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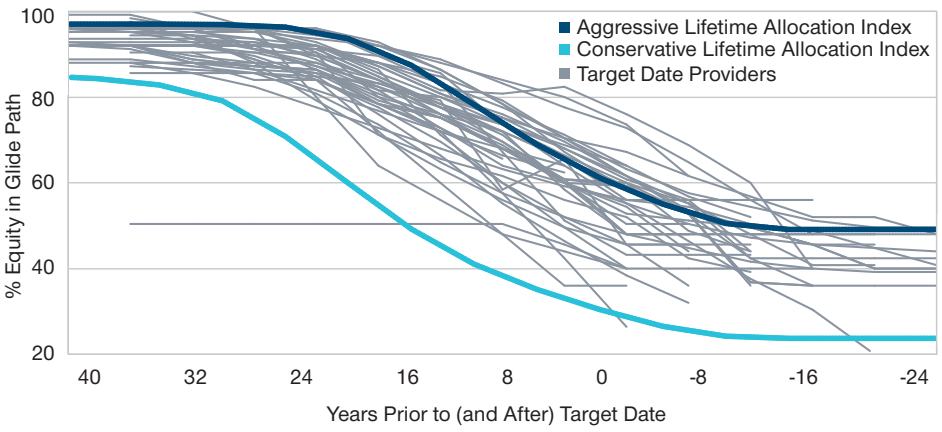
Target Date Glide Paths: BALANCING PLAN SPONSOR GOALS[1]

EXECUTIVE SUMMARY

- We believe that target date portfolios are well suited as the default option in defined contribution (DC) plans. The investment objective of DC plans is twofold: accumulation of wealth prior to retirement and conversion of wealth to income during retirement. While the accumulation of wealth is unambiguous, strategies for extracting income from accumulated wealth depend on the length of the expected retirement horizon.
- Plan sponsors face two primary considerations related to this horizon, each of which has important implications for the level of equity used within the appropriate target date glide path. One is the ability to generate income consistently over the entire course of retirement, and the other is the ability to limit the risk of significant capital loss near retirement.
- Our analysis finds that higher-equity glide paths offer greater efficacy for lifetime income replacement, while lower-equity glide paths offer greater efficacy for more stable account balances, with lower risk of large capital losses. Thus the challenge of glide path selection is striking a balance between these two competing goals. This process must be informed by the risk preferences of the plan sponsor, acting on behalf of plan participants. Two sponsors with similar plan demographics and benefit structures might rationally select different glide paths if they have different risk preferences.
- To aid sponsors in the selection process, we illustrate the trade-offs between the two goals using a series of hypothetical glide paths spanning the range of those available on the market today. We show the directional impact that differing characteristics—such as salary levels, contribution rates, and postretirement withdrawal horizons—have on these trade-offs.

[1] This Investment Dialogue is a summary of a more detailed research paper entitled Evaluation of Target-Date Glide Paths Within Defined Contribution Plans, published in the Spring 2014 issue of The Journal of Retirement.

FIGURE 1: Target Date Providers Offer a Wide Range of Equity Allocations in Their Glide Paths



Source: Morningstar, June 2012

BACKGROUND

We believe that target date portfolios are well suited as the default option for DC plans, appealing in terms of diversification, simplicity, and cost. Nevertheless, these virtues do not translate into easy decision-making for plan sponsors. While many factors will influence the choice of products, much of the sponsor's attention is likely to focus on the allocation glide path—in particular, the equity weight both before and beyond the target retirement date.

The glide paths of target date portfolios vary significantly, and determining the most appropriate one is not a simple task. Figure 1, above, shows the equity weights for a number of glide paths currently offered by target date providers, as well as for two benchmark paths: the Morningstar Conservative Lifetime Allocation Index (MSC) and the Morningstar Aggressive Lifetime Allocation Index (MSA).

The primary challenge for plan sponsors when evaluating glide paths is striking the appropriate balance between the goals of lifetime income replacement and limiting the risk of capital loss near and during retirement. The latter objective is particularly important for participants electing to take withdrawals over shorter horizons. These goals are at odds with each other because, while the long-term growth prospects of equity enhance the ability to generate lifetime income, its higher market volatility leads to greater variability in account balances, which increases the risk of capital loss as retirees approach and enter retirement. Thus, glide path selection involves making a compromise in the trade-offs between these two goals.

