



THE EUROMONEY
ETFs & INDICES HANDBOOK
2009

'Are we there yet?' The dynamic risk glide path approach to target date fund construction

by Ioulia Tretiakova and Mark S. Yamada, PÜR Investing Inc.

TODAY'S 'TARGET DATE FUNDS' OFFER TREMENDOUS POTENTIAL FOR SELF-DIRECTED PENSION SCHEMES AND EMPLOYER-SPONSORED DEFINED CONTRIBUTION PLANS IN PARTICULAR. REDUCING THE DECISION-MAKING BURDEN FOR INVESTORS AND STREAMLINING ADMINISTRATION ARE WORTHY GOALS INDEED, BUT AT WHAT COST TO INVESTMENT OUTCOMES?

Shortly after take-off from Heathrow, the pilot's voice crackles through the cabin.

"We will be flying at an altitude of 35,000 feet and our flight time to New York City will be 7 hours 56 minutes. Stronger than expected head winds are possible in which case we may be landing up to 1200 miles short of the airport. Nevertheless, we are pleased to offer you another 'on time' arrival!"

Such is the case with today's fleet of 'target date' funds that change their asset mix on a predetermined 'glide path' towards a specified future date. The problem is, as with our pilot above, that adverse market head winds promise to ditch unit-holders and passengers in the ocean, short of their destination.

Executive summary

Having a flight plan at take off is essential. But making no adjustments for developments along the route seems irresponsible at best and negligent at worst.

Target date or lifecycle funds (TDFs) attempt to simplify decision making for individual investors by automatically shifting to more conservative asset mixes ('soft landing') as the 'target' date approaches. Investors pick a fund with a terminal date closely corresponding with their

retirement date and are spared rebalancing and asset mix shift decisions. This approach is increasingly popular among defined contribution (DC) pension and other self-directed schemes.

Predetermined asset mix changes vary somewhat from manager to manager, but each has a 'glide path' that shifts from primarily equities in long dated funds to mainly fixed



Mark S. Yamada



Ioulia Tretiakova

Mark S. Yamada, Founder, President &
Chief Executive Officer
Ioulia Tretiakova, Vice President & Director
of Quantitative Strategies
tel: +1 (416) 637 3580
e-mail: info@purinvesting.com

income and cash equivalents later on. Funds with near targets (like 2010), caught with 40%-60% in equities, have been severely damaged by the 2008 market downdraft, with little prospect for meaningful recovery given the increasingly conservative trajectory of their asset mixes. Disappointment, consternation, and questions are understandable.

We argue that the real objective of retirement schemes should be adequate replacement income in retirement, not 'maximising returns' within a fixed risk structure. We revisit TDF tactics and, using passive strategies, suggest that a dynamic risk glide path based upon actual return experience relative to a predetermined dollar target (safety net) and constant volatility rebalancing increases the probability of meeting capital accumulation targets compared with fixed trajectory funds that dominate the market today.

Defined contribution and other self-directed pension schemes

A massive unfunded defined benefit pension liability (perhaps US\$257bn for S&P 500 companies at the end of 2008 for an aggregate funding level of 82.1%) in part explains the shift to defined contribution as a dominant form of pension growth globally. Globalisation itself has forced corporations to lower costs to stay competitive. Only 367 of S&P 500 companies had defined benefit (DB) plans at the end of 2007 and fewer are expected to have them after 2008.¹ DC plans are the primary retirement plan for 64% of private sector employees in the US (2007). The number of active participants in private DC pension plans surpassed those in DB plans in 1984.² Corporations and governments look to control and reduce liabilities by shifting more responsibility to employees. This trend has been in place for over two decades but only within the last year have US DC and Individual Retirement Account (IRA) assets exceeded private DB, government pension plan and retirement annuity assets.³

Self-directed pension plans' problems include participants' failure to save adequately or to start early enough to build sufficient assets for retirement. Mandatory participation and portability are addressing the first issue, but current economic challenges threaten the latter as corporations

trim matching contributions, and immediate participant needs supersede retirement goals.

Shifting investment decision-making responsibility to employees has also been a challenge for plan sponsors addressing varying participant ages, aptitudes, inclinations, and resources. More investment choice, once believed the best way to limit liability, has given way to simpler solutions that encourage fewer decisions with less investment expertise.

