The evidence on target-date mutual funds

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Abstract

This paper assimilates the knowledge and evidence on target-date mutual funds (TDFs). It begins with a discussion of the environment that contributes to the tremendous growth of TDFs. Next, a survey of the theory and recommendations on glide paths indicates a trend towards focusing on meeting retirement liabilities, rather than optimizing asset only portfolios. A review of performance evaluation metrics for TDFs shows that none of the available indexes possesses all seven characteristics of an ideal benchmark. Plan sponsors can provide better outcomes by offering multiple risk profile TDFs while researchers can focus on improving glide path and benchmark design. © 2016 Academy of Financial Services. All rights reserved.

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1. Introduction

The Department of Labor's safe harbor provision of 2007 has provided a significant boost to the popularity of target date mutual funds (TDFs). These funds are now included as a default investment option in defined contribution plans along with managed accounts and balanced funds. According to Department of Labor, the Qualified Default Investment Alternative (QDIA) provides a plan sponsor "safe harbor relief from fiduciary liability for investment outcomes EBSA (2008)." A consequence of the Pension Protection Act of 2006, employers are increasingly adopting the automatic enrollment option in 401(K) plans, which further supplements the assets under management (AUM) base of TDFs.

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Investors held about $1 trillion in target date and lifestyle funds at the end of 2014, compared to a total of $2.75 billion at the end of 1995 (ICI Handbook, 2015). This calculates to a compounded annual growth rate (CAGR) of about 35% over the 10-year period, an impressive flow of investor money to these funds.[1]

A TDF is managed from its purchase date through an expected retirement year, and in some cases, the fund provides an additional "during retirement" investment option. On the other hand, a lifestyle fund is directed to a broad age group and tailored to its purported risk tolerance. For example, a lifestyle fund focused on younger investors in their 30s will usually have a high equity exposure, while a lifestyle fund aimed at retirees will likely have a heavy emphasis on fixed income securities. Assuming that one's risk tolerance decreases with age, an investor will move from one lifestyle fund to the next one catering to their "lifestyle" as they age, until they are in retirement. In the case of a TDF, this asset allocation is automatically shifted for the investor. A good way to understand the difference between target date and lifestyle funds is to think of lifestyle funds as building blocks of a TDF. So, which of these two fund types should investors prefer? Chang et al. (2014) use a utility maximization framework and use bootstrap simulations to compare welfare benefits of both types of funds. The primary focus of their research is to measure utility derived from fixed and decreasing equity allocation for an individual investor over time. They find that a decreasing equity allocation provides better welfare benefits than a static one. This implies that TDFs are superior investment vehicles from a utility maximization perspective. The authors caution that there is no one-size-fits all TDF, the investor should select such funds based on their risk tolerance. For the purposes of this paper, the term "target date fund" is used to designate a broad class of open-end mutual funds and exchange traded funds (ETFs) that include both target date and lifestyle funds.

The appeal of a target-date mutual fund lies in the convenience it provides to the investor. She does not have to monitor, and periodically alter the asset allocation because of passage of time. In most cases, the fund mandate automatically provides for that. Based on the chosen retirement age, the fund manager allocates the funds to a predetermined allocation schedule; say 85% stocks and 15% fixed income initially when the investor is young. This allocation may eventually reverse to 15% stocks and 85% fixed income closer to the "target date." This change in asset allocation that occurs over many years is commonly referred to as the fund's "glide path."

The Vanguard Target Retirement Fund 2055 (Ticker: VFFVX), is provided as an example. The 2055 in the fund name indicates the anticipated retirement year for the investor. In 2015, this fund is recommended for a 30-year old anticipating retirement at age 70 or a 25-year old anticipating retirement at age 65. Based on the fund's glide path, the initial asset allocation is quite aggressive, with up to 90% in equity securities. According to Vanguard, this becomes "more conservative over time, meaning that the percentage of assets allocated to stocks will decrease while the percentage of assets allocated to bonds and other fixed income investments will increase." After the year 2055, the fund will mimic the allocation of Vanguard Target Retirement Income Fund (Ticker: VTINX), another fund in the Vanguard funds family. For a comparison of the two funds, the reader is referred to Table 1 (Vanguard Group [2015]).

The glide path of the Vanguard Target Retirement Funds is shown in Fig. 1. As expected, the glide path of the fund becomes more conservative as the target date approaches. Based

Table 1   Comparative information on Vanguard Target Retirement fund 2055 and target retirement income fund[a]

Composition of funds	Vanguard Target Retirement 2055 fund	Vanguard Target Retirement Income fund
Ticker	VVFVX	VTINX
Assets under management	$1.67 billion	$11.21 billion
Target equity	90%	30%
Target fixed income and cash	10%	70%
Acquired fund fees and expenses	0.18%	0.16%
Asset allocations as of 9/30/2014		
Total Stock Market Index	63.0%	21.1%
Total International Stock Market Index	27.0%	8.8%
Total Bond Market II Index	8.0%	39.3%
Total International Bond Index fund	2.00%	14.0%
Short-term inflation-protected securities	0.0%	16.8%

Note: [a]Reported for September 30, 2014.

on the fund's prospectus the manager of the fund has significant discretion in the asset allocation decision. For example, while the allocation to equities is required to diminish from 90% to 30% by the retirement date, the manager has discretion of plus or minus seven years around the target date to accomplish that. Such discretion may not be the case for all target date mutual funds. Many have a more rigid timetable for asset allocation change.

There are multiple approaches to designing TDFs with each fund family emphasizing their approach as superior, perhaps in the pursuit of market share. Some families use index funds in the lineup of TDFs while others rely on actively managed ones. Some have rigid or semi-rigid asset allocations while others provide their managers with broader latitude in such decisions. The wide range of design approaches can be illustrated by comparing the Van-
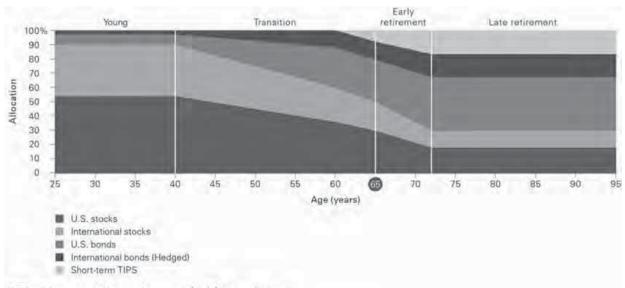
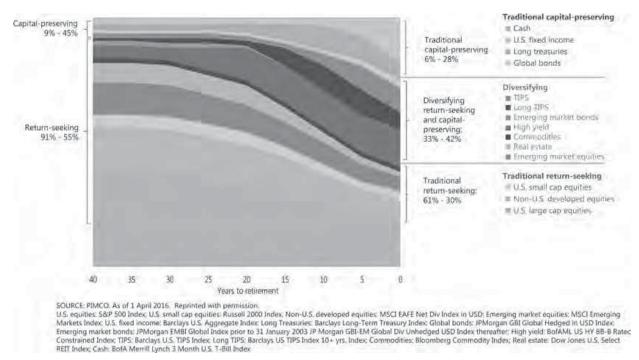Fig. 1. An illustrative glide path for Vanguard target date fund.

SOURCE: PIMCO. As of 1 April 2016. Reprinted with permission.
U.S. equities: S&P 500 Index; U.S. small cap equities: Russell 2000 Index; Non-U.S. developed equities: MSCI EAFE Net Div Index in USD; Emerging market equities: MSCI Emerging Markets Index; U.S. fixed income: Barclays U.S. Aggregate Index; Long Treasuries: Barclays Long-Term Treasury Index; Global bonds: JPMorgan GBI Global Hedged in USD Index; Emerging market bonds: JPMorgan EMBI Global Index prior to 31 January 2003 JP Morgan GBI-EM Global Div Unhedged USD Index thereafter; High yield: BofAML US HY BB-B Ratec Constrained Index; TIPS: Barclays U.S. TIPS Index; Long TIPS: Barclays US TIPS Index 10+ yrs. Index; Commodities: Bloomberg Commodity Index; Real estate: Dow Jones U.S. Select REIT Index; Cash: BofA Merrill Lynch 3 Month U.S. T-Bill Index

Fig. 2. Glide path of PIMCO target-date funds.

guard funds to PIMCO funds. PIMCO TDFs utilize a liability driven investing (LDI) approach to asset allocation changes. The design is motivated by the goal of meeting inflation-adjusted withdrawals (liabilities) during retirement (a more in-depth discussion on Liability Driven Investing [LDI] is provided in a later section of this paper). Fig. 2 depicts the glide path of PIMCO TDFs. The wide range of approaches to TDF design is starkly contrasted by Figs. 1 and 2. The key difference that can be observed is the exposure to inflation insensitive assets like TIPS, commodities and, real estate during retirement in the two glide paths.

To the best of my knowledge, this is the first paper that provides a comprehensive review and evaluation of the body of knowledge on TDFs. The focus of this paper is four fold. In the first section, a discussion of the current state of the target date mutual fund market is provided. The discussion includes analysis of factors that have aided in the growth of this segment of the investment companies market. In the second section, a discussion of the theoretical basis and a summary of varied suggestions for designing glide paths are presented. In the third section performance and benchmarking of these funds is discussed. In the fourth, recommendations and suggestions for plan sponsors, financial advisors and researchers are made. Concluding remarks are provided in the final section.

