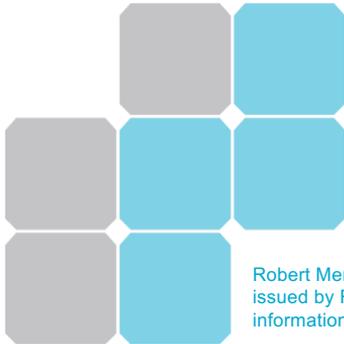


# Funding Retirement: A Feasible Blueprint

**Robert C. Merton**

School of Management Distinguished Professor of Finance, MIT Sloan School of Management  
Resident Scientist, Dimensional Holdings, Inc.

31 May 2018



Robert Merton provides consulting services to Dimensional Fund Advisors LP, in his capacity as Resident Scientist of Dimensional Holdings Inc. This document is deemed to be issued by Robert Merton in his capacity as School of Management Distinguished Professor of Finance at the Massachusetts Institute of Technology. For institutional use and for informational purposes only. Not for use with the public. Not for redistribution

# Global Challenges to Retirement Funding



## Employee's Responsibility

Unsure how much to save;  
investment knowledge is limited

## Product Indecision

Difficulty deciding between solutions  
– guarantees vs liquidity

## Retirement Income Uncertainty

Need an income goal and risk  
management of that goal

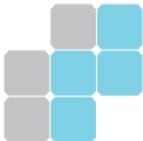
## Increasing Longevity

As lifespans increase, people  
unsure how to make savings last



# What is a Good Retirement Goal?

**“An inflation-protected income for life that allows you to sustain the standard of living that you enjoyed in the latter part of your working life.”**



# Key Design Principles for Achieving a Good Retirement

**1** Set **replacement income** as the goal of the superannuation system

**2** Address risks relevant to the goal: **income shortfall**, not return volatility

**3** Deliver an asset allocation strategy to manage **retirement income risk**

**4** Make efficient use of all **dedicated retirement assets**

**5** Offer **personalisation** based on one's retirement account characteristics

**6** Take account of changes in both **market and personal** circumstances

**7** Be **effective** even for those who are **completely unengaged**

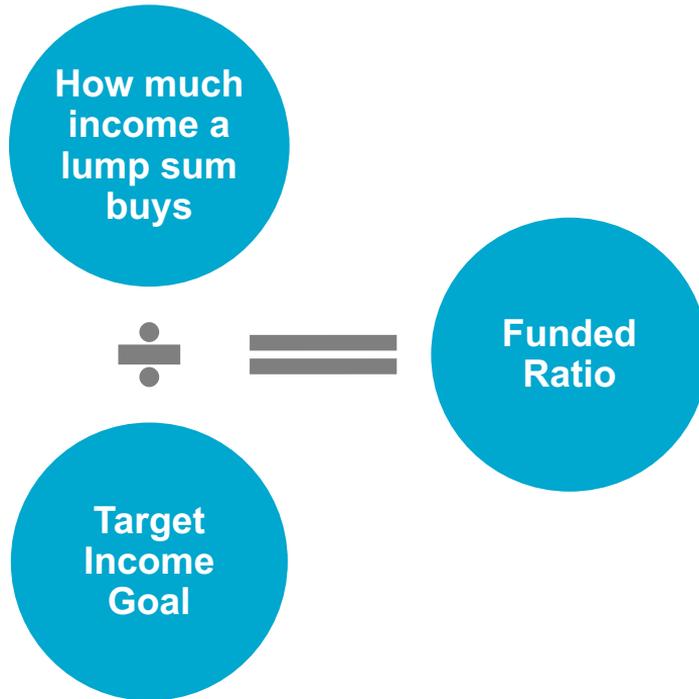
**8** Supply **only meaningful information**; offer **actionable choices** to improve outlook

**9** Offer **robust, scalable and low-cost** investment strategies

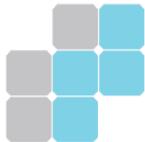
**10** Offer **seamless transition** and **payout flexibility** at retirement



# Retirement Income vs Wealth Accumulation

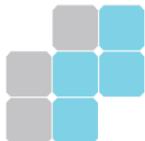


- In a defined benefit framework, we measure success via the funded ratio
- In defined contribution, the emphasis is on wealth (price) over income volatility
- But if our goal is income, the funded ratio is the better measure



