved similarly. However, investor situations and behaviors in real life are quite heterogeneous. For example, our study of recordkeeping data and investor behavior reveals a wide range of salaries, employee contribution rates, employer-matching formulae, postretirement spending needs, etc.9 For this reason our approach to glide-path design is not simply one of determining a single set of assumptions and then finding the optimal glide path under that particular set of assumptions. Rather, we prefer an approach to glide-path design that:

- Seeks robustness in delivering satisfactory results across a wide-ranging set of real-world investor situations,
- Remains sufficiently close to the mathematically optimal solution found under conventional financial planning recommendations, and
- Aligns well with empirically measured investor risk preferences.

We believe that downward-sloping glide paths satisfy these criteria.

**Conclusions**

The asset allocation glide paths used by target date portfolios have drawn a significant amount of attention from investment researchers over the years. Recently, some research papers have advocated upward-sloping glide paths as superior to the downward-sloping glide paths used in target date products on the market today. Our own research supports the argument that, under certain sets of assumptions, U-shaped glide paths that begin to slope upward after retirement can indeed exhibit greater efficacy for retirement income sustainability—at least at the margin and when assuming that investors unfailingly follow the contribution and withdrawal assumptions.

However, upward-sloping glide paths appear to act counter to investor risk preferences according to our empirical study of actual investor behavior, which indicates that investors prefer to de-risk their portfolios as they age. As a result, upward-sloping glide paths appear susceptible to greater behavioral risk, which has the potential to be much more than just a marginal threat to retirement security. For target date portfolios serving a mass audience, we believe that downward-sloping glide paths represent a reasonable investment strategy that helps investors avoid harmful behavioral biases.

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8 The research illustrating this de-risking preference is discussed in Fullmer and Tzitzouris (2013).
9 These statistics are discussed in Fullmer and Tzitzouris (2013).
References


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