The False Promise of Target Date Funds

David Esch and Robert Michaud
New Frontier Advisors, LLC
Boston, MA

Article in Journal of Indexes, Jan/Feb 2014

Presented to QWAFAFEW New York City
David Esch
25 March 2014
Outline

- Target Date Funds – a brief summary
- Research hypothesis
- Simulation experiment
- Varying the assumptions
- Discussion and conclusions
- Q & A
Once upon a time: pension funds, managed
Now: investors must elect plan for 401K
2006 Pension Protection act: Qualified Default Investment Alternatives (QDIA)
TDFs approved as QDIA
Target Date Funds

- Glide path – riskier holdings toward beginning of investment, and smooth transition to less risky assets during payout.
- Model portfolio composition only a function of remaining time to retirement
- Total assets in 2013 estimated at over $1T (Morningstar)
The Implicit TDF Promise

- Early participation in equity markets will provide enhanced return
- The glide path will lock in gains and reduce risk at the time of retirement

However:
- Actively weighted model portfolios planned many years in advance may be dangerous!
401(k) Market Share of TDFs

Percentage of total US 401(k) Market, Year-end 2006-2011

Note: Funds include mutual funds, bank collective trusts, life insurance separate accounts, and pooled investment products.

Why are TDFs so Popular?

- Default offering for many plans
- Provides illusion of guaranteed participation
  - protection
  - lock-in
- However: actually guarantees Glide path
  - Fees
- No decisions for provider once plan is in place
Research Hypothesis

- Glide paths do not meaningfully reduce risk at retirement
- All risk taken is propagated to the target date
- It is not possible to identify the best glide path \textit{a priori}
- Implications if this is true:
  - May “lock in” poor performance
  - Risk taking may not coincide with rising markets
  - May be stuck with active bets in portfolio at inopportune times
Simulation Experiment

- Simple but nontrivial experiment
- Two assets (i.e., equities and fixed income) set to realistic market parameters
- Simulate 40 years of market returns
- Consider simple linear glide paths
- Contributions starting at $10K, growing by 2% yearly - $604K total real investment
- Compute performance of many glide paths
- Find glide path families with matching target date wealth risks and compare terminal wealth distributions
Simulated Asset Return Distribution

<table>
<thead>
<tr>
<th>Asset</th>
<th>Return</th>
<th>Std. Dev.</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Income</td>
<td>3%</td>
<td>5%</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equity</td>
<td>10%</td>
<td>17%</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

- Approximates T-bills and US stocks since 1929
Risk Measures

- Standard Deviation
  - Wealth Distributions are skewed
- Median (or other quantile, e.g. 5% VaR) Terminal Wealth
- 5% CVaR

- All capture different aspects of risk, wealth distribution
- Diagnostics can show pros and cons
- We find standard deviation best in spite of its usual inappropriateness for wealth distributions
Matching on Risk

- The risk at retirement for a glide path can be altered by raising or lowering either the start or end portfolio composition.

- Finding range of glide paths:
  - Evaluate risk of match target static investment
  - Find minimum and maximum slope matching glide paths
  - Fill in range of paths with linear interpolation
  - Adjust each of the interpolated paths to match target exactly
A Set of Risk-Matched Glide Paths

Target Date Wealth Quantiles, 2% Growth of Investment, Glide Paths Matched on Standard Deviation to 40/60

Glide Paths

Static 40/60 Investment

Target Date Wealth

Stock Portfolio Weight

1% 5% 10% 25% 50% 75% 90% 95% 99% Mean
Zoom of Base Case
Comments

- Maximum expected return at gently descending glide path – too gentle to sell
- Wide array of glide paths in either direction matches exactly on standard deviation and closely on distribution of wealth at retirement
- Does 20→80 glidepath beat 80→20? Yes, but it’s riskier. (Arnott 2012)
- Results apply to nonlinear glide paths
- Next: lump sum case – Can be shown mathematically that static is best
Lump Sum Case

Target Date Wealth Quantiles, Glide Paths Matched on Standard Deviation to 40/60, Endowment Case

Glide Paths

Static 40/60 Investment

Target Date Wealth

Stock Portfolio Weight

99% 95% 90% 75% 50% 25% 10% 5% 1% Mean
Matching on Median Terminal Wealth

Wealth Quantiles of Glide Paths with Target Date Median Wealth Matched to 40/60

Glide Paths

Static 40/60 Investment

Target Date Wealth

Stock Portfolio Weight

99% 95% 90% 75% 50% 25% 10% 5% 1%
The 60/40 Case

- Greater risk taken = greater retirement wealth distribution
Averages vs. Individual Histories