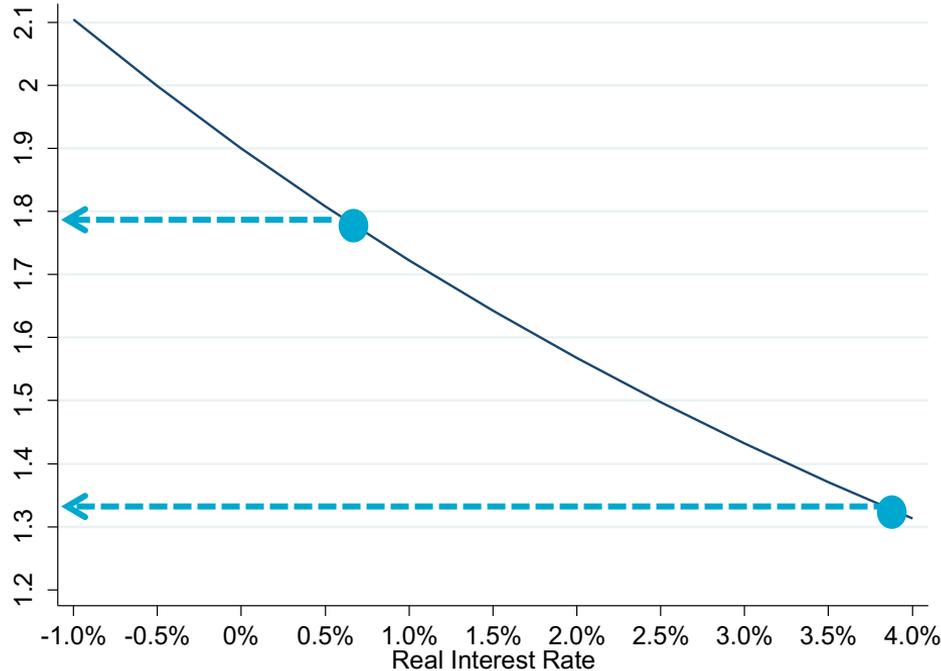
# How is this Approach Different?

	Conventional Approach	New Approach
Investment Goal:	Wealth Accumulation (No specified wealth goal)	Retirement Income (Specified income goal)
Risk Measure:	Volatility of Portfolio Returns (Pot of wealth smaller)	Volatility of Funded Ratio (Income shortfall)
Measure of Success:	Account Balance (Relative to what?)	Funded Ratio (Relative to income goal)
Asset Allocation Strategy:	Generic Proportions (Fixed or based on age only)	Dynamic Individualised (Age, income, funded ratio)

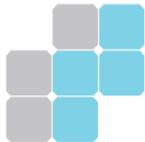


# Effect of Interest Rate Level on Retirement Funding

Hypothetical price of \$100,000 per year inflation-protected life income beginning at age 65



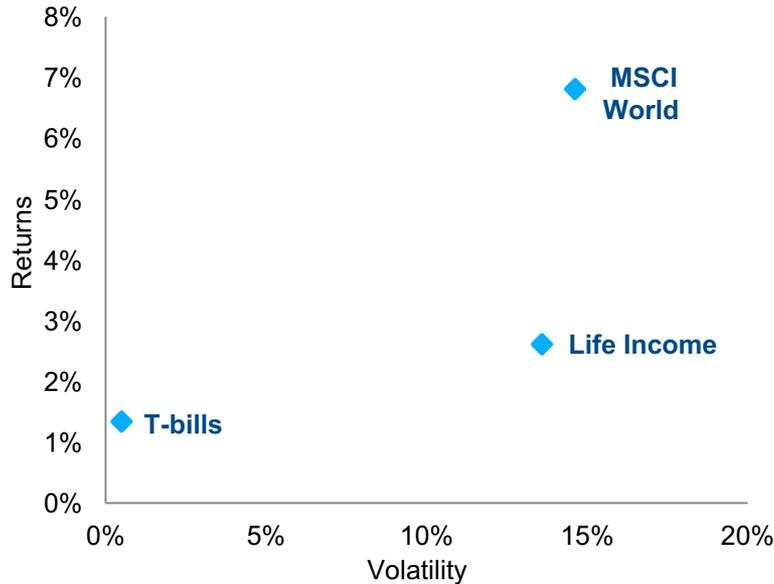
The cost of income moves with changing interest rates