2. The TDF market

Over the 10-year period 2005–2014, assets under management in TDFs have grown about five-fold. According to the Investment Company Institute (ICI), investors had a choice of 797 TDFs for a total of 3,036 mutual fund share classes at the end of 2014 (ICI [2015]). Bauer,

Phillips, and White (2009) predict that 80% of all new defined contribution plan investments will go to TDFs and the target-date market will be $2.3 trillion by end of 2018. There are three broad factors playing a role in the remarkable growth of this market namely, the regulatory environment, demographics, and investor affinity for passive investments.

Before TDFs became popular, Agnew et al. (2003) studied 7,000 accounts of a large defined contribution plan over the period 1994 to1998. They find significant participant indifference towards the management of their retirement assets. Most asset allocations are at extremes, either 100% or 0% equities. They also find "very limited portfolio reshuffling" implying that rebalancing of portfolios is rare. More alarmingly, in a study of over a million retirement accounts from about 1,000 pension plans, Tang and Mitchell (2010) find that most employers provide an efficient menu of investment choices in pension plans. However, participants undo this by making inefficient portfolio selection decisions. This costs the participants a reduction of about one-fifth in potential retirement wealth. In addition to participant education, the natural corollary of these findings would be to have investment vehicles in retirement plans that do not require significant participant intervention over time, that is "do no harm." Each of the preceding studies shows that fund owners are not likely to manage their retirement funds to their best advantage. This provides a compelling argument in favor of TDFs. Funds that absolve the portfolio owner of monitoring and periodic adjustments to reflect altered risk tolerance.

The most significant boost to TDFs comes from two regulatory developments: (1) the automatic enrollment (opt-out option) feature under the Pension Protection Act of 2006 and (2) the Department of Labor directive of 2007 that provides safe harbor relief to plan sponsors if a TDF is offered as a Qualified Default Investment Option (QDIA). The other two QDIA options that emerged from the Pension Protection Act of 2006 (PPA) are managed accounts and balanced funds EBSA (2013). This regulatory protection has greatly increased the popularity of TDFs in qualified defined contribution retirement plans.

According to Landsberg (2007), PPA provides changes in five broad areas: defined benefit plan funding, hybrid qualified plans, defined contribution plans, executive compensation, and plan distributions. Two broad set of key changes promote the growth of assets invested in TDFs. The first relates to enrolment procedures and regulatory relief. This includes permission to employers to offer automatic enrollment in 401(K) plans and safe harbor provisions for default options that include TDFs in automatic enrollment plans. A default investment option becomes the deemed choice of a participant when no selection of investment alternatives is specifically made. The second contributing factor makes permanent the provisions of Economic Growth and Tax Relief Reconciliation Act (EGTRRA) of 2001 with respect to increased contributions, inflation indexing and "catch up" provisions for contributions to various Individual Retirement Arrangements (IRAs) and 401(K) plans.

Balduzzi and Ruetter (2015) report increased heterogeneity in risk taking and associated returns of target date mutual funds since the passing of PPA of 2006. They attribute this divergence in performance to risk taking by fund families with low market shares attempting to differentiate themselves to attract plan sponsors. Consequently, participants in different funds of the same vintage year might experience returns significantly different from the average.

In a study of its participants, TIAA-CREF researchers Richardson and Bissette (2014) find that over the period 2005–2011 TDFs garnered a significant proportion (22%) of all

contributions. These funds are the preferred choice of younger participants with lower account balances and are utilized as a fund of funds strategy, meaning that the target date fund is the primary investment of the participant. A similar trend is reported for the broader 401(K) market by ICI. At the end of 2013, 70% of 401(K) plans offered TDFs and the proportion of recently hired participants in their 20s and 30s holding TDFs is 51% and 53%, respectively. The comparable numbers for 2006 are 29.4% and 28.5%, respectively. Equally interestingly, 85% and 80% of the account balance of these participants, respectively, is held in TDFs. There seems to be a demonstrable trend towards increasing use of TDFs by younger workers. If investment choices in retirement plans are assumed to be stable, then the expectations of a significant increase in assets of TDFs with the passage of time seems logical.

For the year 2014, ICI reports that new fund flows into indexed funds increased by 30% in addition to a 93% increase in 2013. A significant portion of these funds was into equity index funds. Remarking on the growth ICI concludes, "Demand for index mutual funds remained strong in 2014." Index funds reflect a low cost tax efficient passive investment philosophy. TDFs are steeped in a similar belief that discourages frequent readjustment of asset allocation and portfolio holdings. It may not be a leap to assume that an investor embracing index funds is likely to be attracted to TDFs and vice versa. Given the trend of increasing assets directed towards TDFs, the design of these retirement savings vehicles becomes important to retirement well-being of a significant proportion of the working population.

3. Investment theory and glide paths

Towers Watson (2010) reports

> "… a 2009 Watson Wyatt research study found that employees categorized as 'intermediate/ long-horizon' investors planning to retire in 15 years or more experienced typical median declines of 27% to 37% in the value of their plans. This magnitude of loss was attributable to the large exposure to equity investments (51% to 95% across 2020–2055 target horizon funds evaluated) considered appropriate for investors focused on wealth accumulation. What is troubling, however, is that 'short-horizon' investors planning to retire in two to seven years (2010–2015 target horizon funds) suffered a median loss of 21%, and as high as 36% for some funds. These individuals have limited ability to recover from the losses incurred other than by deferring retirement and significantly increasing their rate of retirement saving (p. 1)."

D'Antona (2008) aptly highlights a similar plight of TDF owners retiring in the period 2008–2010. She also points to the wide range of losses suffered by such investors because of deficient glide paths. The glide path of TDFs has a significant influence on investment outcomes and consequently on retirement well-being. A fund's glide path primarily refers to the manner in which the fund asset allocation changes over time until the target date is reached or beyond. The evidence on the efficacy of glide path design is discussed next.

Gomes, Kotlikoff, and Viceira (2008), study asset allocation in the context of a variable labor supply. They propose that the ability of individuals who do poorly in financial markets can make up the performance shortfall by working more. They demonstrate that the welfare loss is negligible when using a typical life cycle mutual fund. Comparatively, there is a

significant loss of welfare in investing in stable value funds. They argue in favor of higher equity exposures during retirement as the presence of bond like cash flows in the form of pension benefits provide better risk taking capabilities. Pfau and Kitces (2014) further endorse the idea of upward sloping glide paths during retirement, that is, those that increase equity exposure during retirement. Using Monte Carlo simulations, they demonstrate that glide paths that increase equities from 30% to 60% during retirement reduce the probability and magnitude of run outs as compared with glide paths that do the opposite that is, reduce equity exposure from 60% to 30% during retirement. Later Kitces and Pfau (2015) combine a rising equity allocation glide path with a dynamic asset allocation scheme. In this scheme, equity exposures are increased when equity markets are deemed undervalued and reduced when overvalued. Using actual return data and overlapping periods, they demonstrate that a rising glide path is most suited in overvalued markets. Blanchett (2015) points to the fact that the initial condition of financial markets is often ignored in many asset allocation decisions as one is embarking upon, or is close to retirement. Utilizing a range of varying market conditions, he concludes that upward sloping glide paths representing increasing allocations to equities seem to perform well in relatively higher return environments and higher allocations to lower risk assets seem to do well in low return markets.

Basu and Drew (2009) are perhaps the first to question the conventional wisdom of reducing equity allocation in TDF portfolios as one nears the target date. They point to the fact that individuals contribute savings to the retirement portfolio on a regular basis and the sum total of the initial portfolio increases with time even if one assumes a rate of return of zero on initial portfolio and contributions. Reducing equity allocation in such portfolios at a point in time close to the withdrawal phase is detrimental to portfolio size at terminal date. The difference between the lifecycle and contrarian strategy (one that increases equity allocation closer to terminal date) is mostly driven by performance close to terminal years. The authors do acknowledge the chance of ruin increase under such a strategy and that the behavioral aspects of such a strategy cannot be ignored.

Pfau (2010) uses Monte Carlo simulations to illustrate that investors with modest risk aversion will find traditional glide paths more suitable as compared with a fixed allocation. He points to the failure to consider expected utility and, therefore, comparative risk aversion in contrarian glide paths of some studies. Contrary to Basu and Drew, he shows that higher utility is derived from traditional life cycle strategies when the investor wishes to avoid probability of ruin.

Capitalizing further on the earlier findings, Basu, Bryne, and Drew (2011) also suggest a dynamic asset allocation strategy predicated on portfolio value rather than the age of the participant. The key to such a strategy would be the setting of an accumulation rate and this accumulation rate guides the asset allocation over time. The authors utilize simulations to demonstrate the benefits of such a strategy. Yoon (2010) suggests a risk budget based methodology to designing glide paths. Under such a system, periodic adjustments to asset allocation are driven by the available risk budget. The advantage of such a strategy as Yoon points out is that the asset allocation stays within the risk tolerance at all times. The downside of such a system is the complexity of the system and the inability to maximize returns.

