



Commitment Driven Investing: Glide Paths

Dimitry Mindlin

SUMMARY. *This paper presents the key properties and advantages of the CDI optimal glide path selection methodology.*

The concept of a glide path – a series of portfolios that extend through the investor’s time horizon – is rapidly becoming one of the key concepts of investment management. Investment products that utilize glide paths are becoming increasingly popular. Yet the theory of optimal glide path selection is still in its infancy. Even the basic aspects of glide path selection ignite raging debates. The methodologies employed by most glide path designers leave a lot of room for improvement.

We believe that the optimal glide path selection methodology developed at *CDI Advisors* is the most advanced to date. This methodology possesses certain valuable properties that distinguish it from its competitors. The goal of this introductory paper is to present some of the key features of the CDI methodology.

- *A solid theoretical foundation*

The CDI methodology takes its roots in *Commitment Driven Investing* (CDI). CDI is a quantitative framework designed to generate optimal asset allocation, contribution, and payout strategies for institutional and individual investors with financial commitment to fund. The principles of CDI and its applications are presented in a number of publications (see the reference list below).

- *Broad applicability*

The CDI methodology is applicable to a broad range of investors with financial commitments to fund. These investors include, but are not limited to, DC and DB plans, college savings plans, foundations and endowments.

- *An effective process*

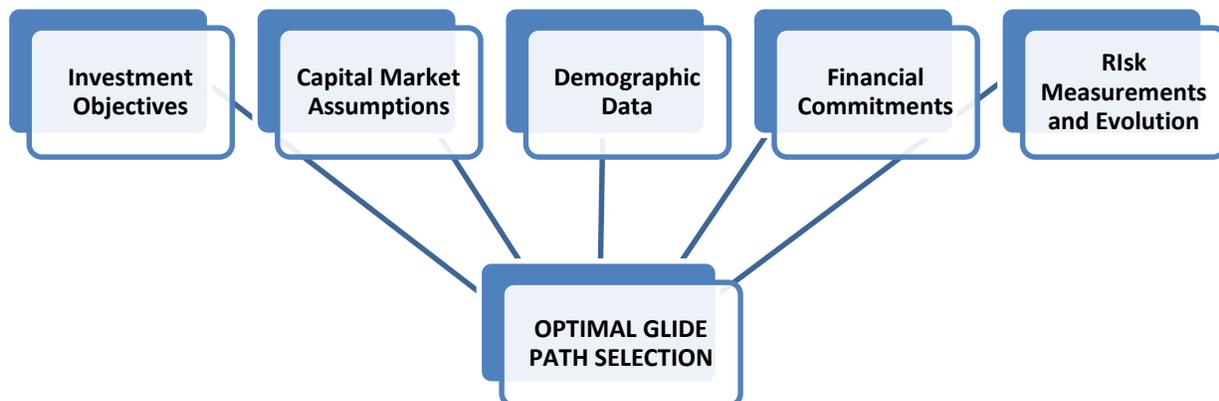
Harry Markowitz once recalled one of Peter Bernstein's most striking statements:



"For me, the most memorable Peter Bernstein quote is something he said at a conference. At some point in the general discussion he told us, "You don't know what it was like before Modern Portfolio Theory." Then he described the piecemeal way portfolios used to be put together. His punch line was: *Now you have a process.*"¹

The CDI methodology comes with an effective process of optimal glide path selection. There are several well-defined input groups: investment objectives, capital market assumptions, demographic data, financial commitments (cash in- and out-flows), and risk measurements and evolution. Given these inputs, a glide path optimizer generates a unique optimal glide path.

CDI Glide Path Selection Process



- *Focus on investment objectives*

The selection of investment objectives is the first step in the development of optimal glide paths. Investment objectives are defined in terms of risk, commitment in-flows (contributions) and commitment out-flows (payouts).

Sensible investment objectives include, but are not limited, to the following.

