

Target Date Evolution: Enhancements to Fidelity's ClearPath® Portfolios

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KEY TAKEAWAYS

- Achieving an adequate level of retirement income with a target date portfolio requires a combination of prudent savings and withdrawal behaviour by investors, and prudent investment management that blends the need for capital appreciation in the savings years with income and stability in the retirement years.
- The glide path for Fidelity's ClearPath® Portfolios, which have a long-tenured history, remains focused on accumulating assets that can provide inflation-adjusted income for investors equal to approximately 45% of an investor's final preretirement salary during retirement, in keeping with assumptions of investor behaviour.
- Fidelity's ClearPath Portfolios are reviewed and refreshed, if necessary, to include Fidelity's latest research on risk management and portfolio construction practices, extended asset classes, demographic and retirement investor behaviour, and our outlook for the capital markets.
- The recent enhancements to the glide path for Fidelity's ClearPath Portfolios reflect updates to three areas of research – capital market assumptions, investor behaviour and risk capacity – that inform the investment process and are used to model, evaluate and select the most appropriate glide path for a broad population of investors.
- In constructing the glide path, our latest capital market assumptions, along with a refined risk-capacity framework focused on loss recovery and analysis of investor behaviour, indicate that the overall equity allocation should increase across most of the dated portfolios, to ensure a higher success rate to achieve the overall income replacement goal. Within the overall equity allocation, our research suggests a reduction in Canadian equity, thus increasing international and U.S. equity exposure.
- In general, we find that investors in Fidelity's target date portfolios can meaningfully improve their probability of achieving a well-defined retirement income objective by taking a number of steps, where possible, such as starting to save earlier, raising their contributions and delaying retirement.

Since 1996, when Fidelity helped pioneer the concept of target date investing, the dynamics of the financial marketplace have changed. In the capital markets, for example, interest rates have declined to near historically low levels amid unprecedented central bank actions around the world. Meanwhile, technological innovations, combined with an increase of information about investor demographics, behaviour patterns and risk tolerances, have led to improvements in our financial modelling capabilities.

While the financial landscape is different today, the goal of Fidelity's ClearPath Portfolios has remained the same: to construct a portfolio to help investors achieve retirement readiness by adjusting the strategic asset allocation over time, in keeping with investors' expected retirement date. Fidelity maintains an unwavering commitment to its target date strategies, as they serve as foundational solutions to

help investors achieve their retirement objectives. Over the years, this commitment has been supported by the addition of fundamental and quantitative asset-allocation research resources, regular analysis of investor behaviour and ongoing evaluation to ensure that Fidelity's best thinking is being applied to the investment process.

The following article reveals some important enhancements to Fidelity's ClearPath Portfolios. These enhancements reflect our ongoing research and modelling efforts, shifting dynamics in the marketplace and our experience managing multi-asset-class portfolios through a range of economic and business cycles. We view these enhancements as part of the evolutionary nature of our target date strategies and our commitment to helping improve retirement outcomes for investors.

Exhibit 1 Achieving a retirement income-replacement goal of approximately 45% of preretirement salary requires adequate investment contributions and prudent withdrawal behaviour by investors, as well as risk-appropriate portfolio returns.

The savings and retirement investment challenge: the balance of contributions, investment returns and income replacement

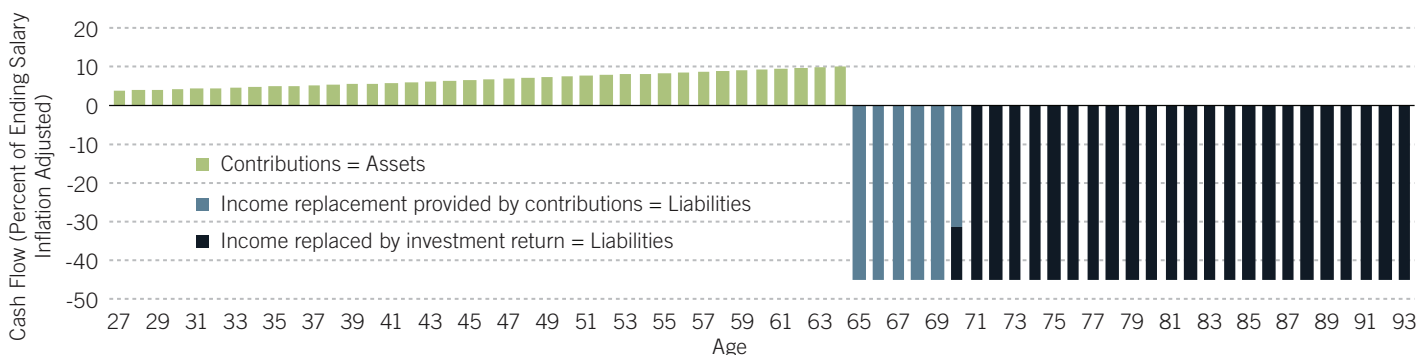


Chart is a hypothetical example based on a set of assumptions to illustrate the limits of income replacement that can be achieved through regular savings contributions alone (blue bars), and the need for an expected return on investment to achieve a desired level of income replacement over a longer retirement horizon (black bars). For the purposes of this chart, the following assumptions are presumed: investor contributes from age 27 through age 64, and receives annual salary increases equal to 2% in real terms over this period. **Green bars** represent an increasing percentage of investor contributions from 8% to 10% of salary from age 27 to age 50 and fixed at 10% of salary through age 64 (includes company matching funds). **Blue bars** represent the expected income replacement provided solely by the contribution amounts, equal to approximately 45% of one's final preretirement salary through the early years of retirement. **Black bars** represent the expected income replacement needed through a target date portfolio's investment returns, equal to approximately 45% of one's final preretirement salary through age 93. A hypothetical internal rate of return (IRR) equal to approximately 5.3% in real terms is the investment return required to have savings equal income replacement needs. This hypothetical illustration is not intended to predict or project the investment performance of any security or product. The IRR is a rate of return used in capital budgeting to measure and compare the profitability of investments. Past performance is no guarantee of future results. Your performance will vary, and you may have a gain or loss when you sell your units. For many investors, these assets will be combined with other complementary sources of income (e.g., government benefits, defined benefit plan benefits and personal savings). Source: Fidelity Investments.