Spitzer and Singh (2011) study the glide path of 22 fund families and classify glide paths utilized by these fund families in two broad categories, "Late Descent" or "Early Descent."

In late descent glide paths, the percentage of stocks stays constant at a high proportion for the first part of the life cycle and then begins to fall rapidly over the latter part of the investment period. In "Early Descent" the asset allocation begins with a high proportion in equities and, the percentage of stocks falls gradually over the entire holding period. Both strategies are shown to be inferior to a static allocation. The Investment Company Institute (2014) uses three similar classifications to illustrate glide paths. The first, "allocates 50% of its assets to equity as of the target date ('RET') and reaches its most conservative allocation (20% equity) 15 years later." In the second, a constant proportion is maintained for the first 20 years and then the asset allocation glides to the most conservative allocation five years before the retirement date. In the third set of glide paths, a constant allocation is maintained in the first 20 years and the asset allocation is gradually reduced to more conservative through 30 years into retirement. Even with same securities in all portfolios in the preceding strategies, the investment outcomes are likely to be different because of asset allocation and its adjustment. The other factor affecting the investment outcome in these funds is the investment strategy and security selection in the portfolio. The primary distinction is between the uses of actively and passively managed funds in the lineup. Findings of the ICI study broadly confirm results reported by similar studies related to glide path efficacy.

Arnott, Sherard, and Wu (2013) are critical of traditional glide paths. If the goal is to maximize wealth accumulation during earning years and minimize longevity and lifestyle risk during retirement, they argue that traditional glide paths fail on both accounts. The reasons for the failure are suboptimal asset class exposure, inefficient risk and return balance including lack of diversification and an assumption of constant risk premiums. Estrada (2014) validates their findings in a global context through analysis of returns of 19 countries covering a period of 110 years. He finds that ten alternate strategies that include five different contrarian and five static equity allocations with varying holding periods, tend to outperform traditional glide paths. The interesting query raised by both sets of authors is what constitutes risk for an individual investor. By traditional measure of volatility as a proxy for risk, TDFs tend to provide greater certainty of outcomes but as shown many times before, other strategies tend to provide higher end of period wealth accumulation and lower run outs (longevity risk). Idzorek, Stempien, and Voris (2013) provide a Glide Path Stability Score (GPSS) to each fund family offering TDFs. They calculate this score by comparing the consistency in asset allocation of different vintage TDFs from the same family. A lower glide path stability score indicates that the glide paths of different vintages of the same family have more variability in asset allocation for the same time remaining to retirement. They conclude, "while glide path changes are not necessarily bad, we believe that unannounced and unjustified changes in glide paths should be viewed with extreme scrutiny, given that investors and sponsors select these investments based on expectations of risk (p. 81)."

Optimal glide paths during retirement have also received some attention from researchers. Spitzer and Singh (2008) use a bootstrap simulation to study the shortfall risk of TDFs during the retirement years. Shortfall risk is defined as the probability of running out of money during retirement. They classify TDFs into three types of glide paths: Steep, Gentle, and Fixed 25/75. They show that all three glide path strategies have higher shortfall risk than a constant 50/50 allocation. They urge the designers of target-date mutual funds to "rethink their asset allocation during retirement (p. 151)." Kalman (2011) uses a similar bootstrap

methodology to confirm the findings of Spitzer and Singh. He also demonstrates that after accounting for equity risk premium, a bond heavy portfolio in retirement reduces the probability of run outs.

The question of whether glide paths should end at retirement or extend through retirement remains unresolved. Clark and Hood (2009) recognize the need for maintaining a constant real withdrawal rate during retirement. To that end, they focus on designing TDFs that are especially suitable for the withdrawal phase of the life cycle. Such TDFs will allocate higher and a constant proportion to riskier assets to accomplish the goal of constant real withdrawals during retirement.

This brings up a worthwhile question: How is the choice of various glide paths supported by investment theory? Two broad inter-related theoretical constructs are used to examine this question: (1) Life-cycle investing incorporating human capital and, (2) Liability driven investing. These are often referred to frequently in the context of glide paths utilized by TDFs. A discussion of each theory in the context of glide paths is presented next. Both lines of examination assume an underlying adherence to mean-variance optimization and portfolio theory constructs, albeit with constraints in both cases.

3.1. Life-cycle investing incorporating human capital

The life cycle theory of consumption and portfolio choice posits that at any point in time in a human's life, one's endowment consists of financial wealth and human capital. The human capital is the present value of lifetime earnings, which is stochastic. This variability in earnings results from controllable and uncontrollable factors. Increasing human capital through skills and education and the ability to work the number of hours chosen along with capacity to retire early can be treated as controllable factors. Uncontrollable factors include being forced to work fewer than intended hours or not being able to work at all because of unemployment, sickness or premature death. Over a lifetime, an individual converts human capital into financial capital and it is assumed that one has exhausted all human capital at retirement. For a detailed exposition, see Mayers (1972), Williams (1978) and Merton (1969).

As a practical application of this theory, financial advisors usually look at a human life as compilation of four consecutive stages: accumulation, consolidation, withdrawal, and gifting. The first stage starts when the individual has accumulated some human capital through training and/or education and is ready to start the conversion of this capital into financial capital. Most analysis and research assumes an initial endowment of zero for financial capital at the start of this stage of the life cycle. This is also perhaps the longest of the four stages of the life cycle that starts at around 22 to 25 years of age and continues to about 10 years before retirement. The consolidation phase usually follows the accumulation phase. In this phase, the preparation for retirement begins. The primary activity during this stage is the transfer of financial capital to less risky investments, since there is a diminished ability to recover from a significant loss of portfolio value because of a shortened time horizon. After the consolidation phase, the depletion of the accumulated financial capital starts in the withdrawal phase. The final stage of the life cycle is the gifting phase where one plans for the inevitable.

While a significant number of TDFs broadly adhere to the preceding life cycle framework, there is a wide disparity in terms of period allocated to each stage of the cycle. While some funds move the asset allocation to bonds quite early in the cycle, others maintain a constant exposure to fixed income assets over extended periods. Research themed around human capital and life cycle investing relevant to TDFs is discussed next.

Viciera (2009) describes a case where an individual has a stable job that implies steady cash inflows. The employment prospects and size of compensation are also not highly correlated with the performance of the stock market. These resemble cash flows from a bond more than common stock. This implies that the investment portfolio of such an individual should hold a high proportion of stocks. As one gets closer to retirement, the bond like component of one's portfolio (human capital) is depleted. This creates the need to increase actual bonds in this integrated portfolio. Viceira also indicates that in cases where human capital is volatile and strongly positively correlated to the stock market, equity exposure should be limited. Finally, since expected returns change over long holding periods, occasional adjustments to glide paths may be useful. He concludes that target date investing is consistent with the human capital approach.

For long holding periods Viciera (2009) finds that having a TDF in a pension plan as compared to a money market fund alone results in higher utility for the participant. Another suggestion for better TDF design implies a significant exposure to real assets in the asset allocation. Funds with higher allocation to TIPS, therefore, are superior in design in Viciera's view.

With respect to accumulation years, Shiller (2005) makes some interesting observations. The optimal asset allocation between human and equity capital is dependent on the correlation between the returns of these two assets. He notes that these correlation estimates vary over a broad range. He also points to recommended equity exposures as a proportion of portfolio value in the literature, of as low as 20% to as high as 300% for young workers depending on the assumptions made regarding the relationship of human capital and equity returns.

A comprehensive examination of the influence of labor income on the portfolio decision is provided by Cocco et al. (2005). This provides a good basis for a discussion on the optimal design of glide paths as related to TDFs. In the presence of labor income that has low correlation to equity returns they find support for decreasing proportion of equity investments as one ages. An interesting find was that the most significant welfare loss of about 2% per year occurs when one ignores labor income in the portfolio decision. The loss is less significant when one ignores labor income risk only. The most significant loss in welfare arises from "disastrous labor income realization," meaning unemployment or disability unsupported by safety nets. In light of the findings, glide paths that have declining equity exposures over time, that incorporate nontraded labor income in the asset allocation choices can result in higher welfare outcomes.

Bodie and Treussard (2007) provide additional insight into the role of riskiness of human capital in determining an optimal glide path. They classify certain individuals as "natural TDF holders." These are individuals with risky human capital, that is, their human capital betas are high. Such individuals will experience substantial welfare gains if offered a relatively safe TDF. To reflect the conversion of an individual's portfolio from human capital

to financial capital and the translation of human capital from "stock like" to "bond like," the glide path should be "humped"; not the traditional linear reduction with age.

Boscalajon (2011) provides a discussion of "critical wealth," a point where financial and human capital is equal. He argues that it is from this point on that a systematic transfer to less risky financial assets should start taking place. Utilizing Monte Carlo simulations and utility functions that have a coefficient of risk aversions ranging from 1 to 10, Pfau (2011) finds support for glide paths that adhere to traditional strategy of high initial equity allocation and declining risky assets over time as utility maximizing.