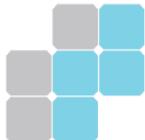
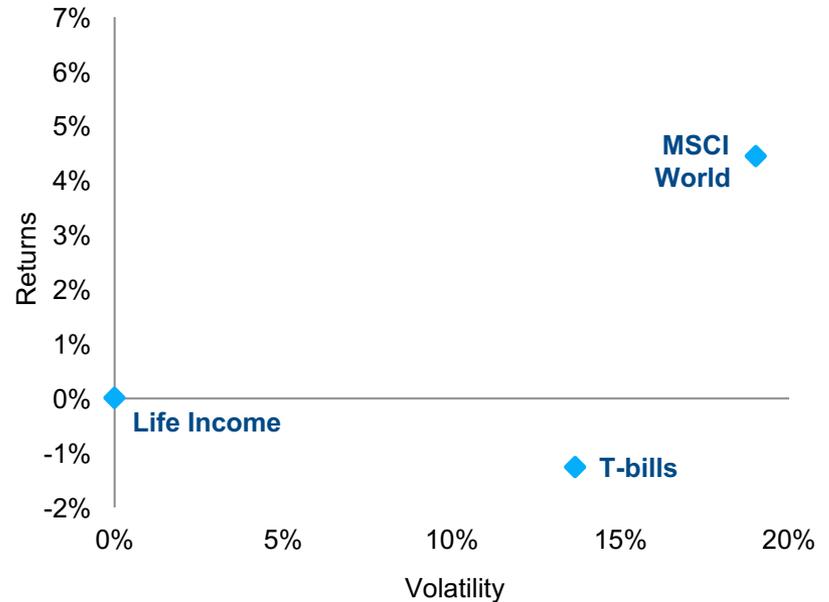
# Risk & Return: Wealth vs Income Goal

## Measuring the risk/return trade-off correctly

### US DOLLARS



### FUNDED-RATIO INCOME UNITS



# Post-Accumulation Flexible Spend-Down Strategies

These four components can be customised to individual needs

1

## Guaranteed income for life

- Annuity
- Age Pension
- DB Pension

2

## Conservative draw-down (minimum-risk income)

- Not guaranteed
- No longevity protection
- Provides liquidity
- Room for bequests

3

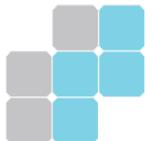
## Desired income growth goal

- Targeted increase in income starts at specified date in retirement
- Invest in risk asset

4

## Longevity insurance

- Deferred annuity



# The Starting Point for Any Asset Allocation Strategy is its Goal

## Glide Path

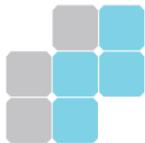
Apply lifecycle theory to consider the evolution of human capital and financial capital, where the investment strategy gradually grows more conservative over time.

## Asset Classes

Offer a combination of assets that provide reasonable growth through diversified exposure to equities and the income risk management hedging asset.

## Income Risk Management

Identify the balance of assets designed to reduce uncertainty relative to a member's goal for future retirement income.



# Optimal Allocation Requires Integration of Sources

Create a personal balance sheet that integrates all funding sources of retirement income

## ASSETS

Superannuation Savings

Voluntary Savings Outside Super

Age Pension

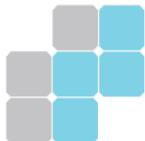
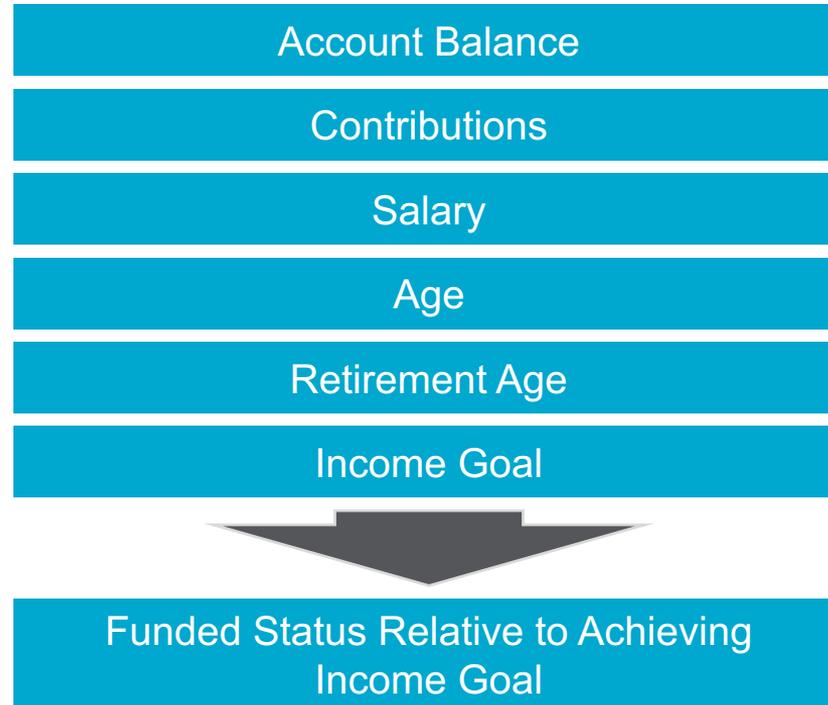
Projected Future Contributions  
("Human Capital")