Understanding the objective of Fidelity's ClearPath Portfolios

The glide path (i.e., time-varying strategic asset allocation) of Fidelity's ClearPath Portfolios, the central component of the target date strategy, remains focused on accumulating assets that, in considering certain assumptions, seek to provide inflation-adjusted retirement income equal to approximately 45% of the final preretirement salary of an investor. Achieving this goal requires a combination of prudent long-term investor contribution and withdrawal behaviour and appropriate portfolio returns. In Fidelity's view, the target date solution is a partnership¹ with our investors, wherein we build and manage an investment program that balances their return needs with appropriate risk management through both the savings and the retirement periods. For investors, a key determinant of success in meeting this retirement investment challenge hinges on adequate contribution and prudent withdrawal practices (see Exhibit 1).

It is also important to recognize that while the target date portfolios are designed to include assets that might act as a primary source of retirement income, for many investors these assets will be combined with other complementary sources of income (e.g., government benefits, defined benefit plan benefits and personal savings) to achieve Fidelity's overall retirement planning target of income replacement equal to 80% of final salary.²

The glide path is constructed to help investors achieve a level of assets to prudently meet their retirement income needs. It is designed with a long-term orientation, balancing expected return and expected risk in an investor's time horizon. For younger investors beginning to save for retirement, the glide path is focused on capital appreciation (i.e., total return) and is constructed to generate returns that help younger

investors achieve asset growth.³ By comparison, the objective for investors who are well past their target retirement date is focused on income and capital preservation. For investors between the two extremes of the age spectrum, the glide path adjusts over time to become more conservative as an investor's time horizon to retirement becomes shorter.⁴ The asset mix at each age is constructed based on Fidelity's capital market assumptions (CMAs) – both historical long-term and 20-year forward-looking – to seek returns sufficient to achieve the income-replacement goal, while maintaining a level of risk that is consistent with an investor's age, time horizon and risk tolerance.

Fidelity's approach to glide-path construction combines and applies three areas of research:

- *Secular-based capital market assumptions.* The proprietary CMAs developed by our Asset Allocation Research Team (AART) consider a long-term historical perspective and a forward-looking perspective on expected return, risk and correlations over a 20-year period. The CMAs influence both the risk boundary (upper limit on portfolio volatility) and, within this boundary, the asset-allocation positioning along the age spectrum.
- *Investor/plan member behaviour and demographics.* Working with Canadian recordkeepers, as well as Statistics Canada, we are able to observe the characteristics and investment behaviour of large populations of Canadian

³ The analysis framework used to develop Fidelity's glide path begins by focusing on the allocations for each of the end points. These two portfolios – the accumulation portfolio, which is focused on capital appreciation, and the retirement portfolio, which seeks a balance among total return, high current income (yield) and capital preservation – are developed to achieve distinct goals at opposite ends of the risk spectrum and investor time horizon. The portfolios serve as anchors for the glide path allocation in the most aggressive target date portfolio (for younger investors) and the most conservative target date portfolio (for older investors). Accumulation portfolio: Based on Fidelity's long-term capital market assumptions, combined with stochastic and empirical modelling, the strategic allocation for the accumulation portfolio includes 92% in equities and 8% in fixed income, with a long-term expected volatility of approximately 13% (expressed via standard deviation). Retirement portfolio: The strategic allocation for the retirement portfolio includes 21% equities, 35% bonds and 44% short-term investments, with a long-term expected volatility of approximately 4% (expressed via standard deviation). The expected volatility of these portfolios was determined based on the long-term historical volatility of three asset categories: equities, investment-grade bonds and money market securities.

⁴ See Footnote 3.

¹ Partnership: This term is used in general terms to describe the collaboration needed between an investor (savings contributions) and an investment manager (portfolio returns) to achieve a desired retirement income replacement objective. The use of this term in no way denotes or implies a contractual legal arrangement or agreement between two parties as joint principals.

² The 80% replacement rate is for a hypothetical average employee and may not factor in all anticipated future living expenses or needs, such as long-term care costs. An individual's actual replacement rate may vary from this income-replacement rate, as each individual's experience and circumstances are different.

retirement savers, in terms of point-in-time snapshots and trends over time. These observations influence the key demographic and risk assumptions that inform the glide-path analysis.

- *A unique risk-capacity framework.* Fidelity’s refined assessment of risk capacity is unique in the industry, employing a combination of quantitative loss-recovery and risk-preference analysis to develop a “risk boundary” across the age spectrum. This boundary considers both investor behaviour and the market conditions experienced by investors, to establish an age appropriate risk boundary that balances the need for investment returns to meet the income replacement goal, with the need for asset stability and longevity around and in retirement.

This research is reviewed in detail in the following sections of the paper, with a concluding section on how this information is considered and utilized when developing the ClearPath glide path.

Key research that informs the ClearPath glide path

In our process, developing the glide path requires consideration of the following elements, which are used to model and evaluate the distribution of potential outcomes for investors: (1) capital market assumptions, (2) investor behaviour, and (3) risk capacity, meaning an investor’s tolerance and capacity for withstanding negative returns. The investment process supporting Fidelity’s target date portfolios includes multiple types of sensitivity testing⁵ and scenario analysis around these assumptions, to ensure that the asset allocation and structure for the portfolios are appropriate under a range of conditions.

Capital market assumptions

Capital market assumptions provide expectations for return, risk and correlation among asset classes over time. These expectations inform the strategic asset allocation among stocks, bonds and short-term investments, which in turn produces the expected risk-and-return profile for portfolios at each age in the time horizon. Historically, Fidelity’s modelling for its target date strategies has considered capital market

assumptions that are consistent with the performance of asset classes over long-term periods.