As mentioned earlier, the value of human capital is the present value of expected future earnings. Using Bureau of Economic Analysis (BEA) data and yields on investment grade corporate bonds in various industries, Blanchett and Straehl (2015) attempt to quantify human capital in 12 industries. The authors treat the estimate of the return and risk of human capital across industries as a separate asset class. These then constitute inputs in a portfolio optimization scheme along with other traditional asset class returns. As might be expected, they find that "the optimal equity allocation decreases with age, riskier employment, and riskier homeownership, whereas it increases with guaranteed pension income (p.1)."

Another and more recent stream of thought affecting glide path design is liability driven investing (LDI). It is derived from defined benefit pension plan design. Under such a strategy, the determination of retirement liabilities is first made and then a glide path is designed to optimally meet them. The body of knowledge as related to glide path design motivated by LDI is discussed next.

3.2. Liability driven investing

LDI derives its inspiration from the management of assets to meet future liabilities, akin to the management of defined benefit plan assets. Examples of prominent practitioners of LDI are defined-benefit plan sponsors and insurance companies. Traditional portfolio theory assumes that the optimal portfolio is independent of investor's risk preferences Markowitz (1952), Sharpe (1964). Risk aversion is incorporated through the proportion of risk free holdings of the investor. LDI on the other hand, focuses on designing portfolios to meet future liabilities. It is an individual exercise for retirement portfolio design and management as each individual liability set is different. A defined-contribution plan can be managed similarly if one considers retirement spending needs as a liability. Under LDI, for TDFs the goal in building a retirement portfolio, is not a maximization of portfolio expected returns given a level of risk, but rather to ensure that the portfolio has sufficient assets to support retirement withdrawals and that it does not run out of money during the lifetime of the investor. Minimizing longevity risk is the priority under such a strategy.

The goal is to attain a set of real cash flows that will last with certainty throughout retirement. Thus, inflation protection during retirement years is an embedded objective of all glide paths in a LDI based framework. In the design of glide paths, attaining this goal often takes precedence over portfolio optimization.

According to Meder (2012), "the first order asset allocation decision is no longer focused on the split between equities and core fixed income but focused on deriving the split between a return-seeking asset (RSA) and a liability hedging assets (LHA) component. The RSA

component seeks to generate returns in excess of the expected liability return (growth in the present value of the liability attributable to the passage of time), similar to the discount rate on the liability (p. 117)." While the preceding comment is in the context of a defined benefit pension, it provides a unique manner of looking at glide paths of TDFs. It provides a dual goal in the accumulation phase of the investing horizon; first, to hedge the anticipated liability and the second, to provide growth to the portfolio.

Idzorek (2008) provides a detailed discussion on designing TDFs that incorporate liability relative portfolio optimization. If an individual's retirement expenses can be thought of as a set of real cash flow liabilities, then a retiree's portfolio during the saving years is optimized subject to this liability constraint. This liability constraint is implemented through a short position in a portfolio of TIPS. Idzorek provides a comparative visual for such optimization vis-a-vis an asset only optimization. The significant difference is the heavy relative over-weighting in real assets like TIPS and commodities in such portfolios that are subject to the liability constraint of a short position in TIPS.

Another advantage of liability relative investing is the determination of the fund status. This is analogous to an underfunded or over funded status of a defined benefit plan. If a retiree finds early on in their life of the underfunded status, and they are responsible about it, then there may be an opportunity to alter their savings-consumption mix accordingly.

There seems to be sufficient support for designing glide paths that embrace meeting retirement liabilities as opposed to optimizing asset only portfolios as the primary goal. It may be possible to jointly accomplish both asset only optimization and LDI, but in the presence of constraints, for example long only portfolios, the task becomes quite challenging. Additionally, optimization processes are extremely sensitive to the value of inputs, for example, a small change in volatility causes a significant shift in the optimal portfolio. In light of the preceding, a LDI only based approach, where portfolio optimization is a secondary constraint to designing glide paths might be worth pursuing.

Whitten and Thuerbach (2015) provide an illustration of using LDI driven glide paths. The goal is to provide a level of real income during retirement. Using a glide path that has a higher proportion of traditional inflation hedge assets (TIPS + Commodities + Real estate) and lower proportion of traditional equities over time, through Monte Carlo simulations, they demonstrate that such glide paths provide narrower distributions and lower Value at Risk (VAR) across all retirement horizons. It is important to point out that the analysis is to retirement and does not extend through retirement.

Anecdotally, it seems that LDI is garnering increasing interest of practitioners. In addition to PIMCO, Dimensional Funds Advisors (2016), a mutual fund company, recently introduced TDFs of various vintages premised on LDI. A review of the promotional literature and prospectus of these funds provide a good example of application of the ideas discussed previously in this section. For example, the 2005, 2010, and 2015 vintages at the end of May 31, 2016 held about two-thirds of their assets in TIPS. This is a good illustration of implementation of the recommendations of Whitten and Thuerbach (2015). A summary of the research on the human capital aspects and liability driven investing as pertaining to TDFs appears in Table 2.

For comparative evaluation and justifying changes to existing TDF design, it becomes important to measure outcomes from TDF investing. TDFs have now been in existence for

Table 2 Target-date fund research summary

Author(s)	Year	Topic focus	Publication	Key finding/contribution
Agnew et al.	2003	Analysis of 401(K) portfolios	American Economic Review	Participant asset allocation neglect and rare rebalancing.
Tang et al.	2010		Journal of Public Econ.	Optimal portfolio offerings undone by poor participant choice.
Landsberg	2007	TDF market and regulatory environment	J of Deferred Comp.	Enrolment procedures and reg. relief promote asset growth.
Landsberg	2014		J of P. Plan. & Compliance	Fiduciary responsibility related to TDFs for plan sponsors.
Richards et al.	2014		TIAA-CREF Dialogue	TDFs garnering most recent retirement contributions.
Balduzzi et al.	2015		NBER Working Paper	Significant risk taking diversity in lower market share funds.
Basu & Drew	2009	Glide path design	J of Portfolio Management	Performance in late years dominates retirement accumulation.
Clark & Hood	2009		Journal of Investing	Equities to increase in retirement for constant real returns.
Pfau	2010		Financial Services Review	Life cycle funds provide higher utility if risk aversion is modest.
Pfau	2011		Applied Economic Letters	Determine glide paths based on coefficient of risk aversion.
Yoon	2010		J of Asset Management	Risk budget based glide paths instead of declining risk tolerance.
Basu et al.	2011		J of Portfolio Management	Dynamic allocation guided by accumulation rate instead of time.
Arnott et al.	2013		Journal of Retirement	Traditional glide paths fail to limit lifestyle and longevity risk.
Idzorek et al.	2013		Journal of Investing	Glidepath stability score (GSS) to examine glide path drift.
Pfau & Kitces	2014		J of Financial Planning	Recommend increasing equities during retirement years.
Blanchett	2015		J of Financial Planning	Significance of initial market conditions at retirement.
Kitces & Pfau	2015		J of Financial Planning	Conditional glide paths based on equity market valuations.

Table 2   (Continued)

Author(s)	Topic focus	Year	Publication	Key finding/contribution
Nagengast, Bucci, & Coaker	TDF performance evaluation	2006	Popping the Hood	TDFs lack imagination and cannot outperform market.
Surz & Isralsen		2007	J of Perf. Measurement	TDFs fail to outperform Pure Target-date Indexes.
Spitzer & Singh		2008	Financial Services Review	Traditional glide paths lag constant mix portfolio.
Blanchett et al.		2010	J of Pension Benefits	Incorporating risk lowers dispersion and retirement failure.
Dolvin et al.		2010	J of Financial Planning	Glide paths outcomes are equivalent to static asset allocations.
Kalman		2011	Financial Services Review	Bond heavy risk premium adjusted portfolios reduce run outs.
Lipton & Kish		2011	Financial Services Review	Life cycle funds add little value on risk-adjusted basis.
Bare & Greves		2013	Viewpoint Russell Res.	Focus on return sources and de-emphasize relative performance.
Cassidy et al.		2014	J of Portfolio Management	Widely disclosed benchmark enables institutional best practices.
Chang et al.		2014	Financial Services Review	TDFs provide better welfare when compared to life cycle funds.
Estrada		2014	J of Portfolio Management	Confirms Arnott et al., US findings for 19 other countries.
Tang & Lin		2015	J of Asset Management	Inappropriate benchmark choice results in welfare loss of 67%.
Williams	Incorporating human capital theory in TDFs	1978	Journal of Business	Initial paper on incorporating human capital in portfolio choice.
Cocco et al.		2005	Rev. of Financial Studies	Ignoring human capital results in a 2% welfare loss per year.
Schiller		2005	The Economist's Voice	Human and financial capital returns correlation effect.
Bodie et al.		2007	Financial Analysts Journal	Recommend humped glide paths to incorporate human capital.
Gomes et al.		2008	American Econ. Review	Asset allocation in the presence of variable labor supply.