## LIABILITIES

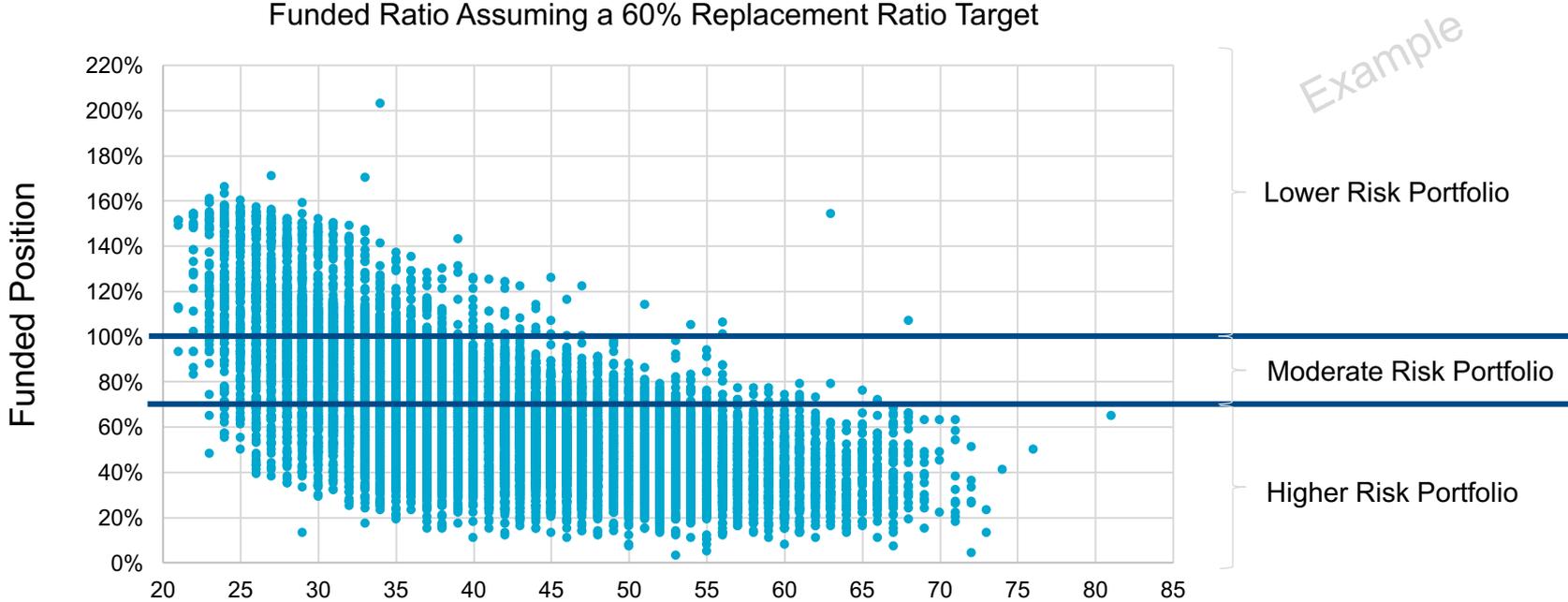
Retirement Income Goal



# Customise Dynamic Asset Allocation Based on Individual

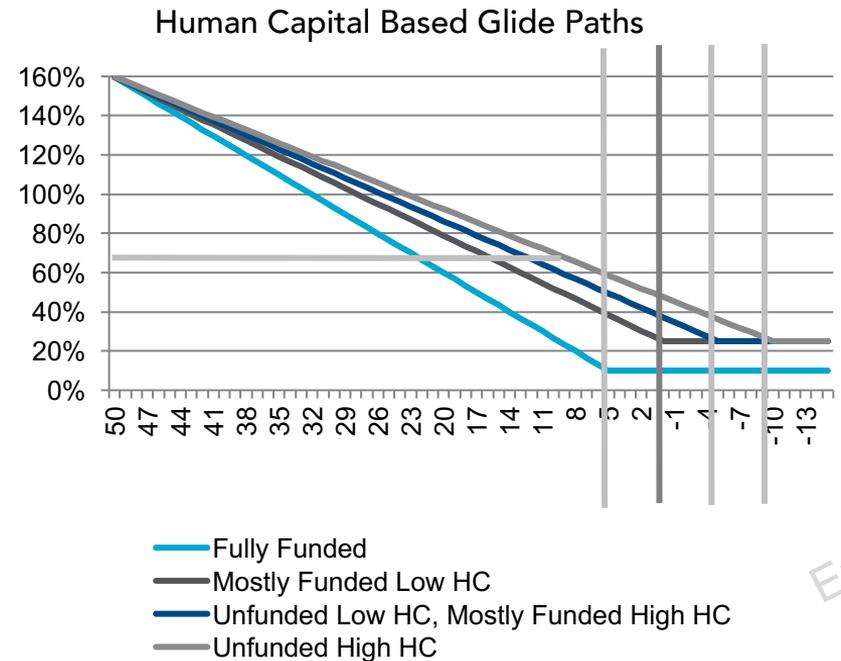
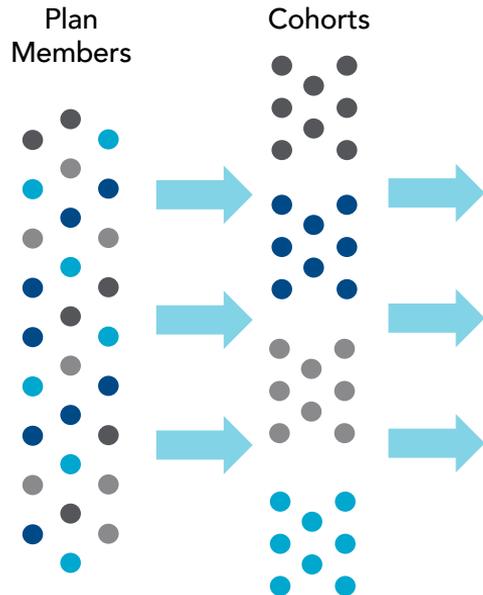


# Tailor Experience Based on Distance to Income Goal



# Dynamic Portfolio Allocation by Market & Individual Circumstances

Allocation Based on Both Funding Ratio (“FR”) and Human Capital (“HC”)



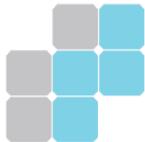
Example



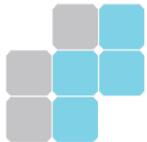
# Only Four Ways to Lift the Probability of Meeting that Goal

1. **Save more** → lower lifetime consumption level
2. **Work longer** → shorter retirement time
3. **Take more investment risk** → face consequences if risk is realized
4. **Generate income from existing assets** → annuities, reverse mortgages

**Improving expected returns for the same risk is always desirable, as is lowering costs for the same service or choice options**



# Key Features



# Speaker Profile

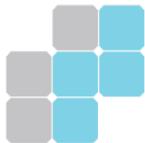


Robert C. Merton is the School of Management Distinguished Professor of Finance at the MIT Sloan School of Management and John and Natty McArthur University Professor Emeritus at Harvard University. He was the George Fisher Baker Professor of Business Administration (1988–98) and the John and Natty McArthur University Professor (1998–2010) at Harvard Business School. After receiving a PhD in Economics from MIT in 1970, Merton served on the finance faculty of MIT's Sloan School of Management until 1988 at which time he was J.C. Penney Professor of Management. He is currently Resident Scientist at Dimensional Holdings, Inc., where he is the creator of Target Retirement Solution, a global integrated retirement-funding solution system.

Merton received the Alfred Nobel Memorial Prize in Economic Sciences in 1997 for a new method to determine the value of derivatives. He is past president of the American Finance Association, a member of the National Academy of Sciences, and a Fellow of the American Academy of Arts and Sciences.