Fidelity’s AART has developed a time-based framework to consider capital market expectations across multiple time horizons. This framework recognizes that at any given time, asset price fluctuations are driven by a confluence of various short-term, intermediate-term and long-term factors. For this reason, AART employs a comprehensive asset-allocation approach that analyzes underlying factors and trends across three time horizons: tactical (one to 12 months), business cycle (one to ten years) and secular (ten to 30 years).

In developing the strategic asset allocation for Fidelity’s ClearPath Portfolios, the secular forecasts for capital market assumptions are an important consideration. AART’s current secular capital market assumptions are focused on a 20-year time horizon, which strikes an appropriate balance that limits the impact of temporary cyclical fluctuations and the need to frequently adjust the glide path, while remaining grounded in current market fundamentals to reflect the risk-and-return conditions expected for investors today. Overall, the secular 20-year time horizon was chosen because we believe it is (1) flexible enough to capture shifts in the economic and market landscape and appropriately position the glide path for today’s investors, and (2) stable enough to be aligned with the long-term nature of the glide path and target date objective.

Rather than relying on historical averages, AART’s research-based approach is underpinned by fundamental analysis of the core drivers and the principal linkages between economic trends and the performance of various asset classes across all geographies. This approach emphasizes what history tells us about the drivers of asset returns to generate fundamentally dynamic and forward-looking expectations.

Findings from AART’s current secular capital markets assumptions, which are reviewed on a regular basis, include:

- *Lower expected returns.* AART estimates that returns for most of the primary asset classes (Canadian equities, U.S. equities, investment-grade debt and short-term debt) will be lower over the next 20 years than their long-term historical averages. This result stems from an expectation that returns for investment-grade debt will be diminished

⁵ Sensitivity testing, or sensitivity analysis, in this context refers to evaluating outputs of a quantitative risk model by changing various assumptions (age, planning horizon, etc.) to understand the sensitivity of outcomes relative to changes in the assumptions.

by starting from a position of low yields in the current market environment. More specifically, AART expects that Canadian equity returns over the coming secular horizon will be lower than their long-term historical average.

- *Lower volatility in non-Canadian equity markets.* In foreign markets (i.e., U.S. and international), AART expects lower equity market volatility relative to the group's historical long-term average volatility.

In general, for a portfolio diversified across the major asset classes, our view is that returns should still be able to outpace inflation. Given the expectation for more muted gains from bonds and cash, a higher allocation to equities will be important in pursuing long-term return objectives. The lower expected volatility of non-Canadian equities allows for a greater allocation to equities, while maintaining a reasonable level of risk. Bonds and cash may still have lower absolute volatility than equities, and the low correlations of their returns with equity performance will likely continue to make them key asset classes to help manage downside risk (i.e., risk of loss) within a diversified portfolio.

Investor/retirement plan member behaviour

The assumptions on investor and plan member behaviour include elements such as an investor's age, contribution rate, retirement age and longevity (see Exhibit 2). For Fidelity's ClearPath Portfolios, these assumptions evolve over time, based on an assessment of investor behaviour today, as well as expected trends in demographics.

Working with Canadian recordkeepers, as well as Statistics Canada, we developed pertinent information that provided insight into the actual Canadian retirement investor, which helped to inform the assumptions for the ClearPath Portfolios. Working with Statistics Canada, we requested and obtained specific data sets not publicly available that were relevant for our analysis (such as consumption and income information by age cohort for Canadians). The research included information for over 1 million Canadian workplace plan members.⁶ To obtain our assumptions, we evaluated cross-sectional analysis and cross-time analysis for Canadian plan members by age groups, asset levels and other population groupings,

⁶ This analysis included data from Canadian recordkeepers and Statistics Canada.

to understand the behaviour and trends of retirement savers. We balanced actual observations and directional observations, with an eye toward encouraging "ideal" behaviours for today's savers (Exhibit 2). Our analysis also considers sensitivity testing for each of the baseline assumptions.

In general, today we find that

- Investors are increasingly starting to save for retirement in their 20s. Specifically, we observed that investors started to save meaningfully during their mid- to late twenties.⁷
- Investors are increasingly delaying retirement. We have observed a shifting pattern among plan members toward staying in the workforce longer, and are beginning to reflect this in our thinking with respect to our target date portfolios. In addition, government policy on certain government benefits (Old Age Security and Guaranteed Income Supplement) is changing to gradually extend the age eligibility for receiving full benefits to age 67 for those born

⁷ This analysis included data from Canadian recordkeepers and Statistics Canada.

Exhibit 2 The glide path for Fidelity's ClearPath Portfolios is informed by assumptions about the behaviour of plan members in defined contribution retirement plans from Canadian recordkeeping data. This glide path also considers sensitivity testing to evaluate a range around each assumption.

Retirement investor/Plan member behaviour assumptions

Characteristic	Baseline Assumption
Starting age	Age 27
Retirement age	Age 65
Contribution rate	Total 8%–10%
Retirement planning horizon	Through age 93
Annual salary increase	2%

Assumptions are informed by analysis of Canadian plan member behaviour in defined contribution retirement plans, as well as other data sources. Contribution rate: "8% to 10%" indicates that the deferral rate grows from 8% to 10% over the accumulation period, and includes company matching funds. Annual salary increase (merit rate): reflects a real (inflation-adjusted) growth rate. See Footnote 5 for definition of sensitivity testing.

in or after 1958.⁸ Reflecting this trend, we have analyzed glide-path outcomes across a range of retirement age assumptions (which today includes the early 60s to late 60s), recognizing that investors have a range of retirement age expectations. We expect retirement ages will increase over time, and we continue to monitor this trend.

- We found the present range of deferral rates to be approximately 8% for younger savers to 10% for older savers, combining individual and employer contributions.