QUANTIFYING PLAN GOALS

Retirement investment strategies have traditionally been evaluated using measures of success, such as the probability of achieving a particular outcome—for example, a targeted income replacement rate to last throughout retirement. We see numerous shortcomings in such measures, mostly related to the need to make specific assumptions when defining success. These assumptions include items such as the income needs and withdrawal strategies of individual participants, which will vary widely. To address these issues, we instead examine measures of *potential*.

Because participant situations and needs within a plan are so heterogeneous, we believe measures of potential, which do not require such restrictive assumptions, are more useful to plan sponsors in evaluating glide paths.

Focusing on potential allows sponsors to emphasize the optionality available to each participant, rather than attempting to maximize the success of one "typical" participant. Once retirement begins, participants can take advantage of this optionality by implementing an individualized withdrawal strategy that seeks to harvest the income-generating potential of that glide path for their own circumstances as efficiently as possible. Thus, sponsors should choose a glide path based on its potential for income replacement, consistent, of course, within a given tolerance for the risk of capital loss.

We can measure the potential of a glide path with respect to its ability both to generate lifetime income replacement and to limit the risk of capital loss near and during retirement. A glide path's "Income Replacement Potential" is measured as the largest constant inflation-adjusted income stream (including Social Security) that may be attained over a participant's expected lifetime after retirement.[2] A glide path's ability to limit the risk of capital loss near retirement is measured as the percentage of a participant's peak preretirement account balance that can be recovered if the account is fully liquidated within a few years after retirement. We refer to this as a glide path's "Balance Recovery Potential" and measure it over various withdrawal horizons, using a five-year horizon in our examples here.

ILLUSTRATING TRADE-OFFS THROUGH ROBUST MODELING

We examine the trade-offs between income replacement potential and balance recovery potential offered by various glide paths with differing allocations to equity. Our analysis uses a Monte Carlo simulation of monthly

[2] We express this as a percent of the participant's final salary of net savings. The amount saved is measured as the sum of the employee's retirement plan contributions and FICA taxes paid (a type of stealth saving that funds future Social Security income).

asset returns, inflation, participant salaries, contribution rates, employer match formulas, and life expectancy. Simulated scenarios extend from age 25 until death, with retirement at age 67. Our model is calibrated using actual plan and participant behaviors (such as contribution rates, salary levels, and employer matching formulas) that we observe in T. Rowe Price's DC recordkeeping database. In this way, we model a varied distribution of realistic participant behaviors—not simply those of a small representative sample. A summary of our modeling methodology can be found in the appendix on page 6.

We model 11 hypothetical target date glide paths. Two of these are defined by the Morningstar Lifetime Allocation Indexes shown in Figure 1—the conservative index (MSC) and the aggressive index (MSA)—which roughly represent upper and lower bounds for the equity allocation used in glide paths commonly available in the market today. In addition, we model nine glide paths representing weighted average equity/bond allocations between these two benchmarks, ranging from a 90%/10% conservative/aggressive mix up to a 10%/90% conservative/aggressive mix.

For each simulated scenario, we compute a value for the potential with respect to each goal. Because we model a distribution of scenarios and multiple glide paths, the result is a distribution of values for each measure of potential for each glide path. We focus, in particular, on severe downside outcomes. In the examples presented here, this downside risk is measured as the average of the worst (lowest) 5% of all simulated potentials. To express the result as a risk measure (in which larger numbers indicate greater risk), we subtract the average of these worst scenarios from 100%.[3] In doing so, our downside risk measure is presented in terms of shortfall risk, in which "shortfall" measures the percent by which a result falls short of a given threshold value.

THE GOAL OF LIFETIME INCOME REPLACEMENT

Let us consider first a plan sponsor who places all emphasis on lifetime income replacement, with no consideration for the risk of capital loss near and during retirement. While we do not believe this is common practice, we show it to demonstrate the efficacy of glide paths in meeting this particular goal.

In Figure 2, below, we examine the income replacement potential for each of the 11 glide paths. The MSA and MSC benchmarks represent the end points of the curve, while the points in between represent the nine glide path blends. Along with the shortfall risk plotted on the horizontal axis, we also plot the median income replacement on the vertical axis as a measure of the typical outcome experienced by participants.[4] In this way, the figure illustrates the relationship between risk (horizontal axis) and reward (vertical axis).