Merton has also been recognized for translating finance science into practice. He received the inaugural Financial Engineer of the Year Award from the International Association for Quantitative Finance (formerly International Association of Financial Engineers), which also elected him a Senior Fellow. He received the 2011 CME Group Melamed-Arditti Innovation Award and the 2013 WFE Award for Excellence from World Federation of Exchanges. A Distinguished Fellow of the Institute for Quantitative Research in Finance ('Q Group') and a Fellow of the Financial Management Association, Merton received the Nicholas Molodovsky Award from the CFA Institute. He is a member of the Halls of Fame of the Fixed Income Analyst Society, Risk, and Derivative Strategy magazines. Merton received Risk's Lifetime Achievement Award for contributions to the field of risk management and the 2014 Lifetime Achievement Award from the Financial Intermediation Research Society.

Merton's research focuses on finance theory, including lifecycle and retirement finance, optimal portfolio selection, capital asset pricing, pricing of derivative securities, credit risk, loan guarantees, financial innovation, the dynamics of institutional change, and improving the methods of measuring and managing macro-financial risk. Merton received a BS in Engineering Mathematics from Columbia University, a MS in Applied Mathematics from California Institute of Technology, and a PhD in Economics from Massachusetts Institute of Technology and honorary degrees from eighteen universities. <http://robertcmerton.com/>



# S&P STRIDE Index: Description Disclosures



In response to the need for income-focused benchmarks within defined contribution plans, on January 11, 2016 S&P Dow Jones Indices (S&P DJI) launched the S&P Shift to Retirement Income and Decumulation (STRIDE) Index Series .<sup>1</sup>

The series features multi-asset class income-based indices tied to target retirement dates. Dimensional Fund Advisors worked collaboratively with S&P DJI to develop the glide path, inflation hedging, and duration hedging techniques used in these indices.

## INDEX SERIES DESCRIPTION

The S&P Shift To Retirement Income and Decumulation (STRIDE) Index Series comprises twelve multi-asset class indices, each corresponding to a particular target retirement date. The asset allocation for each index in the series is based on a predetermined life-cycle glide-path. Each index is fully investable, with varying levels of exposure to equities, nominal fixed income securities and inflation-adjusted bonds.

The S&P STRIDE Index Series represents a strategy that builds a portfolio of assets to support a hedged stream of inflation-adjusted retirement income. The indices also provide a new framework for benchmarking target date funds that focus on delivering similar results. The indices are individually composed of asset class indices (an index of indices), and the index series includes target date years in five-year increments (vintages). Each index vintage covers a full life cycle of accumulation (during what are generally considered working years), and decumulation in retirement years. Beginning 20 years before each target date, the indices gradually re-allocate some of their weight from accumulation constituents to inflation-adjusted income constituents. This process is analogous to dollar cost averaging into income producing assets. The income portion consists of a duration-hedged combination of Treasury Inflation Protection Securities (TIPS) indices. The duration of the combined TIPS indices is matched monthly to the duration of a hypothetical retirement income cash flow stream that begins at the target date and lasts for twenty five years.

## FOR MORE INFORMATION

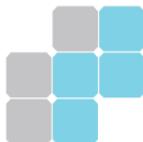
General: <http://us.spindices.com/index-family/multi-asset/sp-stride>

Index Series Methodology: [http://us.spindices.com/documents/methodologies/methodology-sp-stride-index-series.pdf?force\\_download=true](http://us.spindices.com/documents/methodologies/methodology-sp-stride-index-series.pdf?force_download=true)

Example and more data: <http://us.spindices.com/indices/multi-asset/sp-stride-glide-path-2005-index-total-return>

The S&P STRIDE INDEX is a product of S&P Dow Jones Indices LLC or its affiliates ("SPDJ"), and has been licensed for use by Dimensional Fund Advisors LP ("Dimensional"). Standard & Poor's® and S&P® are registered trademarks of Standard & Poor's Financial Services LLC ("S&P"); Dow Jones® is a registered trademark of Dow Jones Trademark Holdings LLC ("Dow Jones"); these trademarks have been licensed for use by SPDJI and sublicensed for certain purposes by Dimensional. Dimensional's Products, as defined by Dimensional from time to time, are not sponsored, endorsed, sold, or promoted by SPDJI, S&P, Dow Jones, or their respective affiliates, and none of such parties make any representation regarding the advisability of investing in such products nor do they have any liability for any errors, omissions, or interruptions of the S&P STRIDE Index.