- The preceding charts show a slight advantage to a gently descending glide path.
- However, these are averages and individual performances within a simulated history favor a wide range of paths.
- The best path is unlikely to be identifiable in advance.
The Base Case 40/60

Target Date Wealth Quantiles, 2% Growth of Investment, Glide Paths Matched on Standard Deviation to 40/60

Glide Paths

Static 40/60 Investment

Target Date Wealth

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Stack Portfolio Weight

1% 5% 10% 25% 50% 75% 90% 95% 99% Mean
Wealth Outcomes in Individual Histories

Simulated Realizations of Glide Paths in 40/60 Experiment with Stationary Return Distribution

Terminal Wealth

Stock Percentage at Beginning of Glide Path
Relaxing Assumptions

- Return Distribution
  - Heavy Tails
  - High/Low return for equities
  - Changing return, i.e. trend

- Contribution Pattern – produces the same effect as varying returns

- All support same conclusions – glide paths don’t intrinsically protect investors, and it’s impossible to know the best glide path in advance
Historical Confirmation

- Inflation-adjusted stock and bond returns from 1928-2012
- Ten year treasury returns and CPI data from the Federal Reserve database (FRED). Equity returns from CRSP.
- Can create 85 sequences (wrapping around time series of returns)
- The total real investment over 40 years is $604,020
### Historical Confirmation Results

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
<th>Worst Period</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>40% Equities</strong></td>
<td>$1,580,000</td>
<td>$1,483,000</td>
<td>$501,000</td>
<td>$675,000</td>
</tr>
<tr>
<td><strong>80→0 glide path</strong></td>
<td>$1,387,000</td>
<td>$1,273,000</td>
<td>$547,000</td>
<td>$632,000</td>
</tr>
<tr>
<td><strong>60% Equities</strong></td>
<td>$1,941,000</td>
<td>$2,020,000</td>
<td>$555,000</td>
<td>$913,000</td>
</tr>
<tr>
<td><strong>100→20 glide path</strong></td>
<td>$1,729,000</td>
<td>$1,559,000</td>
<td>$565,000</td>
<td>$919,000</td>
</tr>
</tbody>
</table>

- Corroborates simulation experiment
- Worse for glide paths than static holdings
Discussion

- A clear improvement would be to allow intervention/decision making during the investment period
- Ignorance of market cycles would motivate a balanced, diversified portfolio, e.g. 60/40
- Could be adjusted appropriately to market conditions
- Could lock in gains when targets are attained and limit regret (without destroying the investment plan)
Conclusions

- It is our duty as finance professionals to provide a good default option for naïve retirement investors
  - Advisors should have an honest conversation with clients about risk
- A good default retirement product should either
  - Build intelligence into path choice
  - Or choose a balanced, safe path such as a strategic basket of index funds
Thank You

- More information:
  - [http://www.newfrontieradvisors.com](http://www.newfrontieradvisors.com)

- Thanks:
  - ETF.com / Journal of Indexes – article published December 2013
  - Robert Michaud
  - Herb Blank and QWAFAFEW
Appendix
Matching on 5% CVaR

Glide Paths with Target Date CVaR Equal to 40/60 Static Investment, Increasing Stock Return Trend

Glide Paths

24.18%/75.82% Static Portfolio

Expected Target Date Wealth

Stock Portfolio Weight
Matching on 5% CVaR - Alternate

Glide Paths with Target Date CVaR Equal to 40/60 Static Investment, Increasing Stock Return Trend

Expected Target Date Wealth

40/60 Static Portfolio

NEW FRONTIER
Is Std. Dev. a Good Match Criterion?

Simulated Terminal Wealth Distribution Comparison for Multiple 40/60 Glide Paths

- Descending Glide Path: 98.2% to 0%
  Stock Weight

- Static 40%
  Stock Weight

- Ascending Glide Path: 0% to 59.4%
  Stock Weight
Is CVaR a Good Match Criterion?

Simulated Target Date Wealth Distribution Comparison for Multiple Glide Paths matched to 40/60 on CVaR

Descending Glide Path: 98.2% to 0% Stock Weight

Static 40% Stock Weight

Ascending Glide Path: 24.0% to 32.0% Stock Weight