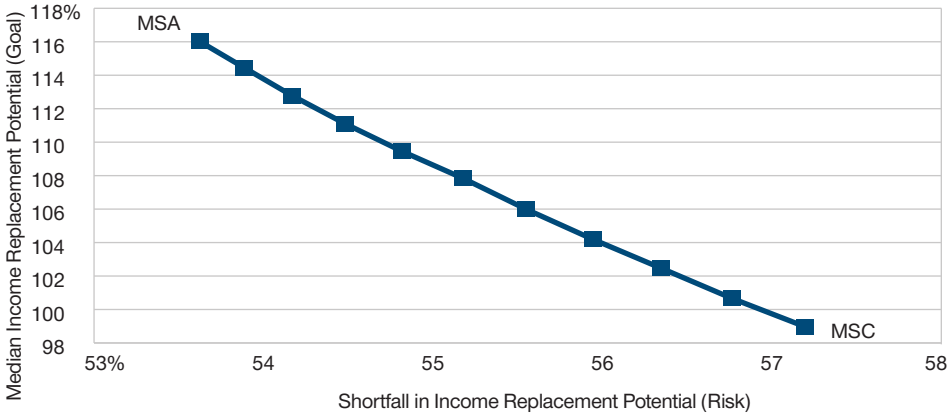
Strikingly, the most aggressive glide path displays both the highest reward and the lowest risk in that it produces higher lifetime income even in the downside tail risk. If lifetime income for participants were the only goal, the aggressive glide path would dominate.

THE GOAL OF LIMITING THE RISK OF CAPITAL LOSS

Next, let us consider a plan sponsor who places all emphasis on limiting the risk of capital loss near and during retirement. In this case, we measure upside potential using the median account balance at retirement as a multiple of final salary. Downside risk is measured as the average shortfall in the worst 5% of scenarios for balance recovery potential, i.e., the percentage by which participants fail to recover their peak balances over an assumed five-year withdrawal period.

Figure 3, page 4, demonstrates a trade-off among glide paths that is in line with intuition. At the median, the more aggressive glide paths demonstrate an appreciably higher balance at retirement. However, the more conservative glide paths offer significantly lower potential

FIGURE 2: Income Replacement Potential for 11 Glide Paths



Source: T. Rowe Price

[3] The technical term for our downside risk measure is conditional value at risk, or CVaR, measured at the 5th percentile of tail risk and expressed as a percentage of final salary net of saving.

[4] Recall that we measure lifetime income potential (and shortfall) relative to one's final-year salary net of savings. Consider, for example, a participant whose final annual salary is $100,000 and who has contributed 4% annually to his or her plan. Given a FICA withholding rate of 7.45%, the final salary net of savings is $88,550. Suppose that the maximum annual retirement income (including Social Security) in the bottom 5% of all simulations averaged just $39,847 in real dollars. The shortfall would be $48,703, or 55% of final salary.

for loss when withdrawing balances shortly after retirement.

Sponsors who emphasize limiting the risk of capital loss near the target retirement date can do so by selecting a glide path with less equity—though, in doing so, they would also have to accept the likelihood of lower participant balances at retirement.

BOTH GOALS COMBINED

In reality, sponsors are likely to be concerned with both lifetime income replacement and the risk of loss. In fact, sponsors and participants will both view income replacement as a goal to be achieved and capital losses as a risk to be managed.

Framing the trade-off this way highlights the role of equity allocations in target date portfolios. The equity risk premium is the factor most likely to provide the growth potential that makes it possible to produce higher real lifetime income from plan assets. However, the higher volatility of equity portfolios may impair the ability of participants to recover their peak balances over shorter horizons.

Figure 4, below, examines income replacement potential against balance recovery potential, again revealing a trade-off among glide paths in achieving each goal. To gain lifetime income replacement potential, one must sacrifice a certain degree of balance recovery potential (and vice versa). The degree to which this trade-off between more aggressive and more conservative glide paths is desirable depends upon sponsor and participant preferences.

SENSITIVITY TO SALARY AND SAVINGS CHARACTERISTICS

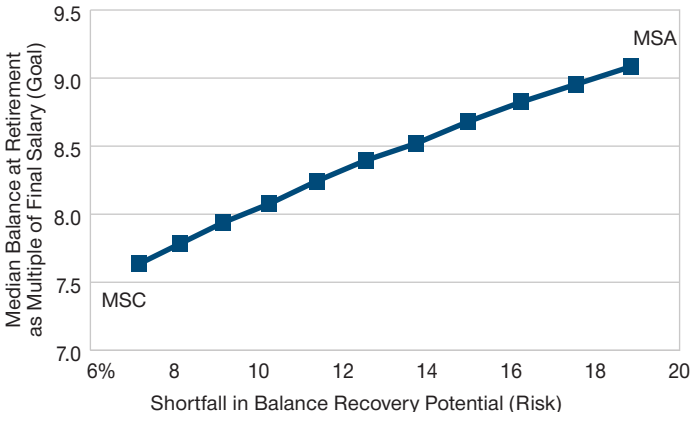
The prior results reflect a "typical" plan as represented by the plans and participants in T. Rowe Price's recordkeeping database. But every employer offers different benefits, and every plan has unique demographics and other characteristics. So we examine the sensitivity of our findings to different assumptions and plan characteristics.