Overall, the trends in earlier and greater savings at the initial stages of the glide path, combined with expectations for additional years of employment, improve the probability of achieving inflation-adjusted retirement income equal to approximately 45% of the final preretirement salary of an investor. At the same time, we believe the relatively low contribution rates are less than ideal and may make the achievement of retirement success a challenge. *(Note: The impact that the changes to these inputs have on retirement success is reviewed later in this paper.)*

Risk-capacity framework

The development of the strategic asset allocation for our target date strategies is also informed by research that assesses an investor's ability and tolerance for withstanding portfolio volatility or losses. By accounting for the capacity for risk taking of investors at each age, this framework establishes a "risk boundary" that provides protection against the risk of extreme market events causing a failure to meet long-term objectives.

While it is difficult to measure risk tolerance precisely, the modelling for Fidelity's ClearPath Portfolios is informed by several types of data and analysis:

Investor risk behaviour

To evaluate investors' capacity for risk taking, we analyzed actual Canadian investor behaviour. This information offers insight into how investors respond to portfolio volatility, risk and losses and provides a fair representation of their capacity for risk taking. This data serves as a reference point for consideration when establishing the strategic asset allocation in the glide path.

In evaluating actual investor risk behaviour, we analyzed Canadian mutual fund flows since the inception of target date funds in the Canadian market in the mid-2000s. Specifically, we studied equity, fixed income, balanced and target date fund flows. In reviewing the data, there is evidence to suggest that investors who were saving for retirement using target date funds behaved in a disciplined, prudent manner by maintaining their positions during periods of market stress. For example, relative to equity, fixed-income and balanced fund investors, the data show that these investors did not meaningfully adjust their contribution rates or make portfolio adjustments during recent periods of market stress and were generally less reactive to short-term market movements.⁹ This research, along with other analysis, suggests that investors in target date strategies have a reasonable level of risk tolerance during the accumulation period,¹⁰ and did not react emotionally by liquidating their positions during temporary periods of market volatility or losses.

Quantitative empirical risk framework

Because a target date strategy is designed to be a long-term holding that spans accumulation and distribution, it is important to consider the economic and behavioural impacts of how investors may react in times of market stress and adverse short-term outcomes. While our analysis on actual risk behaviour provides insight into the short-term risk tolerance of investors, a risk-capacity framework should also consider the impact on portfolio outcomes and behaviour over time. Therefore, to evaluate investor risk capacity over longer time periods, we have refined our quantitative framework for analysis. Our refined assessment of risk capacity defines a "risk boundary" across the age spectrum, based on considerations of investor behaviour and the market conditions experienced by investors, emphasizing historical periods of market stress.

The *behavioural elements of our quantitative framework* are based on the groundbreaking work on loss aversion done by behavioural economics pioneers Amos Tversky and Daniel Kahneman. Their work, which has been validated by others in separate studies, suggests that individuals feel the pain of a loss twice as acutely as they enjoy the pleasure

⁸ Source: Service Canada, <http://www.servicecanada.gc.ca/eng/services/pensions/oas/pension/index.shtml>

⁹ Source: Source: IFC mutual fund flow data from January 1992 to December 31, 2014.

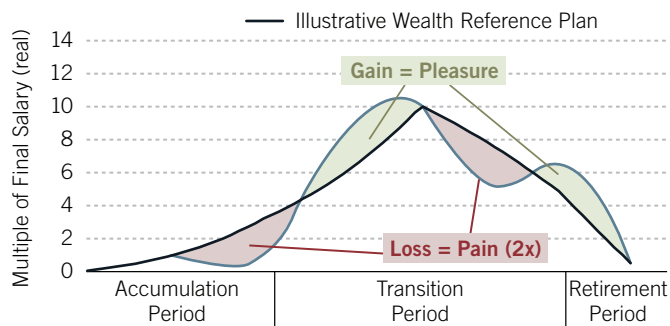
¹⁰ See Footnote 3 on page 3.

from an equivalent gain, as measured by an accumulated wealth reference point.¹¹ In the context of target date investing, this result has both intuitive and quantitative appeal. When an investor's portfolio falls short of the level of assets needed to supply adequate income in retirement, the consequences can be significant, particularly during periods of market stress. Because this experience is painful both economically and behaviourally, these outcomes should ideally be avoided more than favourable outcomes in which the portfolio exceeds the target level of assets.

Applying this concept specifically to a target date portfolio, any time the wealth represented by the portfolio's value falls below its expected path – for instance, during a stock-market

¹¹ Kahneman, D., A. Tversky. "Prospect Theory: An Analysis of Decision under Risk." *Econometrica*, 47.2 (Mar. 1979): pp. 263–292.

Exhibit 3 A quantitative value is assigned to the pain a target date fund investor experiences when an actual portfolio value falls below the wealth reference plan (expected portfolio value based on given assumptions) due to market declines. The value of this shortfall is twice as significant as the value of the pleasure that an investor experiences with an equivalent gain. Loss aversion utility applied in context of a target date portfolio investor



For illustrative purposes only. Based on "Prospect Theory" research of D. Kahneman and A. Tversky. Accumulation Period: Early working life. Retirement Period: Late retirement years. Transition Period: Years between Accumulation period and Retirement Period. Source: Fidelity Investments.

decline – the deviation from this wealth reference plan¹² is considered to be "more painful" to investors than the comparable wealth that may be generated from a stock market gain (see Exhibit 3). As a result, we can define a utility function – the satisfaction from meeting the stated investment objectives (or the dissatisfaction from failing to do so) – by considering these loss aversion assumptions, in order to develop quantitative measures of risk tolerance at each stage of the time horizon.

The *investment elements of our quantitative framework* focus on the outcomes that investors would have experienced during historical periods of significant market stress. Our framework is designed to capture an investor's experience and sensitivity to losses, both at the time of a market decline and in subsequent periods. Historically, we have found severe market environments have occurred more frequently than traditional quantitative models would expect. While quantitative models often assume that investment returns follow a normal, or bell-shaped, distribution, the actual frequency during which markets have produced significant negative returns has been higher (see Exhibit 4). In fact, we find that if returns were normally distributed, annualized declines in equity markets greater than 20% would occur once every 42 years,¹³ with other significant events occurring even less frequently. As Exhibit 4 shows, these types of unexpected events have occurred more frequently in real-world experience. Therefore, as a baseline for our analysis, we have evaluated results using actual market performance from the 20 worst equity market declines during the past 90 years.¹⁴

¹² *Wealth reference plan*: The level or balance of expected assets at any point in the glide path based on the adherence to given assumptions.

