

# Coming Up Short: *Managing Underfunded Portfolios in an LDI-ES Framework*

## Overview

Underfunded portfolios are a problem that has been plaguing pension funds and individuals saving for retirement since the global financial crisis of 2008. In this report, **Seoyoung Kim** outlines potential solutions, including rebalancing, cash infusions and adjusting targets and timelines. She and her co-authors, **Sanjiv Das** and **Meir Statman**, make a significant contribution toward understanding risks and remedies in challenging investment environments.

## Practical Applications

- **Choose a strategy.** When portfolios are underfunded, there are several strategies for remediation including: Infusion, reducing terminal wealth targets, increasing shortfall tolerance and postponing the terminal date of the fund.
- **Recognize its strengths and weaknesses.** Every remediation strategy has strengths and weaknesses. The ultimate choice hinges on the investor's tolerance for risk, the rigidity of his time horizon and the elasticity of his wealth targets.
- **Don't be afraid to combine strategies.** While full commitment to one path may be effective in some cases, mixed-remedy approaches can work.

## Practical Applications Report

Drawing on observations from behavioral portfolio theory, Liability Directed Investing-Expected Shortfall (LDI-ES) focuses on the effective use of portfolio rebalancing to maximize value while minimizing expected shortfall. In the LDI-ES framework, one analyzes the portfolio allocation from period to period, adjusting with the ebbs and flows of accumulated wealth and constructing a new optimal allocation at the beginning of each period, as the terminal date is approached.

At times, due to challenges in the investment environment, the portfolio may reach a point when no set of allocations will enable the investor to recoup losses from a prior period and to meet the target terminal wealth and shortfall allowances. The portfolio is then said to be underfunded, and remedies must be considered carefully. This scenario is the subject of *Coming Up Short: Managing Underfunded Portfolios in an LDI-ES Framework* in *The Journal of Portfolio Management*.

"If your portfolio takes a big hit, as many did in 2008, there are several options, and each one has additional implications. We wanted the choices to be clear, so that people will understand what they are undertaking," Kim says.

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The remedies are similar for Individuals faced with *underfunded portfolios*.

Risk tolerance is a MAJOR DRIVER behind the choice between LDI-ES or fixed-proportion rebalancing.

## Key Definitions

### Liability Directed Investing–Expected Shortfall (LDI-ES)

LDI-ES is an investment framework designed to maximize portfolio value, while minimizing expected shortfall through periodic rebalancing efforts.

### Underfunding

At times, an investor's wealth may decline so much that no portfolio construction effort will enable the investor to reach the desired terminal wealth target and shortfall allowance. In the context of pension plans, this scenario is often referred to as "underfunding."

“If you are not infusing more money, or working more years, the portfolio manager will have to take more risk, or you will need to decrease your target—something has to give.”

—Seoyoung Kim

There are at least four ways to address the problem of underfunding, according to Das, Kim and Statman—all professors at **Santa Clara University**. Plan sponsors may provide cash infusions to their funds in order to augment current wealth. Alternatively, pension funds may reduce the benefits that have been promised to plan beneficiaries, thereby reducing the terminal wealth required to meet those obligations. Seen from a different angle, the fund could take on more risk, though the corollary is an increase in shortfall tolerance. Finally, the fund could allow for more time to reach its targets by delaying the terminal date. The remedies are similar for individuals faced with underfunded portfolios.

### WHAT'S YOUR SHORTFALL RISK TOLERANCE?

Investors who are able to tolerate more risk will tend to allocate more toward risky assets and may indeed wind up with greater terminal wealth. However, each solution has some level of complexity in the trade-offs. As Kim puts it, “If you are not infusing more money, or working more years, the portfolio manager will have to take more risk, or you will need to decrease your target—something has to give.”

When cash infusions are the chosen path, one issue that arises is time. If the target date is far off, this may be an effective strategy, but if the time horizon is short, the infusions will need to be higher and may become prohibitive. Similarly, if investors have high shortfall risk aversion, the infusions will need to be high. Another issue centers on the nature of the infusions; in some cases, rectifying the underfunded scenario may prove to be quite expensive.

Das, Kim and Statman determine that extending the investment horizon, taking on more risk or reducing the target liabilities tend to be the dominant solutions—except in the case of risk-seeking investors—when the infusion strategy may be more viable.