The effect of salary and contribution rates on the glide path trade-offs are linked, in large part because Social Security replaces a higher percentage of income for low wage earners than for high wage earners. As a result, high wage earners must save a larger percentage of salary to maintain their preretirement standard of living. Thus, with all else being equal, the income replacement goal is a heavier burden for DC plans in which participants tend to have higher salaries.

To examine the impact of salaries and savings rates, we divide participants into segments of high and low savers and high and low earners as shown in Figure 5, page 5. For each of these combinations, we evaluate the efficacy of the 11 glide paths. Figure 6, page 5, shows the results for lifetime income replacement potential. This chart is analogous to Figure 2 except that, in addition to the original curve from Figure 2 reflecting the full population (labeled "All" here), it also shows a separate curve for each of the four salary/savings combinations. These curves all slope downward and to the right—indicating that the trade-offs are directionally similar. Note that as before, aggressive glide paths still consistently display the potential for both higher reward and lower shortfall risk. In each case, the earlier conclusions still hold.[5]

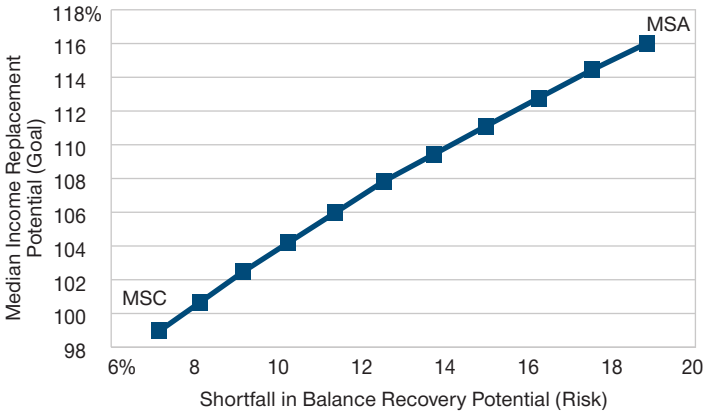
Not surprisingly, higher savers tend to attain a higher level of income replacement. Similarly, low earners tend to attain a higher level of income replacement than high earners, largely due to the fact that Social Security replaces a higher percentage of their preretirement salary. Figure 6 reveals another very important point, which is that the rate of savings dominates anything that can be done via asset allocation. Increasing the savings rate can push a participant much further toward the upper left of this chart than can any glide path. Asset allocation is important, but adequate saving is more important.

FIGURE 3: The Glide Path Trade-Off for the Risk of Capital Loss



Source: T. Rowe Price

FIGURE 4: The Glide Path Trade-Off Between Lifetime Income and the Risk of Capital Loss



Source: T. Rowe Price

[5] Note that salary and savings rates have a negligible effect on balance recovery potential, which is dominated by the volatility of the investment strategy.

RETIREMENT LONGEVITY HORIZON

Our base case assumed that all participants retire at age 67 and, thereafter, experience probabilistic mortality draws according to a single-life mortality table. But some participants may have spouses with little or no retirement plan assets or benefits of their own, in which case they may need retirement income that lasts through both lifetimes. Married or not, most retirees are also concerned about longevity tail risk—the risk of running out of money at an old age.

To gauge the directional impact of extended longevity on our results, we changed the mortality assumptions such that all participants survive at least to age 85. This increases life expectancy at retirement from 19 to 24 years. Figure 7, below, illustrates the effect of increased longevity on lifetime income replacement for the various glide paths. This chart shows the same curve as shown in Figure 2 (labeled "Base Case" here) plus a new curve showing the case of extended longevity.

Lengthening the retirement horizon will naturally decrease the level of income replacement, moving the curve lower and to the right, since the income stream has to be sustained for a longer time. Notably, this also skews the risk/reward trade-off even more in favor of aggressive glide paths, which can be seen by the greater slope exhibited by the extended longevity curve.