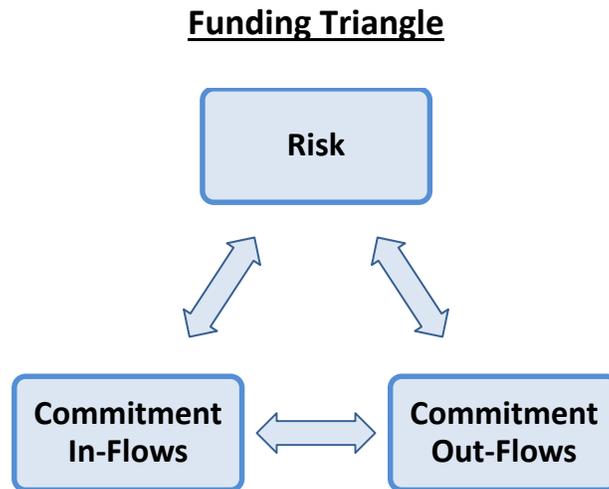
- To minimize risk given commitment in- and out-flows.
- To minimize commitment in-flows given commitment out-flows and risk.

¹ Peter L. Bernstein Special Commemorative Section, *Journal of Portfolio Management*, Summer 2009.



- To maximize commitment out-flows given commitment in-flows and risk.

The concept of “*funding triangle*” offers a convenient way to select suitable investment objectives.



Specifically, investment objectives are stated according to the following principle:

“Given two corners the funding triangle, optimize the third.”

This principle generates the three abovementioned investment objectives.

Furthermore, if *A*, *B*, and *C* are the corners of the funding triangle, then a given corner (say, *A*) generates the following investment objectives:

- given *A* and *B*, optimize *C*.
- given *A* and *C*, optimize *B*.

These investment objectives, under general conditions, *lead to the same efficient frontier of glide paths*. This is another valuable property of the funding triangle.

As an example, a DC plan participant may want to consider the following investment objectives:

- given the saving rate and risk, to maximize payouts;



- given the saving rate and payouts, to minimize risk.

Under general conditions, these objectives lead to the same “*payout-risk*” *efficient frontier*. In this example, corner *A* is the commitment in-flows (saving rate), corners *B* is commitment out-flows (payouts), and corner *C* is risk.

As another example, a DB plan may want to consider the following investment objectives:

- given pension benefits and the cost of funding, to maximize the safety of pension benefits;
- given pension benefits and risk, to minimize the cost of funding.

Under general conditions, these objectives lead to the same “*cost-risk*” *efficient frontier*. In this example, corner *A* is the commitment out-flows (pension benefits), corners *B* is the commitment in-flows (contributions to the plan), and corner *C* is risk.

It should be noted that investment objectives require specific measurements of the commitments and risk for their implementation. In particular, the objective "to minimize risk," while common, is an abbreviated form of the objective "to minimize the selected measurement of risk."

- *Focus on fiduciary aspects*

The high priority given to investment objectives in the CDI framework puts the fiduciary aspects of optimal glide path selection at the front and center of the process. The flexibility of the CDI framework allows for customization of investment objectives in the investors’ best interests.

As an example, it may be reasonable to assume that it is in the best interests of a DC plan participant *to maximize the payouts* from his retirement account. It may also be reasonable to assume that it is in the best interests of a DC plan participant *to minimize risk* to a pre-defined level of payouts from his retirement account. In CDI, these objectives, under general conditions, lead to the same set of efficient glide paths (the “*payout-risk*” *efficient frontier*).



As another example, it may be reasonable to assume that it is in the best interests of DB plan participants *to maximize the safety of pension benefits*. It may also be reasonable to assume that it is in the best interests of shareholders/taxpayers *to minimize the cost of funding* these benefits. In CDI, these objectives, under general conditions, lead to the same set of efficient glide paths (the “cost-risk” efficient frontier).

Thus, the key aspects of fiduciary care are addressed and emphasized at the very beginning of the CDI optimal glide path selection process. This point is especially important in light of the recent expansion of the definition of fiduciary.

- *Nash equilibria, forward and backward inductions*

CDI is designed to generate optimal outcomes. In CDI, the following principle is considered self-evident: a better glide path generates better outcomes. The challenge is to select appropriate measurements of outcomes.

One of the most straightforward ways to measure outcomes is to evaluate the terminal asset value (i.e. the asset value at the end of the time horizon). Sensible measurements of the terminal asset value include its mean, standard deviation and percentiles. Given such a measurement, the CDI optimizer can generate an optimal glide path for this measurement. Similarly, given a measurement of the (stochastic) present value of all financial commitments, the CDI optimizer can generate an optimal glide path for this measurement.

