

The Retirement Income Equation

Understanding how to arrive at a target replacement rate

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INTRODUCTION

How much retirement income is enough? The answer depends on a household's unique needs. If we define successful retirement planning as the ability to maintain one's preretirement standard of living, common advice recommends that households target 75% to 85% of preretirement income. However, while this can be a useful starting point, understanding how to arrive at a target replacement rate can be helpful for future retirees and plan sponsors alike.

Those engaged in retirement planning should understand what is typical for households with similar characteristics. This is an improvement over one-size-fits-all financial advice. This article also provides a roadmap for how one might adjust the recommended replacement rate to fit a unique situation.

For plan sponsors, understanding what replacement rate is appropriate for participants is critical in assessing a plan's adequacy. Benchmarking retirement plans without controlling for participant characteristics might lead to faulty conclusions about retirement readiness.

The purpose of this study is to provide a framework for determining a target replacement rate that will allow a household to maintain its preretirement standard of living. The study considers actual spending patterns of thousands of US households while taking into account uncertainty in investment outcomes and career paths. The results indicate that replacement rates can vary widely, from less than 60% for highly compensated employees to over 80% for low-wage earners. By comparing the prescribed results to actual behavior, we can draw conclusions about the feasibility of DC plans as a primary source of retirement income for future retirees.

THE FRAMEWORK

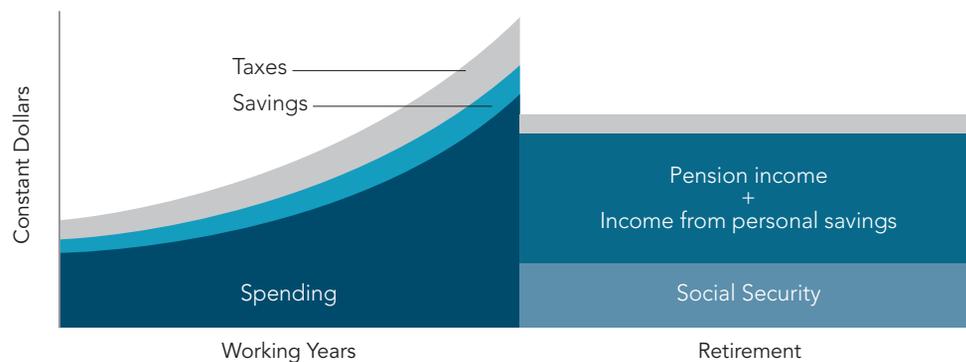
Common sense tells us most people need to replace less than 100% of their gross preretirement income in retirement. While working, income goes to one of three things: taxes, savings, or spending. However, retirees typically pay fewer taxes and no longer need to save for retirement. In a simple example, if a household saved 10% for retirement and had an effective tax rate of 10% while working and 0% when retired, an 80% replacement rate would be required in order to achieve the same level of spending enjoyed before retirement.

Should people target the same level of spending? A wealth of academic research suggests the answer is no. Economic theory suggests people should target the same standard of living; however, this may not mean the same thing as targeting a dollar level of spending. A simple example would be a homeowner whose mortgage is paid off before retirement. Since the homeowner lives in the same house during retirement, there is no change in standard of living, but out-of-pocket housing expenses will decline. In such cases, incorporating a decline in spending might make sense for some households.

Returning to our previous example, suppose the homeowner decides the preretirement standard of living can be sustained even if spending declines by 10%. Since 80% of gross preretirement income was being

spent, the change represents a decline of 8% of gross income (10% of 80%). Now the target replacement rate is 72% (100% less 10% for taxes, 10% for saving, and 8% for spending adjustment). Figure 1 illustrates the framework used in this study to compute replacement rates. By estimating effective tax rates, spending needs to maintain a standard of living, and the appropriate savings rate needed to support that level of spending, we can solve for target replacement rates.

