Rethinking Glide Path Design —
A Holistic Approach

White Paper
Introduction

Target date funds have become one of the key investment products within retirement plans, often used as the main investment strategy for many plan participants. A key differentiating feature among the many available target date funds — and a primary determinant of their returns and volatility — is their glide path. A target date fund’s glide path reflects how its allocation to equity and fixed income investments changes over time in accordance with the risk-return profile of plan participants as they age. Given the prospect of discontinued labor income at retirement, investors in target date funds will commonly experience a decreasing exposure to equity markets throughout their working careers.

The investment goal of most retirement plan participants is a dual mandate: maintaining one’s lifestyle in retirement while also not outliving one’s assets. A glide path design should aim to reconcile these objectives with the appropriate level of portfolio risk at every stage in the life cycle. However, the construction and management of a glide path depends on a manager’s overarching philosophy and objectives. As shown in Figure 1, the target date fund industry currently employs a wide range of glide paths, with different beginning and ending equity allocations as well as different rates of equity reduction over the life cycle.

Figure 1. Glide Path Approaches Differ Significantly Among Managers

Data through 12/31/12.
Source: Morningstar Fund Research, Target-Date Series Research Paper 2013 Survey
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In recent years, the industry has engaged in spirited debate over such target date topics as “to” versus “through”, open versus closed architecture and active versus passive strategies. However, the significant impact of glide path design on long-term results and the wide differences among glide paths within the industry also raises a number of important questions; namely, what are the main drivers of a glide path design, and how can the main objective of a glide path — to provide plan participants with successful retirements — be measured and evaluated over a life cycle?

This paper will address both questions to demonstrate the process of glide path design in a holistic fashion that incorporates the participant profile with investment decisions.
Objective of the Glide Path

With the structure of its glide path, a target date manager seeks to align the market risks of the investment portfolio with the overall retirement goals of plan participants over the course of a full life cycle, thus maximizing the probability of successful retirement — namely, allowing participants to maintain their lifestyles in retirement while not outliving their assets.

Participants can judge the success of their retirement plan by evaluating the in-retirement purchasing power that results from the accumulated wealth in the plan. Purchasing power can be expressed as an income-replacement ratio (IRR), which is defined as the income from the retirement plan as a percentage of the last earned salary. The account value of the retirement plan at retirement can be converted into an in-retirement income stream by annuitizing the ending balance of the retirement plan. While not all plan participants will do this at retirement, IRR is meaningful as it captures the essence of the target date fund investment — saving for retirement income.

Plan participants will naturally value higher IRRs at retirement. At the same time, plan participants want to avoid IRRs that are very low compared to their last-earned salary. There is a strong relationship between the equity exposure in the glide path and the expected level of IRR but not necessarily the risk of a very low IRR:

- **Very aggressive glide paths** — i.e., those with heavy equity exposures — are expected to deliver high expected IRRs; due to increased overall portfolio risk, however, they also heighten the risk of very low IRRs.

- **Very conservative glide paths** — i.e., those with light equity exposures — are not only expected to deliver lower expected IRRs but also the increased risk of very low IRRs given the insufficient investment return of the portfolio during the participant’s career.

A glide path should optimally balance the expected IRR at retirement with the risk of ending up with a very low IRR (i.e., shortfall risk). Differently put, a glide path design should aim to maximize expected participant utility\(^1\) of IRR at retirement (average utility over all possible IRR outcomes) instead of just the expected IRR itself.

In fact, the value or utility that plan participants assign to potential IRR outcomes is heavily skewed, as shown in Figure 2. The graph shows that higher values of IRR at retirement will always produce higher levels of utility. However, the marginal effect of a higher IRR diminishes rapidly around a level that would provide retirees sufficient retirement income to maintain current living standards. At the same time, utility assigned to low IRR outcomes is very low. Therefore, while a particular glide path may provide a higher overall expected IRR, it can still provide a lower expected utility, depending on the full distribution of outcomes.

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\(^1\) Participant utility is the economic concept of individual rational preferences for one choice over another and the resulting marginal benefit or cost.
Figure 2. IRR Experiences Diminishing Marginal Utility

Source: ING U.S. Investment Management

The focus of glide path design should be on the entire distribution of possible IRR outcomes.