Table 2   (Continued)

Author(s)	Year	Topic focus	Publication	Key finding/contribution
Viceira	2009		Life Cycle Funds (Chapter)	Human capital is bond like so more bonds closer to retirement.
Boscaljon	2011		Financial Services Review	Introduces the concept of critical wealth that affects allocation.
Blanchett et al.	2015		Financial Analysts Journal	Quantify human capital return and risk in 12 industries.
Idzorek	2008	Immunizing retirement liabilities	Unpublished manuscript	Liability constraint modeled as a short position in TIPs.
Meder	2012		Journal of Investing	Portfolio split among liability hedging and return seeking assets.
Whitten et al.	2015		PIMCO Solutions	Higher ratio of inflation hedge assets result in lower VARs.

sufficient time to provide return data for such a preliminary assessment. A discussion on benchmarking and evaluation of TDF performance is presented next.

4. Benchmarking and performance evaluation

In this section, a discussion on two aspects of TDF performance is presented. In the first, a framework for benchmarking and performance attribution of TDFs is discussed. In the second, a summary of accumulated empirical evidence on the performance of TDFs is provided. Before the discussion on performance evaluation and attribution of TDFs, an important fact regarding TDF strategies need to be pointed out. Most TDF strategies assume a long-term investment horizon. Many TDFs, for example, those of 2050 or 2055 vintage, assume a holding period of 40 years or more, and this is for just "to" retirement TDFs not "through" retirement. The long horizon becomes even more significant when one takes into account the finding that returns in the last few years of the investment horizon are the most significant, as pointed out by Basu et al., Therefore, any performance evaluation methodology should take into account the assumed long-term investment horizon of the investor. It seems that the traditional one, three, or five-year returns might not be adequate to evaluate TDF performance.[2]

A significant portion of DC plan assets is TDFs, and as mentioned in the earlier part of the paper, assets invested in TDFs are expected to grow. Monitoring duties of the plan sponsor usually involve performance evaluation of plan offerings. Cassidy et al. (2014) emphasize the need for a benchmark based performance evaluation in defined contribution plans. The benchmark enables better communication between plan sponsors and investment managers. It affords the plan participants benefits of institutional best practices. A benchmark also lets the plan sponsor clearly define risk to the investment managers. Cassidy et al. recommend separate benchmarks for accumulation and decumulation stages.

The subject of benchmarking and attribution of TDF performance is best understood in the attribution framework borrowed from Bailey, Richards, and Tierney (2007). Let M be the return that represents a neutral asset allocation and passive return for underlying asset classes of a TDF. As applicable to TDFs the benchmark, M captures the utility function of the investor including an appropriate degree of risk aversion. Neutral asset allocation in this context would result in minimum acceptable welfare derived from the TDF investment strategy.

For an actively managed TDF, a portfolio manager can add value and improve welfare, through three broad sets of decisions. First, the manager can deviate from neutral asset class weights and contribute value to the portfolio. For example, overweighting fixed income securities when relative returns from this asset class are forecasted to be favorable in the view of the manager. Let this be denoted by W. Next, they can alter allocation to sectors within an asset class. For example, over weighting mortgage-backed securities relative to Treasuries. Let this be denoted by S. Finally, security selection can be a source of value. Let this be denoted by A. A represents over and underweighting of securities relative to the benchmark. Assuming interaction affect between S and A to be minimal, the portfolio return P can then be represented as,

$$P = M + W + S + A \tag{1}$$

For a TDF with underlying index funds as investment options, both S and A are required to be 0, so the portfolio return becomes,

$$P = M + W \tag{2}$$

In cases, where no deviation from a neutral allocation is permitted, but underlying funds are actively managed,

$$P = M + S + A \tag{3}$$

In cases, where no deviation from a neutral allocation is permitted, and underlying funds are indexed,

$$P = M \tag{4}$$

In the case of Eq. (4) the role of the manager is largely administrative as they can exercise no discretion in asset allocation or security selection decision. A couple of additional interesting points about the above frame work. In most cases, W is restricted to a range of real life funds. Second, being that a TDF is essentially a fund of funds, S and A are often beyond the control of the TDF manager and a domain of the manager of the underlying fund.

Assuming a similar setup, Bare and Greves (2013) recommend that investment performance and participant success be segregated in the performance evaluation of TDFs. As participant success in accomplishing investment goals is individual and varies across participants, the more objective endeavor would be to study investment performance. The other recommendation made by the authors is to deemphasize peer relative performance evaluation.

The long-term asset allocation of the fund as reflected by the fund's glide path represents the TDF's strategic allocation mix. If the fund relies on active management, then there is an additional component of security selection and tactical return if the fund mandate permits alteration of asset allocation, perhaps within a range. The focus should be upon identifying the sources of risk and return of the TDF portfolio, according to the authors.

Bare and Greves (2013) suggest a three-pronged approach to performance attribution. First, developing a simple benchmark representing the growth and capital preservation components of the fund. Second, determining a composite benchmark representing the returns of the specific target components of the fund. For example, performance of real assets in a neutral allocation. Together, this is analogous to M in Eq. (1). Finally, a return comparison between composite and simple benchmark, and then between the fund return and the simple benchmark to isolate the value added by the manager through security selection and tactical choices. This is equivalent to W+S+A in Eq. (4). With this framework in place, it is instructive to examine how the benchmarking tools available stand up to fundamental principles of a good benchmark. A number of index providers have created target date indexes for benchmarking and performance evaluation. According to Bailey, Richards, and Tierney (2007), a valid benchmark should possess the following properties: it is (1) unam-

biguous, (2) measurable, (3) appropriate, (4) reflective of current investment opinions, (5) prescribed in advance, (6) investable, and (7) accountable.

At present, there are multiple target-date indexes available for benchmarking TDF performance. Descriptive literature provided by each index provider highlights the superiority of each index design. A summary of these indexes appears in Table 3. Please note that despite reasonable efforts, the author of this paper is unable to find up to date information on some of these indexes. In the table, the prominent feature of each benchmark is highlighted. To provide the reader with an academic assessment of index qualities rather than comparative positives and negatives, an aggregate analysis based on Bailey, Richards, and Tierney's seven properties of a valid benchmark are presented.

As can be observed from Table 3, a wide array of investment philosophies is found in the design of target date indexes. There are many different glide paths used by TDFs. Similarly, there are wide and varying approaches to the underlying glide paths tracked by the indexes. Note that the tracking error of any TDF will likely be different by benchmark, given the wide divergence in the underlying glide path of each index. From the perspective of plan sponsors, there seem to be sufficient historical returns to allow back testing and to determine which index best fits their preferred glide path.

All indexes shown in Table 3 take into account the need for asset protection in their design and some aim to benchmark real returns close to and during retirement. This recognizes the need to incorporate investor risk tolerance and volatility of human capital related cash flows. A couple of index sponsors have started offering more than one index series for the same target date. The choice of a particular series incorporates investor risk preferences to some extent in the glide path decision.

A word of caution regarding the calculation of returns, index rebalancing and reconstitution might be appropriate. Some indexes report gross returns, others report returns net of fees, while others report both. The influence on tracking error from this difference in reporting returns should be recognized. All index returns are calculated from underlying indices that have their own rebalancing and reconstitution rules. The impact on returns of this fact is not widely understood or has been investigated by researchers. A wide variation in the frequency of reconstitution and rebalancing of the indexes is revealed in Table 3. Time between reconstitution and rebalancing can range from one month to one year. Too frequent rebalancing can be expensive and may not provide sufficient time to benefit from trending markets, while a period too long between rebalancing may lead to significant deviations from target asset allocations for the portfolio. Again, this has not been analyzed nor there is a consensus among researchers on an optimal time between rebalancing and reconstitution.

With respect to the seven properties of a valid benchmark, none of the indexes meets all seven. The efficacy of target date indexes is undermined by the fact that they are indexes derived from other indexes. All six indexes are measurable and given sufficient information, the manager whose portfolio is benchmarked can agree to be accountable to any of the six benchmarks. Indexes based on consensus cannot be specified in advance and, therefore, are not investable. Similarly, equal weighted indexes do not represent the underlying market and are technically not investable. Benchmarks based on proprietary algorithms and rebalancing methodologies that are not clearly disclosed, or understood, do not meet the unambiguous criteria. Arguably, a benchmark that attempts to incorporate investor risk preferences is more

Table 3 Target-date fund indexes features

Characteristics[a]	Indexes						
	Callan	Dow Jones Real Return	Dow Jones Global	Dow Jones U.S.	Morningstar Lifetime	S&P Target Date Index	TDA On Target Indexes
Risk profile variety	1	1	1	1	3	1	4
Glide paths	Consensus driven	Cosine curve based	Cosine curve based	Cosine curve based	Human capital and liability driven	Consensus driven	Loss probability driven model
Asset classes[b]	4	4	3	3	4	4	4
Inflation protection	REITS, Commodities, and TIPS	REITS, Commodities, and TIPS	No specific allocation. Through underlying indexes.	No specific allocation. Through underlying indexes.	TIPS and Commodities	REITS, Commodities, and TIPS	REITS, Commodities, and TIPS
Rebalancing	Annual	Semi-annual	Monthly	Monthly	Quarterly	Monthly	Monthly
Index reconstitution	Annual	Semi-annual	Monthly	Monthly	Annual	Annual	Monthly
Underlying indexes methodology	Various	Equal weighted	Equal weighted	Equal weighted	Cap weighted[c]	Cap weighted	Various
Underlying indexes reconstitution method	Various	Proprietary	Proprietary	Proprietary	Proprietary	Committee	Various
Underlying components	Various	Dow Jones Indexes	Dow Jones Indexes	Dow Jones Indexes	Morningstar Indexes and Futures	ETFs and Commodity Trust	Mutual Funds and ETFs
Returns calc. start date	January 2006	December 1999	January 1983	January 1983	December 2001	May 2007	January 1998

Note: [a]Table created from information provided in Morningstar, S&P, and Callan Associates documents.