The main weakness of this approach is that it implies that the investor exercises his risk tolerance and makes a long-term asset allocation decision only once. A more realistic approach should be based on *rational expectations of future asset allocation decisions* rather than on a blind adherence to a long-term asset allocation decision made in the past.

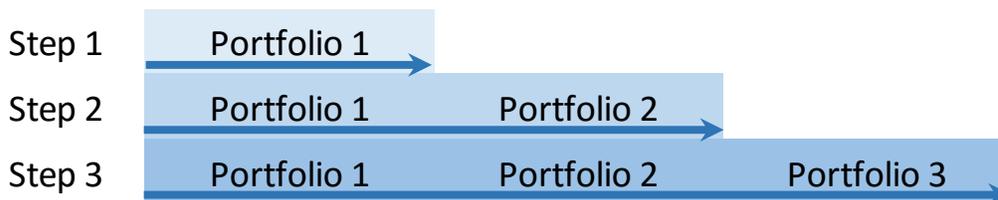
To move in this direction, CDI recognizes that a glide path represents a series of portfolio selections that reflect the evolution of the investor’s risk tolerance. CDI also recognizes that the investor is at liberty to select any portfolio at any time. Furthermore, CDI assumes that the investor never selects an inferior portfolio when a superior portfolio is available. Consequently, CDI subscribes to the following principle:



“Any (sub-) glide path of an optimal glide path should be optimal on its own.”

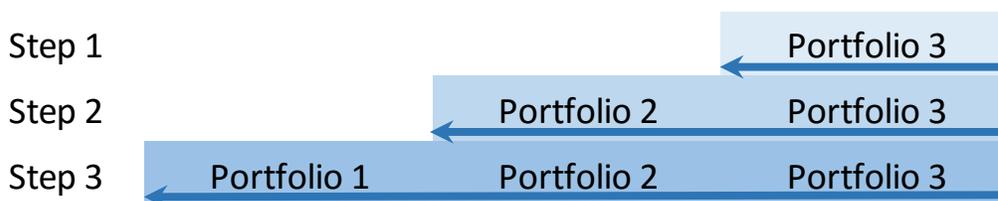
The next step is to determine the “direction” of investment objectives at a given point in time: forward- or backward-looking. For example, the objective to maximize the asset value at a given point is backward-looking – it involves asset allocation decisions made “in the past” (prior to the given point). When the investment objective is *backward*-looking, the process of optimal glide path selection should proceed via “*forward* induction” – from the first portfolio to the last.

Backward-looking objective, forward induction



As another example, the objective to maximize the ability to fund future commitments at a given point is forward-looking – it involves the asset allocation decisions made “in the future” (after the given point). When the investment objective is *forward*-looking, the process of optimal glide path selection should proceed via “*backward* induction” – from the last portfolio to the first.

Forward-looking objective, backward induction





It should be noted that every glide path generated by these processes represents a Nash equilibrium strategy, i.e. every portfolio selection is the best response to all other selections in a glide path.

- *The impact of market valuations*

Capital market assumptions reflect current market valuations for all asset classes under consideration. Capital market assumptions are one of the key inputs to the CDI glide path optimizer. As a result, current market valuations have a direct impact on the glide paths generated by the CDI process.

- *The impact of demographic data*

The demographic data elements include, but are not limited to, the existing asset values, saving rates, and the length of the accumulation and “decumulation” periods. These data elements are essential inputs to the CDI glide path optimizer. For TDFs, in particular, the existing asset values and saving rates, the retirement date as well as mortality and other demographic assumptions have a direct impact on the glide paths generated by the CDI optimizer.

- *“Asset-commitment” valuations*

One of the key features of the CDI process of optimal portfolio selection are regular valuations of investors’ assets and commitments. The goal of an “*asset-commitment*” valuation (ACV) is to estimate the outcomes of investment programs and generate optimal glide paths. For retirement programs, for example, an ACV includes the estimates of asset values throughout the lifecycle and sustainable spending in retirement. Since investment programs generally employ risky assets, ACVs are inherently stochastic. It should be emphasized that the results of ACVs are generated using simulation-free analytical tools.