Figure 1. REPLACEMENT RATES SHOULD BE LESS THAN 100%



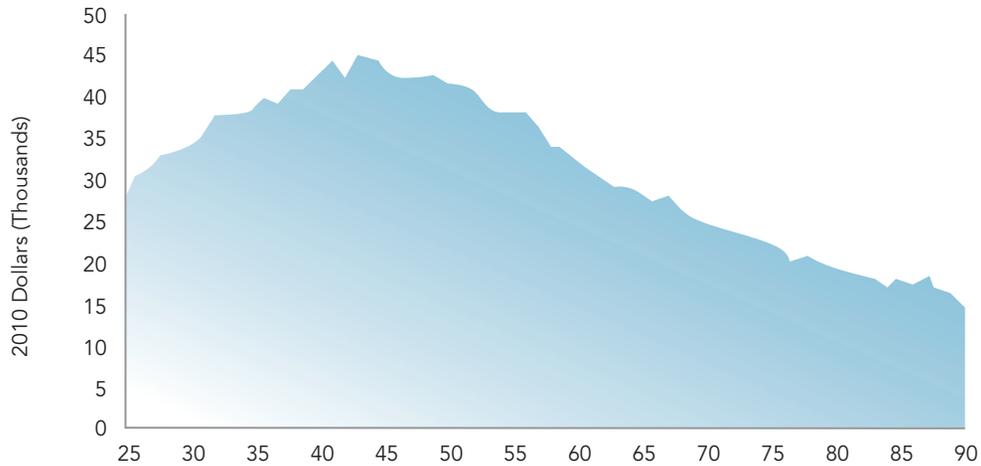
SPENDING NEEDS

For over four decades, academics have known that spending is hump-shaped over the life cycle (Thurow 1969). Figure 2 displays median nondurable spending from age 25 to 90 for a sample of 69,827 households. Spending peaks around age 45 before declining. Many explanations for this spending profile have been proposed, including changes in family size, borrowing constraints, savings behavior, and leisure time, but we need to rule out insufficient financial resources as the primary reason. Otherwise, it does not make sense to incorporate this hump-shaped pattern into retirement plans. It is also important to understand whether all types of households should anticipate these spending declines, or whether the effect is concentrated among a subset of households.

Breaking down nondurable spending into categories suggests the decline is not due to poor planning (Aguar and Hurst 2008). Figure 3 shows median spending around retirement on discretionary items such as trips and vacations, entertainment events, hobbies, and charity. At all income quartiles, we observe that median spending increases for these nonessential items. If the spending decline observed over the life cycle was due to insufficient financial resources, one would expect discretionary spending to take the biggest hit.

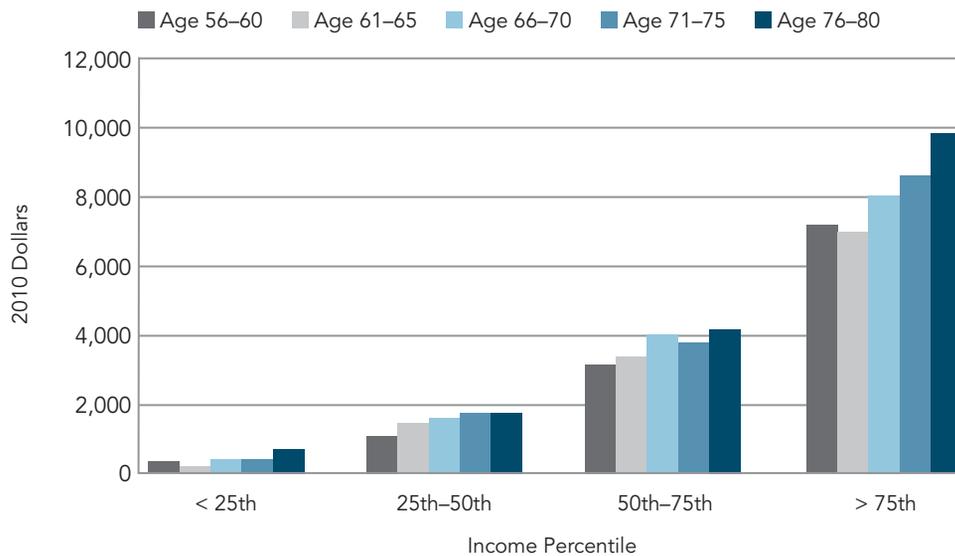
Another category that households tend to spend more on with age is medical care. As shown in Figure 4, out-of-pocket expenses on insurance premiums, medications, doctor visits, hospital stays, medical supplies, and nursing home care increase for all income groups as people get older.

Figure 2. MEDIAN NONDURABLE SPENDING OVER THE LIFE CYCLE¹



Sources: BLS, National Bureau of Economic Research.

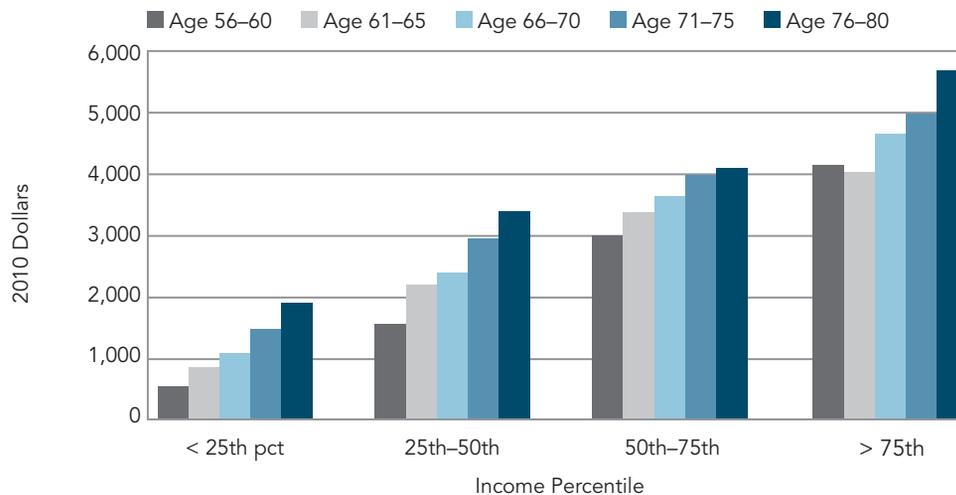
Figure 3. MEDIAN DISCRETIONARY SPENDING BY INCOME QUARTILE²



Source: RAND Corporation.