In summary, a competitive global business environment has led to a shifting of inadequate pension funding from corporations to individuals. DC plan sponsors are now responsible for offering participants inexpensive but effective solutions.

Target date funds

Self-directed pension plan growth is likely to persist. Plan sponsors must respond with simpler but more effective solutions at a fair price. They must, furthermore, eliminate conflicts of interest and provide full disclosure or face consequences that may include lawsuits.

Investors may prefer a simple one-decision approach to investing. Indeed, 90% of DC scheme members in the UK make no choice, ending up with a default portfolio.⁴ Potentially, TDFs address this need well. However, poor plan participation rates, lacklustre involvement in educational sessions and disappointing investment results from higher costs, poor diversification⁵ and neglect has meant that both plan sponsor and investor experience has often been less than happy.

Conceptually, TDFs are a simple and effective solution for the average investor or DC plan participant. The investor need only know their retirement date, although even this information is not clear in the new economic reality that sees changes to mandatory retirement age as a response to inadequate pensions and challenged social welfare systems in many countries.

That TDFs have varying asset mixes for the same target date from one supplier to another suggests that the goal for these products is not always clear. Not surprisingly, different parties have different objectives.

Objectives of target date funds

Plan participants want adequate and reliable replacement income in retirement. TDF investors are no different, yet this objective is not always explicitly incorporated into TDF investment strategy. Is it sufficient to provide a declining risk level over time? Should the current funding status be considered when determining a target risk level?

In common TDF schemes, the portfolio is rebalanced to progressively more conservative asset mixes ignoring the realised market experience of fund participants. Over-funded plans following a roaring bull market and under-funded plans in the wake of a bear market are treated to identical glide paths. The shortcoming of this deterministic approach has been observed by others.⁶

Misalignment of interests explains part of the problem. Investment managers want to win mandates. Demonstrating better historical performance than their competition is one way to do this (although everyone knows that past results are no indication of future performance). These higher returns usually come with higher risk over time (usually via higher equity exposure). Plan sponsors fall into the trap of chasing historical returns for DB schemes all the time. However, the passage of time has a real impact on self-directed plans. Individual portfolios lack homogeneity and have rapidly shortening time horizons compared with DB plans that often have younger workers replacing older retirees, thus maintaining a more stable investing horizon.

When the recent bear market materialised, many TDFs found themselves irreparably under water. Static-predetermined glide paths failed to consider actual market experience and changing risk levels. The results have been tragic for many about to retire.

Purpose

We test the hypothesis that dynamic risk glide paths can increase the probability of providing sufficient retirement funds by:

- establishing a return floor;
- directing asset mix shifts driven by progress towards that return floor;

- enhancing lifestyle by systematically growing assets over the return floor;
- using constant volatility rebalancing to maintain consistent portfolio risk.

Method

According to Maslow's hierarchy of needs,⁷ individuals seek first to satisfy basic needs by addressing physiological and safety requirements. We call this the 'safety net'. For simplicity, the safety net is represented by an annuity purchased at age 65 sufficient to cover basic needs (assumption used in these simulations is US\$20,000 a year). Purchase of an annuity is not being specifically recommended, but is used as a conservative estimate of the required size of retirement savings to achieve this objective.

Once the amount is reached and the 'floor' for retirement is secured, the safety net amount is invested in lower risk inflation-linked vehicles. Remaining funds are invested to improve lifestyle in retirement with the peace of mind that basic needs are secured.

There are two key considerations:

- risk allocation is not equivalent to asset allocation. Over time, the risk of asset classes change in a more predictable and manageable manner than returns;
- incorporating the realised experience of the fund in setting asset allocation significantly increases the probability of achieving retirement objectives.

Risk allocation

In our experience, rebalancing to a constant volatility yielded 3%-4% per annum higher returns than rebalancing to a fixed asset mix (using back-tested data over the last 10 years ending December 2007). While actual returns may differ, this is a meaningful difference worthy of every investor's consideration.

Risk changes over time, and so should a portfolio's asset mix. We are not suggesting chasing performance or timing markets. But adjusting downward the proportion

of asset classes that are becoming more volatile, whether in a bull or bear market, can help to preserve capital. Conversely, increasing risk during quiet markets increases opportunities. Simply, time the risk, rather than the return.