Dimensional Fund Advisors LP receives compensation from S&P Dow Jones Indices in connection with licensing rights to S&P STRIDE Indices.



# S&P STRIDE Index: Hypothetical Performance Disclosures



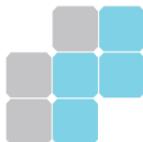
S&P STRIDE (the "Index") was launched on January 11, 2016. All information presented prior to the launch date is back-tested. Back-tested performance is not actual performance, but is hypothetical. The back-test calculations are based on the same methodology that was in effect when the index was officially launched. Complete index methodology details are available at [www.spdji.com](http://www.spdji.com). It is not possible to invest directly in an index.

S&P Dow Jones Indices defines various dates to assist clients in providing transparency on their products. The First Value Date is the first day for which there is a calculated value (either live or back-tested) for a given index. The Base Date is the date at which the Index is set at a fixed value for calculation purposes. The Launch Date designates the date upon which the values of an index are first considered live: index values provided for any date or time period prior to the index's Launch Date are considered back-tested. S&P Dow Jones Indices defines the Launch Date as the date by which the values of an index are known to have been released to the public, for example via the company's public website or its datafeed to external parties. For Dow Jones-branded indicators introduced prior to May 31, 2013, the Launch Date (which prior to May 31, 2013, was termed "Date of introduction") is set at a date upon which no further changes were permitted to be made to the index methodology, but that may have been prior to the Index's public release date.

Past performance of the Index is not an indication of future results. Prospective application of the methodology used to construct the Index may not result in performance commensurate with the back-test returns shown. The back-test period does not necessarily correspond to the entire available history of the Index. Please refer to the methodology paper for the Index, available at [www.spdji.com](http://www.spdji.com) for more details about the index, including the manner in which it is rebalanced, the timing of such rebalancing, criteria for additions and deletions, as well as all index calculations.

Another limitation of using back-tested information is that the back-tested calculation is generally prepared with the benefit of hindsight. Back-tested information reflects the application of the index methodology and selection of index constituents in hindsight. No hypothetical record can completely account for the impact of financial risk in actual trading. For example, there are numerous factors related to the equities, fixed income, or commodities markets in general which cannot be, and have not been accounted for in the preparation of the index information set forth, all of which can affect actual performance.

The Index returns shown do not represent the results of actual trading of investable assets/securities. S&P Dow Jones Indices LLC maintains the Index and calculates the Index levels and performance shown or discussed, but does not manage actual assets. Index returns do not reflect payment of any sales charges or fees an investor may pay to purchase the securities underlying the Index or investment funds that are intended to track the performance of the Index. The imposition of these fees and charges would cause actual and back-tested performance of the securities/fund to be lower than the Index performance shown. As a simple example, if an index returned 10% on a US \$100,000 investment for a 12-month period (or US \$10,000) and an actual asset-based fee of 1.5% was imposed at the end of the period on the investment plus accrued interest (or US \$1,650), the net return would be 8.35% (or US \$8,350) for the year. Over a three year period, an annual 1.5% fee taken at year end with an assumed 10% return per year would result in a cumulative gross return of 33.10%, a total fee of US \$5,375, and a cumulative net return of 27.2% (or US \$27,200).

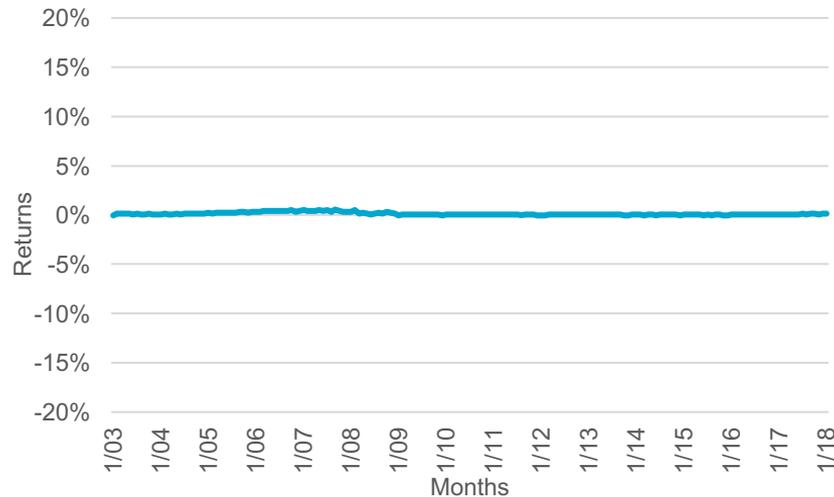


# Wealth Preservation vs Income Preservation

## Using the suitable hedging asset given the goal

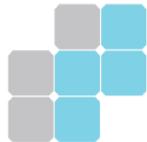
The volatility of T-bills is minimum risk when looking at it as an asset value