¹³ The calculation is based on a blended benchmark of 25% TSE 300 Index, 37.5% Fama-French U.S. Market Value-weighted Index and 37.5% MSCI ACWI Ex-Canada-U.S. (MSCI EAFE prior to 1987). More information can be provided upon request.

¹⁴ The 20 worst equity market declines referenced in the article are based on monthly data for a blend of 25% TSE 300 Index, 37.5% Fama-French U.S. Market Value-Weighted Index and 37.5% MSCI ACWI Ex-Canada-U.S. (MSCI EAFE prior to 1987). The 20 worst declines are represented by the following dates, starting with the first month of the downturn period: Sep. 1929, Apr. 1937, Apr. 1940, Sep. 1944, Dec. 1945, May 1956, Aug. 1957, Apr. 1962, Feb. 1966, Apr. 1969, Apr. 1973, Feb. 1976, Oct. 1978, Jan. 1981, Apr. 1984, Sep. 1987, Aug. 1998, Apr. 2000, Feb. 2007, Feb. 2011. More information can be provided upon request.

Our quantitative framework for evaluating risk capacity combines these aforementioned behavioural and investment market elements by considering the investor experience during each of these 20 periods. For investors at various ages, we evaluate what the portfolio balance, expected cash flows and experience would have been during a defined time horizon, using a wide range of potential asset-allocation strategies over the horizon. For each investor, we calculate the utility at the end of each year by comparing whether the portfolio's value is above or below its expected level. The overall utility, or satisfaction, for the investor's experience can be calculated by aggregating the utility values over the entire period.

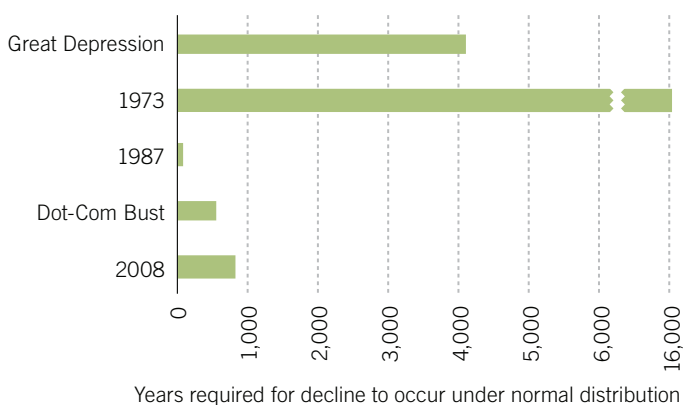
For each hypothetical investor, we identify and select the asset-allocation path that maximizes the investor's average utility over all the historical periods. This asset-allocation path sets a maximum level of risk capacity, or risk boundary, which focuses on protecting the portfolio and the outcome for each investor during periods of market stress.

For example, at age 84 and the start of the retirement period (late retirement years from age 84 through the retirement

horizon age 93, when the glide path becomes static), an investor has a remaining planning horizon of ten years (see Exhibit 5, Step 1). Following a quantitative process known as backward induction (determining the asset allocation for investors at younger ages by using the asset allocation for investors at older ages as an end point), we evaluate a range of possible allocation paths that invest in different combinations of stocks, bonds and short-term assets over time, finishing at a conservative portfolio allocation (i.e., 21% equities, with 4% expected volatility – standard deviation of returns) at the assumed end of age 93. For each allocation path, the investor's utility values are calculated and evaluated, based on what the experience would have been during the 20 historical periods. We then select the allocation path that maximizes the average utility over all the periods. The risk capacity of an 84-year-old is low due to the investor's short time horizon, which results in selecting a path that maintains a conservative allocation over this entire period. For this investor, the risk-capacity framework provides a guideline that recognizes the short time horizon and protects the investor from significant market declines when losses would be most harmful.

Exhibit 4 Quantitative modelling techniques often underestimate the frequency of major equity market declines.

Rate of major equity market declines implied by normal distribution



Years required for event to occur is calculated as 1/(probability of a larger decline than the given event) where the probability is calculated based on normally distributed real equity returns (random walk with drift) with annualized mean of 7.81% and annualized standard deviation of 14.03%. Source: Fidelity Investments.

The same process is applied for investors of different starting ages and time horizons. At the beginning of retirement, an investor has a reasonably long time horizon for planning and is starting to withdraw assets from the portfolio. For this investor, the risk-capacity framework provides an upper boundary that is consistent with a balanced portfolio that gradually becomes more conservative as the time horizon shortens. By comparison, a younger investor has a longer time horizon and continues to make contributions to the portfolio. The results of our analysis illustrate that younger investors have greater risk capacity and more time to recover from periods of market stress.

Exhibit 5 is an illustrative diagram that shows how the application of this framework at various ages leads to a guideline for risk capacity at each age in the time horizon. The capacity for risk diminishes as an investor ages, because the planning horizon shortens and withdrawals increase as a percentage of total wealth. It is important to note that this diagram is simplified to convey the process of how the risk boundary is constructed through backward induction. We evaluate the risk boundary for multiple interval age

assumptions to understand the nature of the way risk capacity changes with adjustments in time horizons.