Figure 3. Different Levels of Risk Tolerance Result in Different Expected IRR Distributions

Source: ING U.S. Investment Management

When modeling glide paths, not only is the optimal glide path for an average level of risk tolerance used but also glide paths for lower and higher risk tolerances. The boundaries of acceptable risk tolerance levels are based on a risk-aversion parameter that is well described in academic literature. This approach will provide an optimal range for glide path design rather than a single glide path.
Evaluating a Glide Path

As discussed earlier, glide path design needs to reflect the optimal tradeoff between expected IRR at retirement and worst IRR outcomes.\(^2\) We can capture the glide path evaluation graphically as shown in Figure 4.

Figure 4. Glide Path Design Should Balance Expected IRR and IRR Shortfall Risk

While each glide path will correspond directly with a point on the IRR efficient frontier, not all glide paths can be considered efficient. Efficient glide paths will offer either 1) the highest level of expected IRR given a certain level of worst-outcome risk or 2) the lowest level of worst-outcome risk given a certain level of expected IRR. Only glide paths on the IRR efficient frontier will have maximum expected utility of IRR at retirement for a given risk tolerance.

Note that this framework is flexible and can be utilized using alternative risk metrics as well. Plan sponsors can use this framework to evaluate the feasibility of their objectives and choose the glide path that is the best fit for their participant population, as we’ll discuss later in this paper.

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\(^2\) While balancing the tradeoff between expected IRR and worst IRR outcomes is not precisely equivalent to our objective of expected utility maximization, these two concepts are roughly comparable, and we feel that this is a more intuitive way of visualizing the differences between glide path outcomes. "Worst IRR outcomes" in this paper is defined as the expected shortfall for the worst 5% of possible outcomes as calculated using the conditional value at risk (CVaR) approach.
Developing a Glide Path Model

As discussed, glide path design should instantaneously align investment portfolio risk with the retirement objectives of plan participants. That means that the investment decision at every stage of the life cycle must incorporate a holistic perspective in which in-retirement objectives are driving the process. Connecting this short-term portfolio risk with the long-term IRR risk determines the relative allocation to equities and fixed income.

A few more details around the glide path model:

■ The model optimizes the equity allocation at each point in time by maximizing the resulting expected participant utility of the IRR distribution at retirement.

■ The model is dependent upon the equilibrium return and risk characteristics of the equity and fixed income asset classes.

■ The model also incorporates labor income (see box on page 8) and pension benefits, as those factors will impact optimal investment choices.

■ Benefits from Social Security can be incorporated in the models as well. However, given ambiguity on long-term forward-looking estimates of real income from Social Security, it has been excluded from this paper. This can be considered a conservative approach, as benefits from Social Security will increase the overall IRR for plan participants.

Note that labor income is not modeled as an asset class but as a stochastic process, to fully capture its dynamics.3 The glide path optimization model uses stochastic scenarios for the capital markets as well. The model even captures potential correlation between labor income uncertainty and financial market returns.

This holistic approach to glide path design can support a differentiation among the optimal investment strategies for various groups of participants and is therefore very applicable for custom glide path design cases.

**What Is the Labor Income Profile?**

Life cycle portfolio choice theory introduced in 1971 the concept of modeling labor income as an input for glide path design. To this day it continues to provide a rationale for age-based target date investment strategies. We define “labor income profile” as the projected distribution of participants’ future income broken down into three main components:

- Expected level of real labor income adjusted to reflect inflation forecasts
- Uncertainty around the expected level of real labor income
- Correlation of income uncertainty with equity market returns

![Expected Level of Real Labor Income over the Life Cycle](source: ING U.S. Investment Management)

Please see our deeper dive into the labor income profile in the Appendix.
Glide Path Model Inputs

Given the setup of the glide path model, there are two sets of inputs that need to be derived in order to run it properly.

- Plan-specific assumptions
  - Defined contribution plan details
  - Pension plan details
  - Labor income profile of plan participants
- Capital markets assumptions
  - Equilibrium forecasts
  - Risk parameters
  - Active management

Below we describe for each of the required inputs what exactly needs to be defined, why it is relevant and how one could derive the inputs.
Plan-Specific Assumptions — DC Plan Details

- **What**: DC plan assumptions include contribution rate, matching policy, starting age and retirement age and demographics.
- **Why**: Those assumptions will have a significant impact on the IRR outcome of a given glide path, though not as much impact on glide path design other than starting and retirement age.
- **How**: More general assumptions based on DC data can be utilized for glide paths that serve broader pools of participants. The assumptions can be made forward looking and may be non-constant over the glide path. For specific plans, a plan sponsor can provide details to help better develop estimates used in custom glide path design.