3-MONTH US T-BILL (USD)



But it is high risk measured in income (funded-ratio units)

3-MONTH US T-BILL (FUNDED-RATIO UNITS)



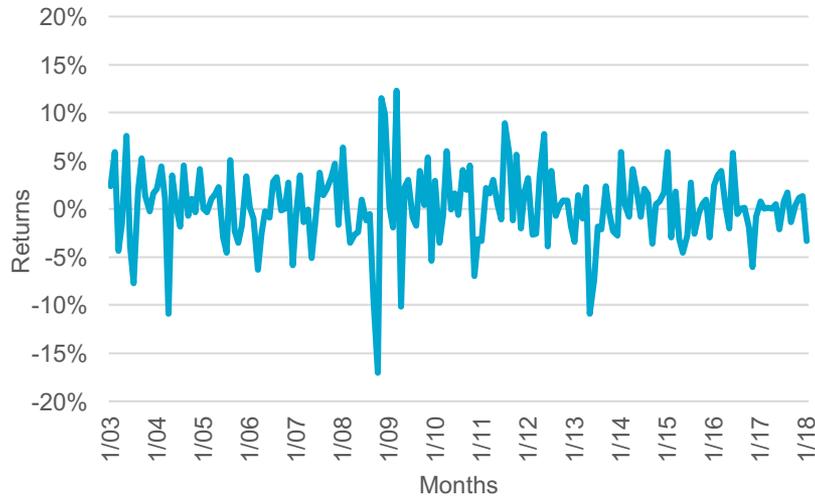
Income returns are calculated as the month-over-month percent difference of 20 years of \$1 cash flows, deferred for 10 years when currently holding 3-month T-bills. Computed using the U.S. TIPS yield curve.

# Income Goal Needs Different Risk Measure

## Using the suitable hedging asset given the goal

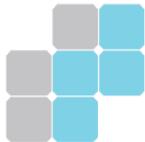
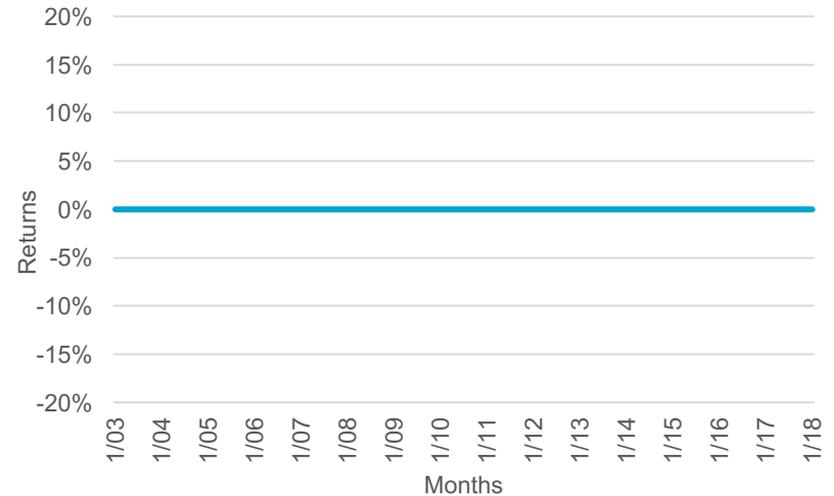
The volatility of life-income price is high risk when measured in terms of asset value.

DEFERRED LIFE INCOME (USD)



The volatility of life-income price is minimum risk when measured in terms of income

DEFERRED LIFE INCOME (FUNDED-RATIO UNITS)



Asset value returns are calculated as the month-over-month percent difference in the current cost of 20 years of future \$1 cash flows, deferred for 10 years. Current cost computed by discounting future cash flows using the U.S. TIPS yield curve.



Thank you.