Constructing the ClearPath glide path

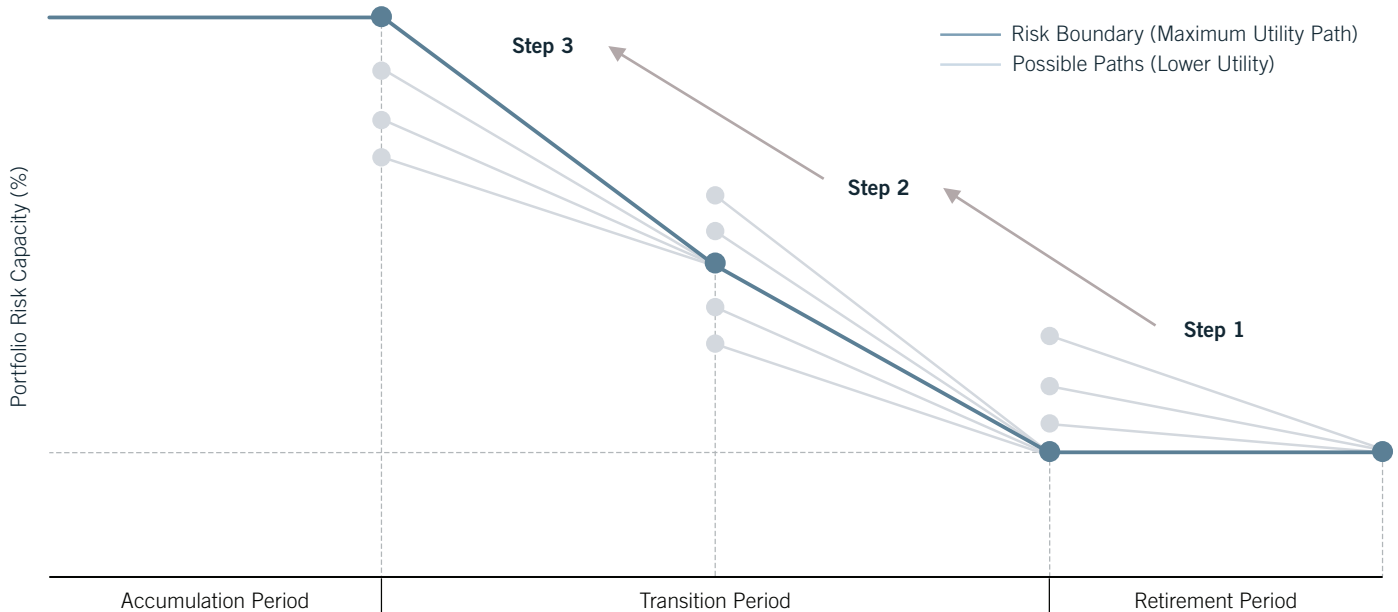
The analysis that supports the glide path for Fidelity's ClearPath Portfolios utilizes the capital market assumptions, investor behaviour assumptions and risk-capacity methodology as research components that inform the decision-making process. The analysis framework used to develop the glide path begins by focusing on the allocations for each of the end points. These two portfolios – the **accumulation portfolio**, which is focused on capital appreciation, and the **retirement portfolio**, which seeks a balance among total return, high current income (yield) and capital preservation – are developed to achieve distinct goals at opposite ends of the risk spectrum and investor time horizon. These portfolios serve as anchors for the asset allocation in the most aggressive target date

portfolio (for younger investors) and the most conservative target date portfolio (for older investors).

Accumulation portfolio. The asset allocation for the accumulation portfolio focuses on capital appreciation as the primary objective. The goal is to build accumulated wealth to achieve a successful retirement income goal of 45%. The accumulation portfolio is designed to produce high expected total return, while maintaining diversification across asset classes. Based on Fidelity's long-term capital market observations, combined with stochastic and empirical modelling, the strategic allocation for the accumulation portfolio includes 92% in equities and 8% in fixed income, with a long-term expected volatility of approximately 13%. This strategic allocation is expected to provide a level of risk and return that is consistent with the capital appreciation objective for investors who have a long time horizon to retirement.

Exhibit 5 The risk-capacity framework identifies the limit on risk (i.e., portfolio volatility) for each age by selecting the allocation paths for investors of different ages that achieve the most favourable outcomes during historical periods of equity market declines.

Fidelity risk capacity framework



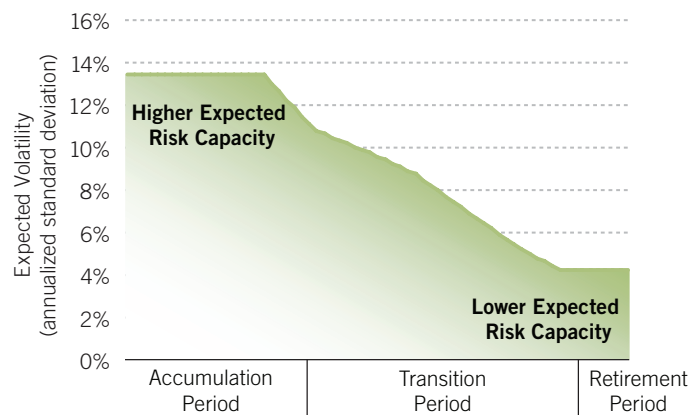
Source: Illustrative example of how Fidelity uses the backward induction process to identify the asset-allocation path with a risk-capacity limit at each age that seeks to achieve the most favourable outcome during historical periods of equity market stress. Accumulation Period: early working life; Retirement Period: late retirement years; Transition Period: years between Accumulation Period and Retirement Period. Source: Fidelity Investments.

Retirement portfolio. The asset allocation for the retirement portfolio focuses on seeking a balance among total return, high current income (yield) and capital preservation. Because the objectives for the retirement portfolio are more nuanced, several types of analyses are evaluated. For example, allocations that maximize total return may also expose an investor to the greatest downside risk in times of market stress, so it is necessary to evaluate the outcomes through multiple lenses.

The strategic allocation for the retirement portfolio includes 21% equities, 35% bonds and 44% short-term investments, with a long-term expected volatility of approximately 4%. This allocation is expected to balance the objectives of the most conservative portfolio for investors who are well past the retirement date, providing the potential for total return, limited declines and current income.

Exhibit 6 The risk-capacity* analysis establishes a targeted level of portfolio volatility at each age in the life cycle.