This is possible because risk is persistent. If markets were volatile in the previous month, they will likely be volatile in the following month and vice versa. One measure of persistence is autocorrelation. The autocorrelation for monthly volatility of the S&P 500 is around 60%; the autocorrelation for monthly returns is close to 0%. Translation: risk is persistent, return is not. The persistence of volatility is the *raison d'être* for the whole risk modelling industry, an increasingly important part of professional investment management.

Ideally, investors should employ asset allocation with the help of a regularly updated risk model, putting overall portfolio risk in the context of each individual investor's risk tolerance. Do-it-yourself investors, without access to a risk model and the expertise necessary to use it, could look to the CBOE Volatility Index [VIX] which measures the implied volatility of S&P 500 index options. The chart below shows

the 252 day (one year) rolling average of the annualised standard deviation of the S&P 500 Index. Persistently higher levels for this index suggest rebalancing to a more conservative asset mix. Persistently low levels may suggest that an increase in equity weight is indicated.

Maintaining a consistent level of risk in the portfolio makes more sense than subjecting clients to often wild swings in volatility. The year 2008 has shown how dramatic volatility can be!

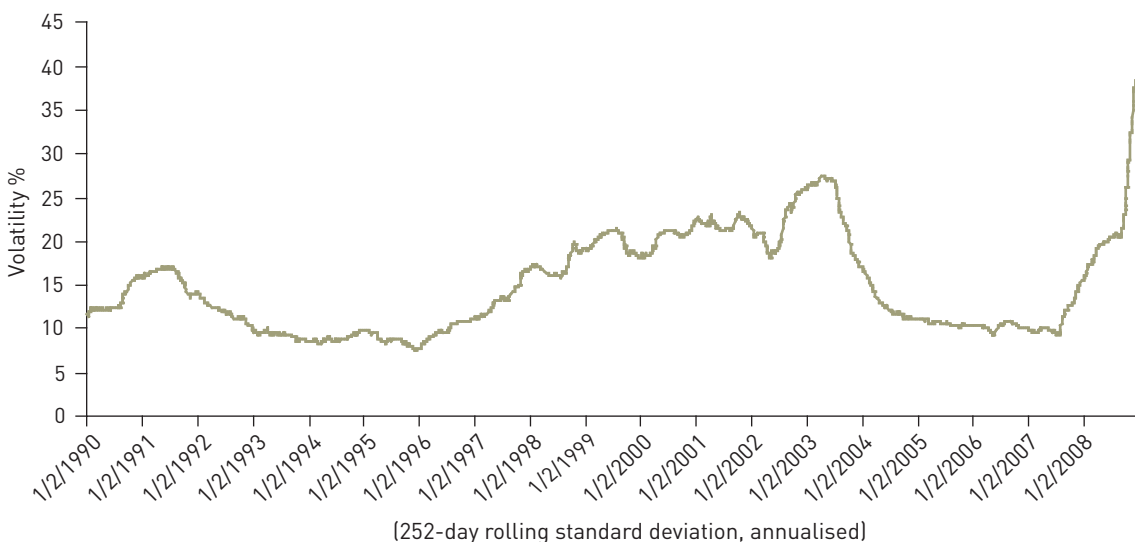
Dynamic risk glide path

In devising a glide path, several observations are made that will be quantified into a few simple and intuitive investment rules.

Assets are moved to a conservative mix once the safety net amount is achieved (or gets close). Gains are locked in and earned capital is preserved. Conversely, if the fund is short of the goal, more risk would be assumed. Hence, the level of risk assumed by the fund is inversely proportionate

Volatility of S&P 500

Exhibit 1



Source: PÜR Investing Inc. 2009

to the funding status. To test this hypothesis, Monte Carlo simulations are run making some basic assumptions about salary levels and growth rates (US Census Bureau), inflation rate, contribution rates and annuity quotes as a proxy for the security net lump sum (see Appendix). The resulting glide path is dynamic. It depends on plan funding status and realised market experience. Results are compared to prevailing predetermined glide path returns.