Illustrating the Impact of Participant Contribution Rate

**Analysis**: Comparing glide path designs using different contribution rates.

- Glide Path 1 assumes 9% total contribution
- Glide Path 2 assumes 12% total contribution

Source: ING U.S. Investment Management

**Observation**: An increase in contribution has limited impact on glide path design but significant impact on the outcome of the glide path.

**Interpretation**: Sufficiently high savings rates are crucial. If the plan sponsor’s IRR target does not fit in the range of IRRs, the appropriate solution is to increase the participant savings rates (through auto-enrollment and -escalation features, more generous match, education, etc.).
Plan-Specific Assumptions — Pension Plan Details

- **What**: Pension plan assumptions include the type of plan (traditional defined benefit, account balance), the status of the plan (open, closed, frozen) and the expected benefit (e.g., 50% income-replacement benefit adjusted for inflation).

- **Why**: The presence and size of a pension benefit will impact the optimal investment strategy. The benefit will increase expected IRR and provide a cushion against very bad IRR outcomes. Moreover, the presence of a separate income stream from a pension plan allows DC plan participants to take more market risk.

- **How**: Pension plans come in different shapes and forms; for example, account balance plans paying a lump sum or traditional final average earnings plan paying annuities. In a custom glide path exercise, the details can be modeled based on information provided by the plan sponsor.

Illustrating the Impact of Pension Plans

**Analysis**: Comparing optimal glide path designs incorporating different pension plan benefits.

- Glide Path 1 assumes DC-Only
- Glide Path 2 assumes DC + Account Balance Plan
- Glide Path 3 assumes DC + Traditional DB

**Observation**: The value of pension plans can be significant in the current DC retirement plan context. This particularly holds true for traditional DB plans, given the security provided by the sponsor. Increased contributions for DC-only investors could match the expected IRR of the participants that also have a DB plan (savings rate would need to increase from 9% to 15%). Still, the worst-outcome risk remains higher for DC-only participants, given that the retirement outcome is not guaranteed by the sponsor.

**Interpretation**: Modeling pension benefits accurately is of great importance for successful glide path design given its significant impact on IRR. The impact can be severe for plans that are still active but closed to new hires, while plans frozen for a longer time will have less impact. A material difference in glide paths warrants the discussion whether a single glide path or multiple glide paths is optimal.
Plan-Specific Assumptions — Labor Income Profile of Plan Participants

- **What:** The labor income profile of plan participants consists of various components and is reflected as an expected real income stream over the life cycle with various degrees of uncertainty around this level.
- **Why:** The labor income profile will impact the choice of optimal investment strategy.
- **How:** Modeling the labor income profile requires an estimate of real income level over the glide path adjusted to reflect inflation forecasts, short-term shocks, longer-term deviation potential and the correlation of the uncertainty of income with financial markets. Plan-specific data can be used to estimate the parameters. Alternatively, sector statistics provided by the Department of Labor or other sources can be used as proxy.

Illustrating the Impact of Income Volatility

**Analysis:** Comparing optimal glide path designs using different levels of uncertainty around the real salary levels and growth expectations.

- Glide Path 1 assumes a more steady and less dispersed income stream
- Glide Path 2 assumes higher volatile and more dispersed income stream

**Source:** ING U.S. Investment Management

**Observation:** Increased income uncertainty leads to higher equity allocations in the glide path and increased expected IRR as well.

**Interpretation:** Higher income uncertainty will lead to more dispersion in IRR outcomes at retirement. To balance the risk contribution to the overall IRR distribution risk, a participant with more uncertainty needs more equity market exposure during the accumulation phase. As a net result, the overall expected IRR will go up.
**Illustrating the Impact of Equity Correlations with Variable Income**

**Analysis:** Comparing optimal glide path designs using different levels of correlation of income uncertainty with equity returns.