Risk capacity in Fidelity's glide path



*Based on Fidelity's assumptions previously stated in this article. Expected portfolio volatility (risk capacity) is calculated using the equity rolldown that produces a high level of utility over the 20 market decline events in combination with the long-term capital market assumptions for asset return volatilities. Standard deviation: A statistical measure of spread or variability; the root mean square (RMS) deviation of the values from their arithmetic mean. Accumulation Period: Early working life. Retirement Period: Late retirement years. Transition Period: Years between Accumulation Period and Retirement Period. Source: Fidelity Investments.

Applying risk capacity in the glide-path design

The analysis that supports the glide path for Fidelity's ClearPath Portfolios utilizes Fidelity's capital market assumptions, investor behaviour assumptions¹⁵ and risk-capacity methodology as research components that inform the decision-making process.

The outcome of this control process is an age-based asset-allocation strategy that seeks to balance the need for total return and the need to limit the pain an investor experiences in the event of a market decline, all with respect to a wealth reference plan. Further, Fidelity's risk-capacity analysis considered the results of sensitivity testing¹⁶ for each of the baseline assumptions. The expected long-term volatilities of the portfolios associated with Fidelity's ClearPath Portfolios provide a risk boundary along the age spectrum.

The risk boundary acts as an upper boundary on the long-term portfolio risk (measured as standard deviation) for investors at each age. In this framework, the asset allocation for the retirement portfolio¹⁷ serves as an anchor point for an investor at the end of the planning horizon (age 93). The backward induction process is applied at multiple ages and for multiple time horizons, with the accumulation portfolio¹⁸ providing a limit on the most aggressive allocation for younger investors (beginning at age 27). The allocation points are then linked across the different ages in the transition period to create one continuous allocation path. This asset-allocation path defines the risk boundary at each age for the glide path (see Exhibit 6). While a more aggressive glide path could increase the likelihood for achieving successful outcomes, the risk boundary helps to provide protection for investors at each age during periods of market stress. As a consequence of this consideration, the slope of Fidelity's risk boundary – the targeted level of portfolio volatility – becomes more gradual during the decade prior to an assumed retirement date (Exhibit 6).

¹⁵ The glide path goal of Fidelity's target date strategies is based on a set of assumptions regarding an investor's total savings rate, retirement savings start date, planning horizon and annual salary increase, among others.

¹⁶ See Footnote 5 on page 4.

¹⁷ See Footnote 3 on page 3.

¹⁸ See Footnote 3 on page 3.

Asset-liability model analysis: Testing a universe of glide paths and applying secular capital market assumptions

The final stage of the investment process applies asset-liability modelling to evaluate potential investor outcomes in the context of the overall income-replacement objective. Ideally, an investor’s portfolio would have precisely enough assets to generate payments equal to the desired income-replacement level, or liability, during the planning horizon. In practice, variability in investor behaviour, combined with the uncertainty and volatility of markets, creates a distribution of potential outcomes that investors may experience. Asset-liability analysis uses quantitative modelling techniques to create a distribution of outcomes that can be evaluated. From this analysis, a glide path is selected that strikes a balance between providing a high likelihood for successful outcomes in meeting the objective and reducing the shortfall risk that would occur if success were not achieved.

By combining the results of our risk boundary analysis and the application of the secular CMAs, a universe of glide paths can be evaluated in an asset-liability framework. The risk boundary from the quantitative empirical risk framework provides an upper boundary for the level of risk that is appropriate for investors at each age in the time horizon. Glide paths are then considered with portfolios that include varying levels of expected risk, based on Fidelity’s secular capital market assumptions, that are less than or equal to the risk boundary at each age (see Exhibit 7).

In combination with the demographic assumptions for investor behaviour, the allocation paths produce a range of outcomes that can be evaluated to highlight the trade-offs in having a more aggressive or conservative asset-allocation approach over time. When assessing potential outcomes in a target date strategy, it is important to evaluate reward and risk relative to the income-replacement goal for investors. While the risk-and-return results for traditional mutual funds are often measured against standard market benchmarks (e.g., S&P/TSX Composite Index for equity strategies, FTSE TMX Canada Universe Bond Index for bond strategies), the asset-liability objective of a target date strategy requires a different type of measurement to evaluate risk and reward relative to a retirement liability.

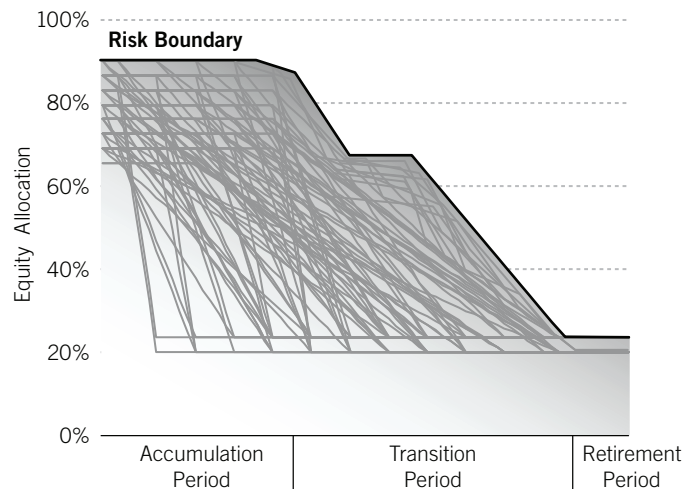
In the context of the target date strategies, “reward” can be defined as success in achieving the income-replacement

objective – having sufficient inflation-adjusted income to last from the retirement date until the end of the planning horizon. Fidelity’s ClearPath Portfolios strive to achieve successful outcomes in a high proportion of scenarios. “Risk” can be defined as those outcomes when success is not achieved, and there is not sufficient income to last for the entire planning horizon. For measurement purposes, outcomes can be created using simulation techniques, with risk focused on the worst-case scenarios. “Shortfall” can be defined as the number of years in the planning period for which there is insufficient income. Fidelity’s ClearPath Portfolios strive to achieve successful outcomes, while limiting average shortfall in the worst-case scenarios.