SENSITIVITY TO OTHER ASSUMPTIONS

To evaluate the robustness of our conclusions, we also examined the impact of other important plan assumptions, including the value of the equity risk premium and the rate of salary growth. Furthermore, we examined our choice of technical assumptions, such as the length of the withdrawal horizon used when evaluating balance recovery potential and the level at which we measure shortfall tail risk. The directional trade-offs offered among high-equity and low-equity glide paths still held for all reasonable values of these variables.

Readers interested in the details of our additional analysis should request a copy of our full paper, Evaluation of Target-Date Glide Paths Within Defined Contribution Plans, published in the Spring 2014 issue of The Journal of Retirement.

CONCLUSIONS

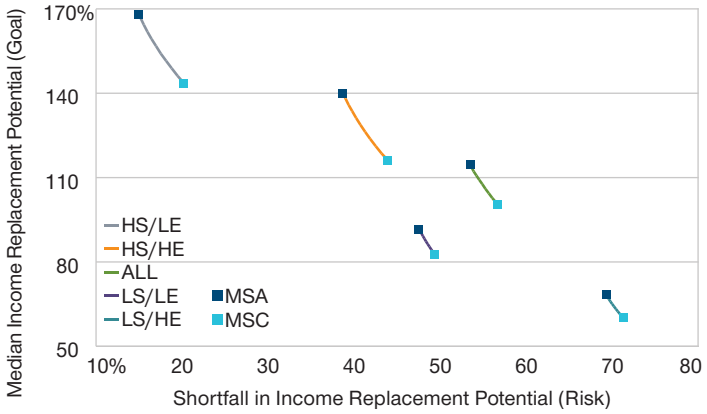
The challenge of target date glide path selection lies in striking a balance between two goals: the ability to replace preretirement income over the course of retirement and the ability to limit the risk of capital loss close to retirement. A glide path's equity allocation affects the degree to which each goal can be achieved, but in opposite ways: The equity risk premium can provide growth that makes it possible to generate greater replacement income, but equity volatility can lead to greater instability in account balances, impairing

FIGURE 5: Modeling Variability in Plan Salary and Savings Characteristics

Segment	Savers Definition	Earners Definition	Salary at Retirement (Social Security Replacement Ratio)	Median Employee Deferral Rate	Median Employee + Employer Combined Rate
Low Savers/Low Earners (LS/LE)	Bottom 40%	Bottom 40%	$38,000 (40%)	5%	8%
Low Savers/High Earners (LS/HE)	Bottom 40%	Top 40%	$88,000 (24%)	5%	8%
High Savers/Low Earners (HS/LE)	Top 40%	Bottom 40%	$38,000 (40%)	11%	16%
High Savers/High Earners (HS/HE)	Top 40%	Top 40%	$88,000 (24%)	11%	16%

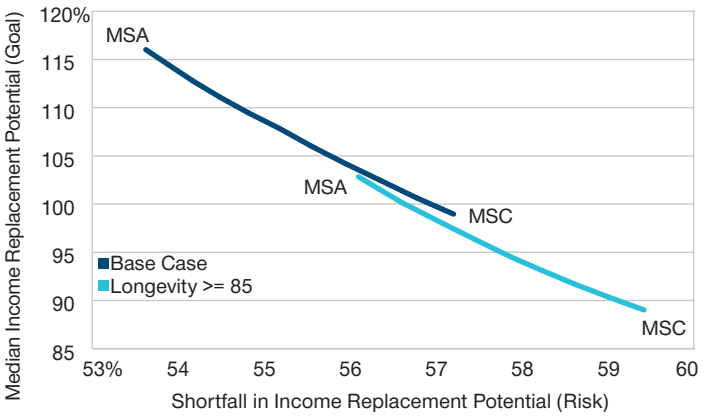
Source: T. Rowe Price

FIGURE 6: Salary and Savings Sensitivity Analysis: Impact on Lifetime Income Replacement



Source: T. Rowe Price

FIGURE 7: Retirement Horizon Sensitivity: Impact on Lifetime Income Replacement



Source: T. Rowe Price

the ability of participants to recover peak balances when withdrawals occur over shorter horizons.

We find that higher-equity glide paths are better at providing an income stream that enables participants to maintain their standard of living through retirement. This result is robust for both broad and narrow definitions of tail risk.

Conversely, a lower-equity glide path might be a better choice for plan sponsors who are concerned about participants' ability to recover their peak account balance in the early stages of retirement and who are willing to trade some lifetime income potential for lowering the risk of significant capital loss near retirement.