[b]Asset classes are classified as Equity, Fixed Income, Inflation Hedge Assets, and Cash. Indexes with three asset classes do not include inflation hedge assets separately.

[c]Cap weighted indexes are float adjusted. Commodity exposure is production weighted.

appropriate than the one that relies upon the investor holding suitable levels of cash to incorporate risk tolerance. Two of the six indexes attempt this, and, therefore, seem better designed on the appropriateness factor. Blanchett and Kasten (2010) provide initial support for incorporating risk aversion in index design. They demonstrate that using three broad categories of risk and dynamically adjusting allocation provide lower dispersion of returns and more certain outcomes. Therefore, a risk appropriate benchmark may capture a neutral welfare maximizing allocation more appropriately.

A proportion of TDFs are supported by underlying indexed funds and ETFs that are actively managed. Sometimes fund managers have latitude regarding asset allocation in many TDFs. The property of the benchmark being reflective of current investment opinion becomes significant. A manager who has discretion in terms of asset allocation and security selection should understand factors that affect the benchmark and have an opinion with regard to the factors. A majority of TDF strategies is executed through indexed portfolios and predetermined glide paths. Under such circumstances, the property of the benchmark being reflective of current investment opinion is not so relevant, as manager discretion is limited. Based on the evaluation of the seven benchmarks, once the underlying indexes and their proportions are disclosed, all of the indexes meet the investment opinion criterion.

At best, TDF benchmark design is in its infancy and plan sponsors can expect more refinements in time to come. Once an appropriate benchmark is selected, it becomes relevant to measure the performance in context of the benchmark. To this point, most performance evaluation has relied on benchmark independent performance evaluation and mostly on simulations.

The empirical evidence on TDF performance is presented next. Nagengast, Bucci, and Coaker (2006) study performance of TDFs from six major fund families. They utilize a weighted score of six metrics: structure/strategy, expenses, allocation, performance, and two measures of risk. The authors find the returns from these funds to be in line with the performance of the market. They observe, "the asset allocations of most of the fund families lack imagination."

Surz and Israelsen (2007) determine that TDFs "failed to measure up to the risk-adjusted performance standards established by the Pure Target-date Indexes." To arrive at this conclusion, the authors first prescribe the characteristics possessed by an ideal TDF. They also build four benchmarks ranging from "Defensive" to "Aggressive" depending upon the glide path applicable to each category of TDF. They arrive at the preceding conclusion based on the risk classification of a TDF and performance relative to the benchmark.

Borrowing performance metrics from the annuity industry, Lewis (2008) uses actual annuity quotes to calculate the probability of attaining an income replacement ratio. This enables one to evaluate the efficacy of a particular glide path and the shortfall risk associated with each. In the opinion of the author, this makes comparative risk assessment of glide paths easier and, perhaps less dependent on simulated data as in other studies.

Using bootstrap simulations, Dolvin et al., (2010) find that certain dynamic strategies that reduce equity exposure over time are equivalent to some static strategies. They also conclude that most glide paths follow a 120-age allocation scheme, similar to a 100-age strategy.

Lipton and Kish (2011), highlight the opacity in disclosure and the wide variability in glide paths, management fees and outcomes in life cycle investing. They construct simple

Rolling Indexes based on the widely used asset allocation rule of 100-age in equities. An evaluation of a wide range of target dates and TDFs leads them to conclude "Life Cycle funds add little value on a risk-adjusted basis" and "that individuals with a long time horizon may want to consider whether the apparent convenience of Life Cycle funds outweighs the difficulties in measuring and attaining return (p. 92)."

In a study of 36 fund families, Tang and Lin (2015) find significant welfare loss from investing arbitrarily in a TDF. They measure loss from two sources: portfolio selection and glide path. The authors conclude that an inappropriate TDF, one whose glide path does not reflect the risk preference of the investor can cost the investor a loss of as high as 17% in welfare. Of this loss in welfare, the most significant contributor to welfare loss of about 67% is attributed to inappropriate glide path choice and the remainder could be attributed to portfolio selection. The authors advocate a risk-based TDF selection strategy. A summary of the accumulated research on performance evaluation of TDFs appears in Table 2.

Some initial evidence on the actual performance of TDFs is now available. In a 2016 Morningstar study, Holt et al. (2016), calculate the historical 10-year annual average total return on TDFs and compare them to various classes of mutual funds. They find that on a total return basis the TDFs lag funds that include only equities, but do better than categories of bond funds. There has been a tremendous flow of funds into TDFs over the past 10 years, a point made on multiple occasions in this study. Returns calculated after taking cash flows in and out of the portfolio might be a better gauge of the returns actually experienced by the investor. When comparing dollar-weighted return, Holt et al., find that with the exception of sector and diversified funds, TDFs exceeded the performance of all other categories. The dollar-weighted return for TDFs was 5.16% compared with the all funds average of 4.35%. When comparing dollar-weighted returns of various vintages, as might be expected because of their heavier equity weightings, later vintages outperformed the nearer vintages. Now that some actual return data are available, it will be interesting to evaluate performance on a risk-adjusted basis with actual returns rather than relying on simulations. A recommendation in this regard is made in the next section.

5. Recommendations

This section is divided into three parts, each aimed at a different set of TDF stakeholders. The first set of recommendations is directed towards investors and their financial advisors. The second is for plan sponsors and mutual fund companies and finally and the last set is aimed at researchers and presented as ideas for future research.

5.1. Investors and financial advisors

In light of the wide variety of TDF offerings, deliberated choices by individuals and their advisors specific to the individual situation can improve investment outcomes. As with other mutual fund recommendations, fees are a significant variable affecting long-term results and the investor or their advisor should closely analyze these. Lipton and Kish (2011) report front-end loads ranging from 4.75% to 5.75%. They also report that management fees and

expense ratios decline with the approach of the target date. Given due diligence and fiduciary duty requirements, it is important that advisors monitor fund fees over time. Economies of scale dictate that as assets under management of a fund increase, the expense ratio of the fund should decline. Investors should avoid a fund that increases fees under such circumstances.

TDFs at a basic level are fund of funds. The underlying funds have their own fees. Many fund families do not charge overlay fees at the TDF level and the investor pays only the fees of the underlying funds. Such funds should be preferred to ones that tack on another layer of fees. The total fees paid by the investor over time should be the ultimate consideration though.

Passive funds have attracted significant amounts of investor funds and indexing as an investing strategy is gaining increasing popularity. The empirical evidence against the long-term performance of actively managed funds and their cost disadvantage do not make them a competitive alternative in a TDF vis-à-vis those with indexed underlying funds.

There is growing theoretical evidence that a one-size fits all TDF is not an optimal choice. Incorporating risk tolerance of the investor in the TDF choice provides higher welfare. For example, an investor whose human capital return has low correlation to equity market return has perhaps higher risk tolerance in their TDF choices. Under such circumstances, investors can consider a TDF whose target date is past the intended retirement year. Additionally, a choice that incorporates increased longevity and longer life spans will likely result in higher utility.

There are two sets of cash flows that are often ignored in the choice and design of TDFs. These are: (1) The investor's holdings of real estate in the form of primary residence and (2) defined benefit pension cash flows like social security. The latter is quite like a real asset with "bond like" characteristics. According to Jennings and Reichenstein (2003) "the financial profession ignores the value of the DB plan in calculating asset allocations, it places an implicit value of zero on DB benefits (p. 197)." Incorporating both of these often-ignored assets in the TDF choice might indicate a different level of risk aversion and, thus, suggest a different asset allocation Pederson (2015).

The importance of including real assets in TDFs is emphasized in many studies. In LDI, many scholars have modeled the retirement liability as a set of real outflows analogous to the payout on a real annuity. Therefore, inflation protection appears to be a primary objective of any sound glide path design. Investors and their advisors should favor TDFs that have a healthy dosage of real assets like TIPS, commodities and other such assets, especially through retirement. The task of finding utility maximizing choices is facilitated when plan sponsors and mutual fund companies offer TDFs designed with this goal in mind.

5.2. Plan sponsors and mutual fund companies

Benz (2015) characterizes TDFs as "blunt instruments." There is widespread agreement among academics and practitioners that TDF efficiency can be improved by broadly tailoring funds to investor risk preferences. Here are some simple suggestions for improving efficiency and there are long-term structural changes that can be affected to improve outcomes for plan participants.