- Glide Path 1 assumes no correlation between income uncertainty and equity markets
- Glide Path 2 assumes modest positive correlation (+0.2)

**Observation:** Increased correlation of income uncertainty with equity markets will lead to more equity exposure in the optimal glide path design.

**Interpretation:** Higher correlation of income uncertainty with equity markets will narrow the IRR distribution at retirement (see the labor income profile discussion in the Appendix). The plan participant with correlated income uncertainty can take more equity market risk; in bad market scenarios, both account value and income drops, meaning that the impact of the bad market scenario is dampened in IRR terms relative to a participant with no correlation between labor income uncertainty and equity markets.
Capital Markets Assumptions — Equilibrium Forecasts

- **What:** Equilibrium forecasts include as inputs both long-term asset class returns as well as an AA yield curve (as a proxy for the interest rates used for annuity products).
- **Why:** The attractiveness of equity risk premium will impact the allocation across the glide path. The AA yield is used to calculate the IRR-equivalent value of the account balance at retirement.
- **How:** The input can be based on proprietary long-term capital market forecasts, plan sponsor input or consultant research.

Illustrating the Impact of Equity Risk Premium Forecasts

**Analysis:** Comparing optimal glide path designs using different levels of equity risk premium.

- Glide Path 1 assumes 3% return over fixed income
- Glide Path 2 assumes 4% return over fixed income

Source: ING U.S. Investment Management

**Observation:** The assumed equity risk premium can have a substantial impact on both glide path design as well as the expected IRR levels. Higher equity risk premium assumptions will lead to higher equity allocations during the accumulation phase and to higher expected IRR levels at retirement.

**Interpretation:** When equity becomes more rewarding, the model will allocate more to this asset class. Given the sensitivity, it is important to use a set of assumptions that can be considered realistic. Moreover, given the long-term nature of target date strategies, it is appropriate to use equilibrium assumptions for asset class returns.

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4 For all calculations in this document, we assume global equity and global bond risk premiums based on ING U.S. Investment Management’s long-term capital market forecasts.
Capital Markets Assumptions — Risk Parameters

- **What:** Asset class volatilities and correlations are essential as an input to the model.
- **Why:** Since the model aims to match participant risk tolerance with market risk, it is vital to calculate market risk appropriately.
- **How:** Risk estimates should include higher moments of the return distributions (i.e., skewness and kurtosis). Correlation estimates should reflect instability of these parameters, particularly during volatile market regimes.5

Illustrating the Impact of Asset Class Risk Parameters

**Analysis:** Comparing optimal glide path designs using different sets of risk parameters, in this case volatilities, skewness and kurtosis values of equity and fixed income, as well as correlations between those two asset classes.

- Glide Path 1 represents normally distributed returns
- Glide Path 2 represents non-normally distributed returns (i.e., negative skew and fat tails)

Source: ING U.S. Investment Management

**Observation:** More developed risk estimates that assume non-normally distributed returns would lead to lower equity allocations along the glide path.

**Interpretation:** Using more developed risk estimates would lead to increased expected portfolio risk levels without increasing the expected IRR levels. Under this assumption, the plan participant would be better off with a more conservative allocation to offset the increased portfolio risk.

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5 See our annual long-term capital market forecasts for further description.
Capital Markets Assumptions — Active Management

■ **What:** Assumptions on the net expected return and additional tracking error of the underlying investments in the target date fund are inputs as well.

■ **Why:** Active management — from the underlying managers or through an active overlay — can impact the expected outcome of a glide path.

■ **How:** This input often comes from the plan sponsor or the investment consultant and is typically based on their view on active management and the ability of managers to add value through security selection or overlay strategies.

**Illustrating the Impact of Active Management Forecasts**

**Analysis:** Comparing optimal glide path designs using different levels of expected returns from active management (i.e., alpha).