Because no one glide path can simultaneously satisfy both goals optimally, a compromise is required, and thus the selection process must be informed by the subjective horizon and risk preferences of the sponsor acting as an agent for plan participants.

APPENDIX: MATERIAL ASSUMPTIONS INCLUDE:

Our analysis used Monte Carlo simulation to model the uncertainty of asset class returns and inflation, derived from a structural model of financial and economic factors. From this model, we generate 10,000 scenarios, representing a spectrum of possible monthly outcomes for each variable over a period of 1,080 months (a 90-year horizon corresponding to a starting age of 25 and a mortality table that runs to age 115). Portfolio glide paths were modeled with equity/bond allocations that varied from quarter to quarter. All portfolios were rebalanced back to target weights at the beginning of each month.

For modeling plan characteristics and participant behavior, we used the T. Rowe Price Behavioral Scenario Model, which is based on actual participant data from DC plans for which T. Rowe Price provides recordkeeping services. Participants were assumed to begin working and saving at age 25 and to retire at age 67. Each participant was assigned a unique salary, contribution savings rate, and employer contribution match formula such that the distribution of these variables closely aligned with the actual participants in our database. Salaries were assumed to grow over time according to a model incorporating average wage growth for all workers as measured by the national Average Wage Index, as well as career salary growth. Postretirement withdrawal horizons were modeled according to the combined healthy RP-2000 mortality table using projection scale AA. For complete modeling details, please refer to our full paper, Evaluation of Target-Date Glide Paths Within Defined Contribution Plans, published in the Spring 2014 issue of The Journal of Retirement.

MONTE CARLO SIMULATION

Monte Carlo simulations model future uncertainty. In contrast to the use of average outcomes, Monte Carlo analyses produce outcome ranges based on probability, thus incorporating future uncertainty.

MATERIAL LIMITATIONS INCLUDE:

- The analysis relies on certain assumptions, combined with a return model that generates a wide range of possible return scenarios for these assumptions. Despite our best efforts, there is no certainty that the assumptions for the model will accurately predict asset class return rates going forward. As a consequence, the results of the analysis should be viewed as approximations, and readers should allow a margin of error and not place too much reliance on the apparent precision of the results.
- Extreme market movements may occur more often than in the model.
- Some asset classes have relatively short histories. Actual long-term results for each asset class may differ from our assumptions, with those for asset classes with limited histories potentially diverging more.
- Market crises can cause asset classes to perform similarly, lowering the accuracy of our return assumptions and diminishing the benefits of diversification (that is, using many different asset classes) in ways not captured by the analysis. As a result, returns actually experienced by the investor may be more volatile than those used in our analysis.
- The analysis does not use all asset classes. Other asset classes may be similar or superior to those used.
- Income taxes are not taken into account, nor are early withdrawal penalties.
- The analysis models asset classes, not investment products. As a result, the actual experience of an investor in a given investment product (e.g., a mutual fund) may differ from the range generated by the simulation, even if the broad asset allocation of the investment product is similar to the one being modeled. Possible reasons for divergence include, but are not limited to, active management by the manager of the investment product or the costs, fees, and other expenses associated with the investment product. Active management for any particular investment product—the selection of a portfolio of individual securities that differs from the broad asset classes modeled in the analysis—can lead to the investment product having higher or lower returns than the range used in this analysis.

MODELING ASSUMPTIONS:

- The primary asset classes used for this analysis are stocks and bonds. An effectively diversified portfolio theoretically involves all investable asset classes, including stocks, bonds, real estate, foreign investments, commodities, precious metals, currencies, and others. Since it is unlikely that investors will own all of these assets, we selected the ones we

believed to be the most appropriate for long-term investors.

- Results of the analysis are driven primarily by the assumed long-term, compound rates of return of each asset class in the scenarios. Our corresponding assumptions are as follows: for inflation, 3%; for stocks, 8.0% annual return; and for bonds, 5.3% annual return.
- Investment expenses, such as those in the form of an expense ratio, are not considered.

IMPORTANT: The projections or other information generated by our analysis regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. The projections are based on assumptions. There can be no assurance that the projected results will be achieved or sustained. The charts present only a range of possible outcomes. Actual results will vary with each use and over time, and such results may be better or worse than the projected scenarios. Clients should be aware that the potential for loss (or gain) may be greater than demonstrated in the projections.

The results are not predictions, but they should be viewed as reasonable estimates. Source: T. Rowe Price Associates, Inc.

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