Anecdotally, numerous defined contribution plans offer TDFs from one provider only. This virtually locks the participant into a glide path that may or may not be relevant to their

risk tolerance and overall portfolio objectives. Plan sponsors can easily increase the menu choices by offering funds from more than one family. In adding another family of TDFs, it would be ideal to have new ones that have significantly different glide paths from the current choice. While this would increase fiduciary responsibility related to monitoring, it would benefit the sponsor with regard to the fiduciary duty related to "risk appropriateness." It is acknowledged that the question of picking the fund best suited to the risk aversion function of an employee partially defeats the notion of a single Qualified Default Investment Alternative (QDIA). However, if this selection is made part of an employee's onboarding process, it will lead to more desirable welfare outcomes. For a good exposition on fiduciary responsibility related to TDFs for pension plan sponsors see Landsberg (2014).

The risk profile of the TDF is significantly influenced by the correlation of human capital returns to equity returns (Bodie and Treussard, 2007; Idzorek, 2008; Shiller, 2005). Bernard (2009) points out that "target-date funds with a retirement date of 2010 have stock allocations from 9.15% to 65% of their portfolios." Prospective buyer of TDFs would appear to have a wide range of risk choices with which to tailor their holdings. Plan sponsors should strive to consider work force risk characteristics when offering TDFs to employees. One simple suggestion is to take into account the correlation of employer stock returns to the broader stock market. For example, where returns are highly correlated to stock market returns, in line with recommendations of Bodie and Treussard (2007), a safer TDF might be appropriate.

Stempien and Zoll (2015) report a growing trend towards custom glide paths by plan sponsors with a unique work force. If the workforce has a similar demographic, for example 85% of the workers are between the ages of 25 to 35, then a custom TDF will have a greater fiduciary duty demonstrability than an off the shelf product. The advice in this regard from Bauer, Phillips, and White (2009) is twofold: custom offerings with indexed funds as underlying options. The benefit of indexed offerings relate to compliance and due diligence issues while the second of custom TDF address transparency and relevance for the work force requirements.

With individualized asset allocation through robo-advisors becoming increasingly likely, it might be possible soon to move from custom target date to individualized TDFs. It may be possible to develop individualized glide paths for participants or at least provide a recommendation based on information provided by an employee. The first step in this regard would be to incorporate risk tolerance information as part of personnel information.

With respect to mutual fund families, it might be worthwhile to offer three variants of the same target year, or at the very least two. The glide path can be aggressive, balanced, and conservative or just aggressive and conservative. This will enable investors to tailor risk to some extent without borrowing or short selling in other parts of the portfolio. Alternatively, as suggested earlier, this would mitigate the need to seek a TDF of a vintage different from the intended retirement year.

It is widely acknowledged in the mutual fund industry that Vanguard funds have one of the lower expense ratios in the industry. In *Bell v. Anthem* the plaintiff alleges excess fees charged by the Anthem 401(k) plan that has about $5 billion in assets. All the funds in the lineup are Vanguard funds. The litigation highlights the need for establishing due diligence procedures. Tramell (2009) points to the need for monitoring and controlling fund fees as these can significantly affect retirement outcomes for participants.

5.3. Researchers

Given longevity increases and long retirement horizons, an answer to the "to and through retirement" glide path question is quite vital. This is premised on the basic issue of the responsibility of the employer or the mutual fund to the employee. Does it end at retirement or at end-of-life? At this time there seems to be no definitive answer. Each set of providers claim their glide path to be superior. Researchers should try to answer both aspects of this question definitively.

The discussion on glide paths earlier in this paper, create a new set of research possibilities. There have been numerous suggestions on an optimal glide path. Blanchett and Straehl (2015) present a unified single-period framework for incorporating non-tradeable assets like residential home and human capital in the portfolio optimization process. Their analysis provides many insights into the design of next generation glide paths and TDFs. The question of the optimality of a glide path given a utility function that incorporates non-tradeable assets needs to be explored in greater detail and definitively answered.

Two recent developments in the TDF market have created a host of new research questions; one set is regulatory and the other technological. The first is the new Treasury rule that permits the holder of an IRA or 401(K) to invest up to the larger of 25% or $125,000 of the portfolio in a longevity annuity. More important, through Notice 2014–66, the U.S. Treasury (2014) further permits TDFs to offer deferred annuities as a part of the asset allocation, without violating discrimination rules, as long as certain conditions are met. One of the questions examined by researchers previously (Pfau, 2014; Spitzer and Singh, 2008), focuses on the longevity risk faced with different glide paths during retirement. The inclusion of longevity and deferred annuities alters the optimal asset allocation profiles of TDFs, and the actuarial probabilities of longevity risk. A host of new questions need to now be answered. As the permission to offer annuities is fairly recent, research needs to be conducted on the optimal pricing of these annuities and their influence on the risk profiles of TDFs.

The second development is the mechanization of investment advice. The infiltration of robo-advisors in the investment advice market provides a fertile ground for the implementation of the idea of individualized glide paths. TDF glide paths that incorporate risk tolerance individually may not be a far-fetched idea. The day may not be far off where an individualized glide path is generated for participants based on the information collected from their personnel file or the initial employment interview.

TDF evaluation mechanisms are still in their infancy. There are a number of indexes now available to benchmark TDF performance. Each index has strengths and weaknesses. A comprehensive comparative index evaluation would provide useful information to defined contribution plan providers and consultants. Moreover, the impact of building indexes that has underlying indexes instead of individual securities as components, needs attention and analysis.

One of the other growing and popular approaches to designing glide paths is liability driven investing or LDI. Currently most LDI related to TDFs assume the retirement liability to be a set of real cash outflows. To the best of this author's knowledge, no effort to model stochastic shocks to accumulation or decumulation cash flows, like unanticipated health care costs, has been attempted. In the modeling of glide paths incorporating such situations, an

interesting line of inquiry would involve a comparative evaluation of risk tolerance of a group of employees as opposed to the risk capacity needed to meet their retirement liabilities. An effort in this regard, would be a valuable addition to the body of knowledge.

6. Conclusion

Aided by a favorable regulatory environment, TDFs have experienced unprecedented flow of funds over the past eight years. There seem to be two complimentary approaches to the design of TDF glide path. The first is in the theory of portfolio choice in the presence of nontraded assets like human capital and the second is rooted in the ultimate goal of meeting retirement liabilities. Most of the empirical evidence on TDFs calls for better design of glide paths. Given the long-term horizon of TDF strategies, performance measurement and evaluation remain a challenge even though indexes are now available to benchmark performance. Given the nature of TDFs, none of these indexes fully meets ideal benchmark qualities. The empirical evidence on, and the design of, TDFs is still in its infancy. Much work still remains.

Notes

1 During the period 1995 to 2006, TDF assets grew by about $300 billion. Since the passing of the PPA Act, over the 2007 to 2014 period assets in TDFs increased by about $700 billion. Bauer, Phillips, and White (2009) predict that TDF assets will increase by another $1.2 trillion by end of 2018.
2 The author would like to thank an anonymous referee for pointing this fact and for suggesting an attribution framework.

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References

Agnew, J., Balduzzi, P., & Sundén, A. (2003). Portfolio choice and trading in a large 401(k) plan. *American Economic Review, 93,* 193–221.
Arnott, R. D., Sherrerd, K. F., & Wu, L. (2013). The glidepath illusion …. and potential solutions. *Journal of Retirement, 1,* 13–28.
Bailey, J. V., Richards T. M., & Tierney, D. E. (2007). Evaluating portfolio performance. In John L. Maginn, Donald L. Tuttle, Jerry E. Pinto, & Dennis W. McLeavey (Eds.), *Managing Investment Portfolios: A Dynamic Process* (pp. 717–782). Hoboken, NJ: John Wiley & Sons, Inc.

Balduzzi, P., & Reuter J. (2012). Heterogeneity in target-date funds: Optimal risk taking or risk matching? *NBER Working Paper* 17886, Boston, MA.

Bare, R., & Greves, J. (2013). Evaluating target date investment performance. *Veiwpoint Russell Research*, Russell Investments Monograph, Russell Investments, Tacoma, WA.

Basu, A. K., & Drew M. E. (2009). Portfolio size effect in retirement accounts: What does it imply for lifecycle asset allocation funds? *Journal of Portfolio Management, 35,* 61–72.

Basu, A. K., Byrne, A., & Drew, M. E. (2011). Dynamic lifecycle strategies for target date retirement funds, *Journal of Portfolio Management, 37,* 83–96.

Bauer, D. J., Phillips, B. F., & White, J. R. (2009). *Target-date retirement funds: The new defined contribution battleground.* Casey Quirk and Associates (available at http://tinyurl.com/p43ppgs).

Benz, C., & Stipp, J. (2015). *Morningstar Inc. video, What the Best 'In-Retirement' Mutual Funds Can Teach You* (available at http://tinyurl.com/ol647).

Bernard, T. S. (2009). Target-date funds: Seven questions to ask before jumping in. *New York Times, June 29* (available at http://tinyurl.com/m9lqdr).

Blanchett, D. M., & Kasten, G. W. (2010). Improving the "target" in target-date investing. *Journal of Pension Benefits, 18,* 17–27.

Blanchett, D. M. (2015). Initial conditions and optimal retirement glide paths. *Journal of Financial Planning, 28,* 52–60.