### WHICH APPROACH IS RIGHT FOR YOU?

In their article, Das, Kim and Statman provide a high level of detail on their methodology and offer highlights from the empirical research. The results underscore the fact that risk tolerance is a major driver behind the choice between LDI-ES and fixed-proportion rebalancing. In the latter, the allocations at the beginning of the second period are rebalanced to some fixed proportion, such as 60/40, where 60% is allocated to the risky asset and 40% to the risk-free one. Investors who can bear more risk will benefit from using the LDI-ES methodology.

Another noteworthy finding emanates from studying infusion in light of the other three remedies. Once the mean and variance are taken into consideration, infusion proves to be the least effective solution, with a greater expected shortfall than is present in the other three cases. Therefore, the authors suggest that infusion may be viewed as a last resort in situations where the other options are not possible. However, the team is looking at extending the work to encompass other beneficial strategies.

Das, Kim and Statman say future research may consider the impact of spreading infusions out over time, rather than making them after the precise period during which underfunding has occurred.



*Infusions may be viewed  
as a LAST RESORT.*

Another area for further exploration is the situation in which there is no single target date, but a stream of liabilities to cover on a series of future dates. In the event of underfunding, this scenario may lend itself to a different approach. A further innovation would be the adoption of blended approaches.

“We could decrease the target a little bit, while increasing the infusion at the same time, so it is worthwhile to consider different combinations and see which ones are most palatable for the investor,” explains Kim. The authors point out that in the current research, they applied each approach to underfunding in an exclusive manner. There could also be substantial value in optimizing mixed-remedy strategies for certain situations.

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Sanjiv is a Senior Editor of the **Journal of Investment Management**, Co-Editor of **The Journal of Derivatives** and **The Journal of Financial Services Research**, and Associate Editor of other academic journals. Prior to being an academic, he worked in the derivatives business in the Asia-Pacific region as a vice president at Citibank. His current research interests include: The modeling of default risk, machine learning, social networks, derivatives pricing models, portfolio theory and venture capital. He has published more than 80 articles in academic journals and has won numerous awards for research and teaching. His book **Derivatives: Principles and Practice** was published in May 2010. He currently also serves as a Senior Fellow at the **FDIC Center for Financial Research**.



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Seoyoung's scholarship has been published in leading academic journals and she has been an invited speaker at financial institutions, government events and universities in the United States and abroad. Prior to joining Santa Clara University, Seoyoung held a faculty appointment at Purdue University. She holds a BA in mathematics from Rice University and PhD in finance from Emory University.



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Meir is the Glenn Klimek Professor of Finance at **Santa Clara University's Leavey School of Business**. His research focuses on behavioral finance. He attempts to understand how investors and managers make financial decisions and how these decisions are reflected in financial markets. Meir's award-winning book, **What Investors Really Want**, was published by McGraw-Hill.

His research has been published in **The Journal of Finance**, the **Journal of Financial Economics**, the **Review of Financial Studies**, the **Journal of Financial and Quantitative Analysis**, the **Financial Analysts Journal**, **The Journal of Portfolio Management**, and many other journals. The research has been supported by the National Science Foundation, the CFA Institute Research Foundation, and the Investment Management Consultants Association (IMCA).

Meir is a member of the Advisory Boards of **The Journal of Portfolio Management**, **The Journal of Wealth Management**, **The Journal of Retirement**, the **Journal of Investment Consulting** and the **Journal of Behavioral and Experimental Finance**. He is an Associate Editor of the **Journal of Financial Research**, the **Journal of Behavioral Finance** and the **Journal of Investment Management**.

He is recipient of a **Batterymarch Fellowship**, a **William F. Sharpe Best Research Paper Award**, a **Bernstein Fabozzi/Jacobs Levy Outstanding Article Award**, a **Richard J. Davis Ethics Award**, a **Moskowitz Prize for Best Paper** on Socially Responsible Investing, three **IMCA Journal Awards**, and three **Graham and Dodd Awards**. Meir was named as one of the 25 most influential people by **Investment Advisor** in 2011. He consults with many investment companies and presents his work to academics and professionals in many forums in the United States and abroad. Meir received his PhD from Columbia University and his BA and MBA from the Hebrew University of Jerusalem.