Results

A successful design should improve the probability of securing the safety net. Exhibit 2 summarises results of the Monte Carlo simulations. While the static predetermined path gives us a probability of secure retirement that is virtually the same as a flip of a coin (45%), the dynamic risk path results in a comfortable 91% probability. Furthermore, the worst 10th percentile of dynamic risk glide path outcomes is almost twice as good as for the predetermined glide path example.

The impact of the adjustable glide path can also be seen

Fund value at retirement

Exhibit 2

	Predetermined glide path	Dynamic glide path
Mean	US\$802,159	US\$961,233
Median	US\$708,821	US\$968,967
Standard deviation	US\$405,868	US\$223,690
Probability of achieving target	45%	91%
10th percentile (low outcomes)	US\$407,196	US\$781,514

Source: PÜR Investing Inc. 2009

in the changed shape of the return distribution (Exhibit 3). The dynamic distribution is more compact, substituting low probability positive extreme returns for an improved chance of securing the security net.

Observations

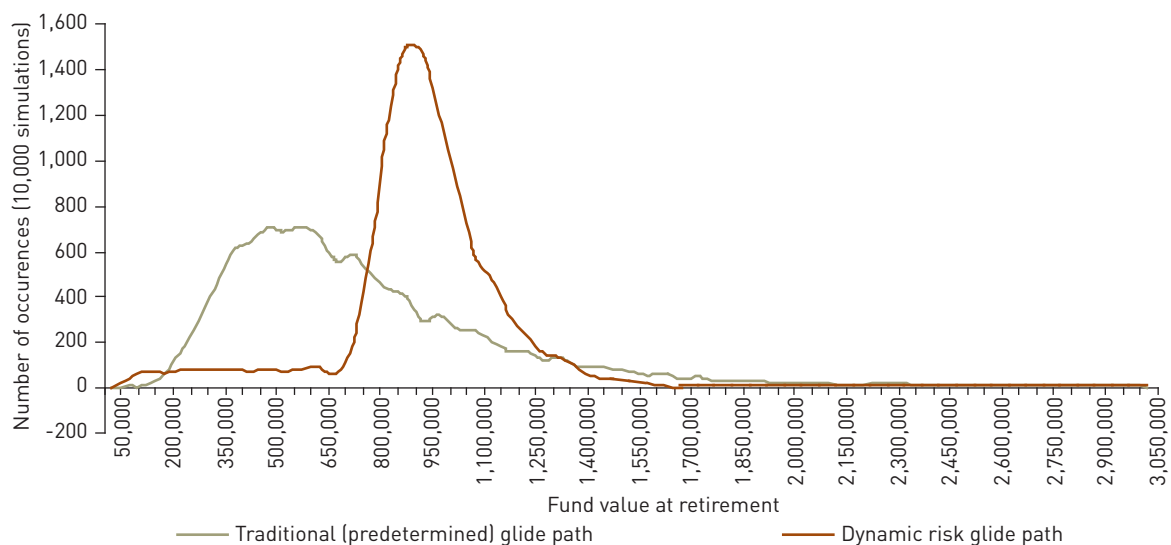
Plan participants want adequate and reliable replacement income in retirement. Reliable cash flow after retirement is best afforded by an annuity from a reliable carrier. A balanced self-directed portfolio may provide similar cash flow at lower cost. Nevertheless, there are advantages to targeting a fixed dollar amount at retirement:

- purchasing an annuity to provide a reliable income stream remains an option;
- restructuring the portfolio to address post-retirement investment needs is also an option;
- if projected rates of return are insufficient to provide required replacement income (or risk is too high), plan participants can be better motivated to save more and to start earlier;
- interest rate changes over the accumulation phase can lead to adjustments to the target goal so that savings and/or risk profile can be modified as required;
- funding a post-retirement income stream addresses one of the advantages of DB plans.

While the dynamic glide path approach is a form of actively managing the course of the portfolio towards a target destination, it is not active management. By maintaining a consistent level of risk that is appropriate for the investor, the portfolio is simply optimising the opportunities and avoiding the high volatility that markets present over time. This is a prudent approach that should be considered regardless of the mandate.

Conclusion

The distance between Heathrow and JFK is 5,560km with an approximate flying time of eight hours. Flying for exactly eight hours and landing or putting down after precisely 5,560km without accounting for conditions along the way



Source: PÜR Investing Inc. 2009

or where you happened to be en route would be silly. Yet today's target date funds would have investors sign on for just such a journey.