■ Glide Path 1 assumes net alpha is 0 with no tracking error

■ Glide Path 2 assumes net alpha is 50 bps with 150 bps of tracking error

**Source:** ING U.S. Investment Management

**Observation:** Active management return can significantly impact the expected outcome from optimal glide paths.

**Interpretation:** Assuming a certain level of alpha will increase the overall IRR distribution. Even small levels of alpha can have significant impact at retirement. The additional risk that may come from active management is typically marginal compared to the overall portfolio risk, particularly if risk from active management is assumed to be uncorrelated with the markets. Given its impact on the outcome, this assumption needs to be set with consideration.
Developing an Optimal Glide Path

Developing an optimal glide path for target date funds entails four steps:

1. Defining the inputs
2. Modeling the glide paths
3. Analyzing the glide paths
4. Selecting the glide path or paths

For a custom glide path design, this will be a highly interactive process involving the plan sponsor and its consultant. Given the impact that the various inputs can have on the glide path design (as described in the previous section), the first step in the process warrants an interactive approach in which the plan sponsor can confirm the appropriateness of the inputs. Furthermore, during the selection phase the plan sponsor can evaluate whether the glide paths can meet the set objectives. Based on the analyses, a plan sponsor may decide to change the retirement plans’ conditions, perhaps by increasing the matching amount or by introducing auto-escalation or auto-enrollment features to stimulate higher savings. The analyses can also support effective education of the plan participants through targeted communications.

Conclusion

Glide path design — or how the equity and bond mix of a target date fund changes with the passage of time — tends to be the primary driver of target date fund returns and volatility. To address the retirement goals of plan participants — namely, maintaining their lifestyles while not outliving their assets — glide paths must balance these objectives with the appropriate level of portfolio risk at every stage in the participants’ life cycle.

While target date fund managers share a common goal, the construction and management of the glide path depends on a manager’s overarching philosophy and objectives. Given the wide range of glide paths within the fund industry as a result, plan sponsors are well-advised to consider the evaluation metrics available to determine the product most suitable for their participant base.
Appendix: Labor Income Profile

One of the key inputs in the glide path design model is the labor income profile (LIP) of the plan participants. For plan sponsors considering custom glide path, it is crucial to have their plan participants’ LIP correctly modeled and integrated in the custom glide path model. This appendix explains the concept of the LIP in more detail and also elaborates on its impact on optimal glide path design.

The LIP of plan participants aims to describe the characteristics of salary income for plan participants during their working careers. As the actual future salary income cannot be known, the LIP is a best estimate based on data points provided by a plan sponsor or by public data sources such as the Department of Labor. The LIP of plan participants may differ between plans and will thus impact optimal glide path design.

The LIP describes the forward-looking salary distributions along the glide path using three components:

- Expected level of real labor income adjusted to reflect inflation forecasts
- Uncertainty around the expected level of real labor income
- Correlation of income uncertainty with equity market returns

All of these three components can impact the glide path on their own; below we describe the impact of each and demonstrate their effect in the IRR efficient frontier framework based on a sensitivity analysis.

Expected Level of Real Labor Income

The first component is the expected level of labor income throughout participants’ careers described in real terms (that is, adjusted for inflation effects). A typical pattern is that salaries increase during the early stage of a career, plateau nominally between ages 40–45 and then start to decline in real terms due to the effects of inflation.

The graph below shows this typical profile of the expected level of real labor income over a life cycle. Note that the salary levels are normalized; the actual dollar levels are not captured here. However, other inputs in the glide path model (asset returns and interest rates) are expressed in nominal terms. Therefore, the real salary levels need to be converted to nominal levels. This requires an inflation model consistent with other capital market forecasts.
The expected real salary levels can be estimated using generic income data or specific income data provided by a plan sponsor if the sponsor believes the expected income levels should differ for fundamental or company-specific reasons.

**Uncertainty Around the Expected Level of Real Labor Income**

Salaries do not develop exactly in line with the expected path. Plan participants are exposed to two levels of uncertainty in this regard:

- **Temporary shocks**: Changes in income that affect only the current year (for example, due to variable and uncertain bonus payments).
- **Permanent shocks**: Events that have an ongoing impact on labor income (for example, a job promotion).
As demonstrated in Figure 6, the total expected uncertainty around the expected real income levels for plan participants increase over time due to the compounding effect of permanent shocks.

**Figure 6. Uncertainty Around Expected Income Levels Increases over Time**

![Graph showing the increase in uncertainty around expected income levels over time.](image)

Source: ING U.S. Investment Management

The uncertainty in income can differ strongly by industry and plan participant base and can have many different sources. The uncertainty can be captured in parameter estimates using industry or sector data. For specific pools of plan participants, the plan sponsor can provide salary data and in some cases qualitative judgment on the estimated parameters. This should be used as an input to develop the optimal custom glide path design.