Blanchett, D. M., & Straehl, P. U. (2015). No portfolio is an island. *Financial Analysts Journal, 71,* 15–23.

Bodie, Z., & Treussard, J. (2007). Making investment choices as simple as possible, but not simpler. *Financial Analysts Journal, 63,* 42–47.

Boscaljon, B. (2011). Determining the "glide path" for target date funds. *Financial Services Review, 20,* 113–128.

Burtless, G. (2010). Do workers prepare rationally for retirement? In A. Drolet, N. Schwarz, & C. Yoon (Eds.), *The Aging Consumer: Perspectives from Psychology and Economics* (pp. 103–127). New York: Taylor & Francis.

Callan Associates (2015). *Target date fund index primer* (available at http://tinyurl.com/p6kwpwz).

Cassidy, D. P., Peskin M. W., Seigel, L. B., & Sexauer, S. (2014). Be kind to your retirement plan – give it a benchmark. *Journal of Portfolio Management, Special Issue,* 33–36.

Chang, R. P., Hunter, D., Qianqiu L., & Saar H. (2014). Saving for retirement while having more nights with peaceful sleep: Comparison of lifecycle and lifestyle strategies from expected utility perspective, *Financial Services Review, 23,* 169–188.

Clark, J. M., & Hood, M. (2009). Policy implications for modeling next generation of target date funds. *The Journal of Investing, 18,* 53–61.

Cocco, J. F., Gomes, F. J., & Maenhout, P. J. (2005). Consumption and portfolio choice over the life cycle. *The Review of Financial Studies, 18,* 491–533.

D'Antona, J. Jr. (2008). *Disappointing performance hits 2010 target-date funds.* Pensions & Investments (available at http://tinyurl.com/mz2l2z).

Dimensional Fund Advisors. (2016). *Target date retirement income fund* (available at http://tinyurl.com/hgxk8sa).

Dolvin S. D., Templeton, W. K., & Rieber, W. J. (2010). Asset allocation for retirement: Simple heuristics and target-date funds. *Journal of Financial Planning, 23,* 60–71.

Employee Benefit Security Administration. (February 2013). *U.S. Department of Labor, Washington, DC. Target Date Retirement Funds—Tips for ERISA Plan Fiduciaries.* p. 2–3.

Employee Benefits Security Administration. (April 2008). U.S. Department of Labor, Washington, DC. Regulation Relating to Qualified Default Investment Alternatives in Participant-Directed Individual Account Plans. p. 1–2.

Estrada, J. (2014). The glidepath illusion: An international perspective. *Journal of Portfolio Management, 40,* 52–64.

Gomes, F. J., Kotlikoff, L. J., & Viceira, L. M. (2008). Optimal life-cycle investing with flexible labor supply: A welfare analysis of life-cycle funds. *American Economic Review: Papers and Proceedings, 98,* 297–303.

Holt, J., Yang, J., Acheson L., & Wasserman, S. (2016). 2016 target-date fund landscape. *Morningstar Research,* 68.

Idzorek, T., Stempien, J., & Voris, N. (2013). Bait and switch: Glide path instability. *Journal of Investing, 22*, 74–82.

Idzorek, T. (2008). Lifetime asset allocation methodologies for target date maturity funds. Unpublished manuscript, Ibbotson Associates, 22–26.

Investment Company Institute. (2015). *Investment Company Fact Book, 2015*. p. 45, p. 230–231.

Investment Company Institute. (2015). *Frequently Asked Questions about Target Date or Lifecycle Funds*. p. 2–3: Investment Company Institute, Washington, DC.

Investment Company Institute. (2014). 401(k) plan asset allocation, account balances and loan activity in 2013, *ICI Research Perspective, 20*, 40–47.

Jennings W. W., & Reichenstein, W. (2003). Valuing defined-benefit plans. *Financial Services Review, 12*, 179–199.

Kalman, M. B. (2011). The role of the equity risk premium in the shortfall risk of target-date funds. *Financial Services Review, 20*, 265–284.

Kitces, M. E., & Pfau, W. D. (2015). Retirement risk, rising equity glide paths, and valuation-based asset allocation. *Journal of Financial Planning, 28*, 38–48.

Landsberg, R. D. (2014). Fiduciary risk management and target date funds. *Journal of Deferred Compensation, 19*, 86–94.

Landsberg, R. D. (2011). Target date funds and the proposed SEC rule on disclosure. *Journal of Pension Planning & Compliance, 36*, 86–94.

Landsberg, R. D. (2007). An overview of the pension protection act of 2006. *Journal of Deferred Compensation, 13*, 13–33.

Lewis, N. D. (2008). Assessing shortfall risk in life-cycle investment funds. *Journal of Wealth Management, 11*, 15–19.

Lipton, A. F., & Kish, R. J. (2011). Life cycle funds: Lack of disclosure and lack of return. *Financial Services Review, 20*, 75–94.

Markowitz, H. M. (1952). Portfolio selection. *Journal of Finance, 7, 1*, 77–91.

Mayers, D. (1972). Non-marketable assets and capital market equilibrium under uncertainty. In M. Jensen (Ed.), *Studies in the theory of capital markets* (pp. 223–248). New York: Praeger.

McGraw Hill Financial. (2015). *Dow Jones target date indexes: Risk attributes and performance* (available at http://tinyurl.com/nsqk3py).

Meder, A. H. (2012). Level 1 LDI: Selecting an appropriate benchmark. *Journal of Investing, 21*, 117–127.

Merton, R. C. (1969). Lifetime portfolio selection under uncertainty: The continuous-time case. *Review of Economics and Statistics, 51*, 247–257.

Morningstar Inc. (2015). *Target date indexes: Comparison grid* (available at http://tinyurl.com/o42pbdf).

Nagenast, J. C., Bucci, J., & Coaker, W. J., II. (2006). *Popping the hood: An analysis of major life cycle fund families* (2nd ed.). Turnstone Advisory Group LLC Marina Del Ray, CA.

Pederson, N. (2015). *Rethinking retirement risk* (available at http://tinyurl.com/ngj227c).

Pfau, W. D. (2010). Lifecycle funds and wealth accumulation for retirement: Evidence for a more conservative asset allocation as retirement approaches. *Financial Services Review, 19*, 59–74.

Pfau, W. D. (2011). An optimizing framework for the glide paths of life cycle asset allocation funds. *Applied Economic Letters*, *18*, 55–58.

Pfau, W. D., & Kitces, M. E. (2014). Reducing retirement risk with a rising equity glide path. *Journal of Financial Planning, 27*, 38–45.

Richardson, D. P., & Bissette, B. (2014). Trends in premium and asset allocation by TIAA-CREF participants: 2005–2011. *TIAA-CREF Institute Research Dialogue*, *112*, 23–24.

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium. *Journal of Finance, 19, 3*, 425–442.

Shiller, R. J. (2005). Life-cycle portfolios as government policy. *The Economists' Voice, 2*, 1–14.

Spitzer J. J., & Singh S. (2011). Assessing the effectiveness of lifecycle (target-date) funds during the accumulation phase. *Financial Services Review, 20*, 327–341.

Spitzer, J. J., & Singh, S. (2008). Shortfall risk of target-date funds during retirement. *Financial Services Review, 17*, 143–153.

Stempien, J., & Zoll A. (2015). *Morningstar Inc. video, What's Behind Target-Date Funds' Popularity?* (available at http://tinyurl.com/owznmlz).

Surz, R. J., & Israelsen, C. L. (2007). Evaluating target date lifecycle funds. *The Journal of Performance Measurement, Winter,* 62–70.

Tang, L., & Lin Y.-T. (2015). The efficiency of target-date funds. *Journal of Asset Management, 16,* 131–148.

Tang, N., & Mitchell, O. (2010). The efficiency of sponsor and participant portfolio choices in 401(k) Plans. *Journal of Public Economics, 94,* 1073–1085.

Torregrosa, P. T., & Koenig, D. A. (2008). Target date funds: The case for a more conservative glide path. *Institutional Investor Guide to Defined Contribution and Defined Benefit Services,* Wells Fargo Bank.

Towers Watson. (2010). *Defined contribution: Lessons after the crisis* (available at http://preview.tinyurl.com/nqorkdp).

Tramell, S. (2009). Glide path. *CFA Magazine, Jan-Feb 2009,* 36–43.

United States Treasury. (2014). *Treasury issues guidance to encourage annuities in 401(k) plans* (available at http://tinyurl.com/jr8nc82).

Vanguard Group. (2015). Vanguard target retirement funds prospectus. *January 27, 62x.*

Viceira, L. M. (2009). Life cycle funds. In A. Lusardi (Ed.), *Overcoming the saving slump: How to increase the effectiveness of financial education and saving programs* (pp. 140–178). Chicago, IL: University of Chicago Press.

Whitton, B., & Thuerbach, K. (2015). PIMCO's glide path: An outcome focused design. *PIMCO Featured Solution, March,* 2–8.

Williams, J. (1978). Risk, human capital, and the investor's portfolio. *Journal of Business, 51,* 65–89.

Yoon, Y. (2010). Glide path and dynamic asset allocation of target date funds. *Journal of Asset Management, 11,* 346–360.