Self-directed investment schemes dominate the global pension space and target date funds are increasingly popular. Target date funds' appeal is simplicity.

Disinterested plan participants are asked to make important investment decisions about a distant abstract event (retirement) that is low on their list of priorities. Target date funds ask a question that most can answer, "When do I retire?". The logical appeal of an increasingly conservative set of predetermined asset mixes is not borne out in theory and the practical example of funds maturing within the next several years is equally discouraging.

Suppliers and plan sponsors need to revisit the investment construction process to assure more than just a disciplined asset mix procedure is in place. A dynamic risk glide path is only one way to tailor the plan to the real needs of investors, but making shifts to reflect consistent volatility rather than fixed asset mix is a promising approach. The

simple trading rules pursuant to funding status are:

- once the safety net amount is achieved (or gets close), move assets to a conservative mix;
- if the fund falls short of its goal, assume risk inversely proportionate to the funded status.

The diversification possibilities afforded by risk dampening index and exchange traded funds (ETFs) can help fine tune and target risk in these portfolios although the use of futures and proxies for groups of securities may be more applicable to pools.

Establishing a return floor that addresses the investors' key goal of reliable replacement income is a good way for plan sponsors to engage participants in a discussion of the most powerful retirement options: saving more and starting sooner.

Plan sponsors choosing to remain with the existing crop of target date funds may be well advised to issue floatation devices to participants for those 'on time' landings that fall short of their mark.

Appendix

Assumptions

3.43%, the long-term average inflation rate (US) is used for inflation: http://www.inflationdata.com/Inflation/Inflation_Rate/Long_Term_Inflation.asp

Monte Carlo simulations (10,000 iterations):

- The portfolio's value is simulated for a representative employee starting at age 30 through retirement (age 65) resulting in a 35-year investment period.
- A target safety net amount is estimated using the cost of an annuity as a proxy. The annuity quote is obtained from <http://www.immediateannuities.com/information/rates.html> for a 65-year-old male and US\$20,000 annual income amounting to US\$230,696. The cost of the annuity is then adjusted for inflation of 3.43% over 35 years resulting in a target 'safety net' estimate of US\$751,048.
- Using target levels of risk, expected returns are determined using standard deviation as a departure point assuming a risk-free rate of 4% and a Sharpe ratio of 0.30. For example, for a target risk of 10%, the expected return is $4\% + 0.30 \times 10\% = 7\%$. Returns are assumed to be normally distributed.
- Employee income levels and growth rates, are estimated using the US Census Bureau Current Population Survey (CPS) 2007 data. The starting salary value is taken as US\$30,127, according to

the CPS, and the annual growth rate is calculated as the percentage difference in income between age groups linearly interpolated for annual values. This approximates the salary growth rate due to experience. The second component is an inflation adjustment accounted for as the inflation rate (3.43%) added to the growth rate above.

- The plan's contribution rate is assumed to be 8%.

Notes:

1. 'Funding Woes', Jennifer Byrd, *Pensions & Investments*, December 2008.
2. Department of Labor Form 5500, Pension Plan Bulletins, 1998-2001.
3. 'U.S. Retirement Market, First Quarter 2008', *Investment Company Institute*, October 2008, Vol.17, No.3-Q3.
4. 'Pensioners at risk in 'defined contribution' pensions environment', David Blake, *Cass School of Business*; Debbie Harrison, *Visiting Fellow*, April 2007.
5. 'Patience is a Virtue, Asset Allocation Patterns in DB and DC Plans', Boive and Almeida, Issue Brief, July 2008, *National Institute on Retirement Security*.
6. 'Dynamic Lifestyle Strategies for Target Date Retirement Funds', Anup Basu, *Queensland University of Technology*, Alistair Byrne, *University of Edinburgh*, Michael Drew, *Griffith University*, 2008.
7. 'A Theory of Human Motivation', A.H. Maslow, *Psychological Review*, 1943.

Contact us:

PUR Investing Inc.

1179 King Street West, Suite 309

Toronto, ON M6K 3C5, Canada

web: www.purinvesting.com

e-mail: info@purinvesting.com