**Correlation of Income Uncertainty with Equity Market Returns**

In some sectors, the uncertainty of income can be a function of the financial markets. The financial industry is a good example, as bonus payments tend to have an identifiable relationship with market returns.

The correlation of the income uncertainty with financial markets can be estimated by using income data of various years and calculating the relationship with the stock market return. When income data is unavailable, sector estimates provided by public sources and academic studies can be used as proxies.

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How Does the Labor Income Profile Impact the Glide Path Model?

The glide path model optimizes the level of risk in the investment portfolio with the perspective of maximizing the probability of a successful retirement. In this model, the LIP is of importance for two main reasons:

- To calculate the IRR at retirement, the distribution of salary paths must first be modeled; those are not known or deterministic. Then, the distribution of the account balances at retirement can be calculated as a factor of the simulated contributions (based on the salary paths) and the simulated distributions of investment returns. The IRR is calculated using the distribution of final account balances, the distribution of last-earned salaries and a simulated annuity factor.

- As the LIP will impact the shape of the IRR distribution at retirement, it will also impact the output of the glide path model. The model aims to maximize the plan participants’ expected utility of that IRR distribution (assuming an asymmetric utility function as described before). Different LIPs warrant different glide paths to ensure maximum expected utility of the IRR distribution for plan participants.

The examples below illustrate the joint effect of different LIP parameters on glide path design.

**Level of expected salary growth.** If the same glide path were used for a strong expected salary growth compared to an average or low salary growth, the following would result:

- The expected at-retirement account value distribution will be greater for the higher-salary-growth participant, as the level of contributions are expected to be larger based on the higher salary.

- The at-retirement salary level distribution for the higher-salary-growth participant will be higher.

- The IRR distribution is a function of the expected at-retirement account value distribution and at-retirement salary distribution. The IRR distribution would overall be lower due to increased salary levels for a higher-salary-growth participant, as the impact of the higher salary distribution would only partially offset the higher expected at-retirement account values.

When the glide path model optimizes the glide path under the higher-salary-growth assumption, the equity allocation becomes higher (compared to a glide path optimized for average salary growth) to deliver maximum expected utility of the IRR distribution.

**Conclusion:** With a higher expected growth of labor income, a plan participant should take more market risk to compensate for the effects of higher required replacement income.
**Level of uncertainty around expected salary levels.** If the same glide path were used for a very uncertain salary growth compared to an average or lower salary growth uncertainty, the following would result:

- The at-retirement account value distribution will be wider, with higher levels of income uncertainty.
- The at-retirement salary level distribution assuming the higher-salary-growth uncertainty levels will be wider.
- Given the combination of the two, the IRR distribution would be wider assuming the higher-salary-growth uncertainty levels. This will negatively impact participant utility, as the average of the distribution did not increase but the risk of bad outcomes did.

When the glide path model optimizes the glide path under higher-salary-growth uncertainty assumptions, the equity allocation becomes higher (compared to a glide path optimized for average salary growth uncertainty) to deliver maximum expected utility of the IRR distribution.

**Conclusion:** With more labor income uncertainty, a plan participant should take more market risk to optimally balance total risk between income risk and market risk.

**Correlation of income uncertainty with equity market returns.** If the same glide path were used for a LIP in which salary variability is positively correlated with equity market returns compared to using a LIP in which salary variability is uncorrelated with equity markets, the following would result:

- The at-retirement account value distribution will be equal for both cases.
- The at-retirement salary level distribution will be equal for both cases.
- The big impact is in the combination of the two. Due to the assumed correlation, high/low account values with high/low salary levels would occur at the same time more often than when no correlation is assumed. This means that the IRR distribution will become narrower.

When the glide path model would optimize the glide path under the correlated income uncertainty assumption, then the equity allocation becomes higher (compared to a glide path optimized for average salary growth uncertainty). The reason is that the narrower IRR distribution allows for more market risk, as really bad IRR outcomes would occur less frequently.

**Conclusion:** With labor income correlated to equity markets, a plan participant should take more market risk to ensure an optimal level of total risk during the accumulation phase of the life cycle.
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