Regular ACVs are required to take into account new capital market assumptions and incorporate the latest asset values and saving rates. As a result, regular ACVs ensure that optimal glide paths incorporate the latest market valuations and expectations, provide plan sponsors and participants with reliable estimates of investment outcomes, and incorporate the most recent data.



- *Analytical tools*

The CDI methodology contains a suite of powerful and flexible analytical tools for the stochastic analysis of the outcomes of investment programs. *These tools are simulation-free*, i.e. they do not utilize Monte-Carlo simulations. The results of such analysis are robust, reliable, and replicable.

- *Behavioral finance*

Behavioral finance is increasingly utilized in the design of retirement and other investment programs. In the CDI process, one of the key areas for behavioral finance is the selection of risk measurements and their evolution. We are just beginning to realize the potential of behavioral finance in funding financial commitments. We expect the area of behavioral finance to receive a lot of attention in the near future.

Overall, we are optimistic that the CDI methodology will eventually become a mainstream approach to optimal glide path design.

Contact Dimitry Mindlin at dmindlin@cdiadvisors.com for more details about the optimal glide path selection methodologies presented in this paper, as well as modeling, analytics, and licensing information.

REFERENCES

Mindlin, D., [2009]. Commitment Driven Investing and Time Diversification, *CDI Advisors Research*, CDI Advisors LLC, 2009, [link to the original](#).

Mindlin, D., [2010 A]. Is LDI Legal? *CDI Advisors Research*, CDI Advisors LLC, 2010, [link to the original](#).

Mindlin, D., [2010 B]. Principles of Optimal Glide Path Design, *CDI Advisors Research*, CDI Advisors LLC, 2010, [link to the original](#).



Mindlin, D., [2011]. LDI vs. CDI: Bitter Foes or Best Friends? *CDI Advisors Research*, CDI Advisors LLC, 2011, [link to the original](#).

Mindlin, D., [2012]. The Case for Annuities and Matching Bonds in Retirement Plans, *CDI Advisors Research*, CDI Advisors LLC, 2012, [link to the original](#).

Mindlin, D., [2013]. A Tale of Three Epiphanies, *CDI Advisors Research*, CDI Advisors LLC, March, 2013, [link to the original](#).

Mindlin, D., [2014]. Commitment Driven Investing: The Essentials, *CDI Advisors Research*, CDI Advisors LLC, March, 2014, [link to the original](#).

Mindlin, D., [2015 A]. Glide Path 2.0: The Next Generation, *CDI Advisors Research*, CDI Advisors LLC, 2015, [link to the original](#).

Mindlin, D., [2015 B]. The Glide Path Assumption, *CDI Advisors Research*, CDI Advisors LLC, 2015, [link to the original](#).

Mindlin, D., [2015 C]. The Glide Path “Takeoff”, *CDI Advisors Research*, CDI Advisors LLC, 2015, [link to the original](#).

Mindlin, D., [2015 D]. Why Glide Paths Evolve, *CDI Advisors Research*, CDI Advisors LLC, 2015, [link to the original](#).

Mindlin, D., [2016 A]. The Fallacy of “To vs. Through” Glide Path Classification, *CDI Advisors Research*, CDI Advisors LLC, 2016, [link to the original](#).

Mindlin, D., [2016 B]. The Pitfalls of “Sequential Risk”, *CDI Advisors Research*, CDI Advisors LLC, 2016, [link to the original](#).

Important Information

This material is intended for the exclusive use of the person to whom it is provided. It may not be modified, sold or otherwise provided, in whole or in part, to any other person or entity. The information contained herein has been obtained from sources believed to be reliable. *CDI Advisors LLC* gives no representations or warranties as to the accuracy of such information, and accepts no responsibility or liability (including for indirect, consequential or incidental damages) for any error, omission or inaccuracy in such information and for results obtained from its use. This material is intended for informational purposes only and should not be construed as legal, accounting, tax, investment, or other professional advice. Certain aspects of this material include features disclosed and/or claimed in U.S. Patent No. 8,396,775. Information and opinions are as of the date indicated, and are subject to change without notice.