Fidelity’s review of results from the asset-liability analysis shows that glide paths with higher equity allocations at each point in time produce a higher likelihood for success and lower shortfall risk relative to the results for more conservative strategies. These glide paths are preferred

Exhibit 7 Using asset-liability modelling based on a set of given assumptions, glide paths are evaluated with varying levels of risk that are less than or equal to the risk boundary at each age.

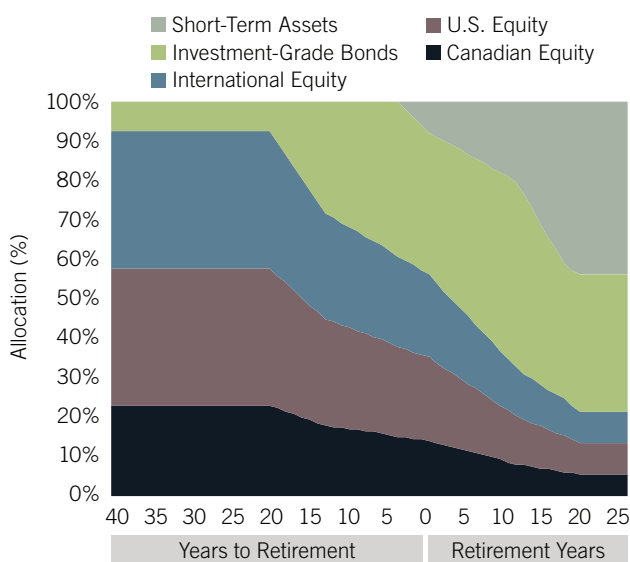
Sample glide paths tested using asset-liability modelling



Light grey lines shown in chart are illustrative representations of many sample glide paths tested. Source: Fidelity Investments.

because of the interrelationship of investor behaviour and capital market assumptions. Because current levels of investor contributions (8% to 10%) alone are not sufficient to provide inflation-protected income through the planning period, investment returns are needed over time. When evaluating potential glide paths, strategies with higher equity exposure are preferred to provide this return, in part because of their higher return potential. While a more aggressive glide path may increase the likelihood of achieving successful outcomes, the risk boundary helps to provide protection for investors at each age during periods of market stress.

Exhibit 8 The outcome of Fidelity’s investment process produces a glide path for Fidelity’s ClearPath Portfolios that can help investors achieve their retirement objectives. The glide path for Fidelity’s target date strategies



Investors should allocate assets based on individual risk tolerance, investment time horizon and personal financial situation. A particular asset allocation may be achieved by using different allocations in different accounts or by using the same allocation across multiple accounts. The glide path is not intended as a benchmark for individual investors; rather, it is a range of equity, bond and short-term debt allocations that may be appropriate for many investors saving for retirement, based on an assumed retirement age of 65, as well as a range of expected retirement ages at or near 65. Investors should consider whether they anticipate retiring significantly earlier or later than age 65, and should select the allocation that best meets their individual circumstances and investment goals. Source: Fidelity Investments.

Output: Fidelity’s enhanced glide path

Through a combination of quantitative and qualitative judgment, Fidelity’s glide path establishes a long-term strategic asset allocation that balances return and risk at each point in the time horizon, while striving to achieve the income-replacement objective, assuming appropriate investor behaviour. Establishing a risk-capacity framework and applying Fidelity’s secular CMA’s in the asset-liability model for Fidelity’s ClearPath Portfolios produces a glide path that we believe strikes an appropriate balance for achieving a reasonable likelihood for success, limiting shortfall risk and reflecting investor risk capacity over time (see Exhibit 8).

After applying our current secular capital market assumptions, the strategic asset allocation for investors with a long time horizon to retirement reflects 92% equities and 8% fixed income. This allocation remains consistent until investors reach their middle 40s, at which point the allocation to equities is gradually reduced. The allocation to equities continues to be reduced until age 84, at which point the portfolio allocation becomes static. At that time, the strategic allocation includes 21% in equities, 35% in bonds, and 44% in short-term assets.

Final thoughts: Retirement readiness is a partnership

Investors should recognize that achieving adequate income replacement throughout retirement requires a combination of investor contributions and portfolio returns. In the absence of consistent and adequate investor contributions, there is a low likelihood that an individual will have sufficient assets at retirement, to meet the goal of the asset-allocation strategy that is implemented.

Fidelity’s analysis shows investors looking to improve outcomes have options that can be implemented. Specifically, making only modest adjustments to the following investor behaviours are some of the ways to increase the likelihood of achieving a successful outcome:

- Increase the contribution rate.
- Start saving/contributing earlier.
- Delay retirement age.
- Lower the expected income-replacement level.

Meanwhile, Fidelity continues to focus on the investment aspects of the retirement readiness partnership, and

we continually evaluate opportunities to improve outcomes for investors. We believe the recent enhancements to our investment process offer investors in our ClearPath Portfolios an investment solution that can adapt to the current market dynamics through an innovative framework. These enhancements are part of an evolutionary process designed to help investors achieve successful retirement outcomes.

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Past performance is no guarantee of future results.

Neither asset allocation nor diversification ensures a profit or guarantees against a loss.

Investment decisions should be based on an individual's own goals, time horizon and tolerance for risk.

Target date portfolios are designed for investors expecting to retire around the year indicated in each portfolio's name. Each portfolio is managed to gradually become more conservative over time as it approaches its target date. The investment risk of each target date portfolio changes over time as the portfolio's asset allocation changes. The portfolios are subject to the volatility of the financial markets, including that of equity and fixed-income investments in Canada and abroad, and may be subject to risks associated with investing in high-yield, small-cap, commodity-linked and foreign securities. Principal invested is not guaranteed at any time, including at or after the portfolios' target dates.

Target date portfolios are designed to help achieve the retirement objectives of a large percentage of individuals, but the stated objectives may not be entirely applicable to all investors due to varying individual circumstances, including retirement savings plan contribution limitations.

+ Capital market assumptions are "forward-looking statements," which are based upon certain assumptions of future events. Actual events are difficult to predict and may differ from those assumed. There can be no assurance that forward-looking statements will materialize or that actual returns or results will not be materially different than those presented.

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