1. Spending data for 69,827 households is from the Bureau of Labor Statistics Consumer Expenditure Survey; Family-Level Extracts, 1980: 1–2003:2, compiled by Ed Harris and John Sabelhaus and provided by the National Bureau of Economic Research. Values are converted to real 2010 dollars using CPI-U from the Bureau of Labor Statistics.

2. Median discretionary expenses by income quartiles. Income quartiles are based on the average of the three highest observations of total household income. The 25th, 50th, and 75th percentiles of income are \$25,327, \$49,755, and \$93,980, respectively. Sample contains 12,625 observations. Source: RAND HRS, waves 1–9 and HRS CAMS 2001–2009.

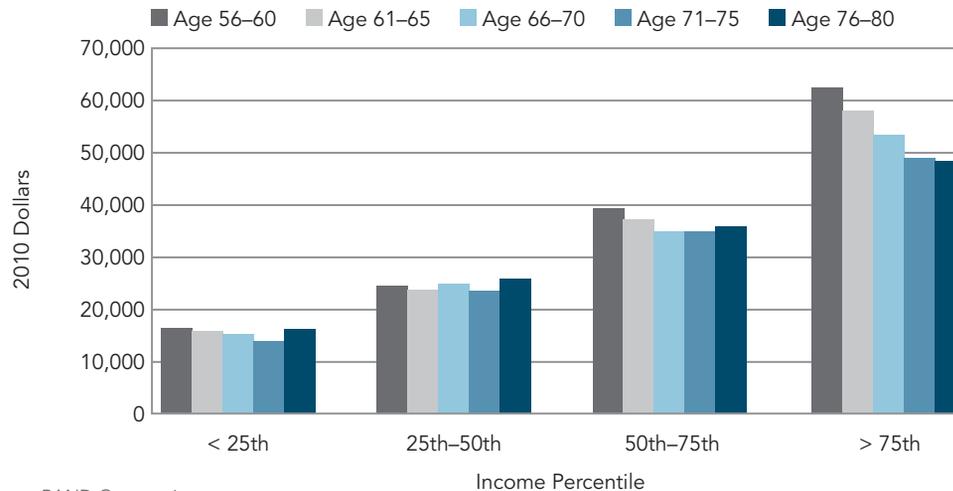
Figure 4. MEDIAN OUT-OF-POCKET MEDICAL CARE SPENDING³

Source: RAND Corporation.

A few factors explain the overall decline in spending, despite observed increases in discretionary and medical spending. For example, households tend to spend less on food in retirement. Retirees have more time to prepare their meals at home and shop around for better prices. Aguiar and Hurst (2007) find older households dedicate more time to shopping, and as a result, pay lower prices for the same products. Households also tend to spend less on work-related items in retirement, such as clothing and transportation. Among homeowners, we observe a large reduction in housing expenses because mortgages are typically paid off by retirement. Within this sample, the net effect on total nondurable spending has been a robust decline of about 10%–16% for households with income above the median. For households with income below the median, there is not a robust change in spending (see Figure 5). In this sample, the typical household with an annual income of \$50,000 or more reduced spending by about 10% or more. Households with income below this threshold held spending roughly constant.

These findings are remarkably consistent with the planning behavior reported in a survey of 1,000 plan participants conducted by Dimensional Fund Advisors and the Boston Research Group. Relative to current spending, 45% of participants plan on spending less in retirement. Only 11% of participants plan to spend more, with the remainder expecting to keep spending about the same. There is a big range in individual outcomes, so people must consider their unique needs and how they might differ from the “typical” household. Future retirees must also consider how budget shares might change in the future. For example, the budget share of medical care has risen over time, and many predict that it will continue to rise. Thus, the spending patterns of households in the past may not adequately reflect the challenges of retirees in the future.

3. The figure shows median out-of-pocket medical expenses by income quartiles. Sample contains 11,995 observations. Source: RAND HRS, waves 1–9 and HRS CAMS 2001–2009.

Figure 5. MEDIAN NONDURABLE SPENDING BY INCOME QUARTILE⁴

Source: RAND Corporation.

SAVINGS RATES

Determining spending needs in retirement is one step in determining an appropriate replacement rate. The next step is to determine what savings rate is consistent with achieving those spending goals. How much savings is needed is a very difficult question. A partial list of considerations would include risk tolerance, target retirement age, current savings, perceived health status, and predicted career path. To look at all combinations of these relevant factors is outside the scope of this article. Instead, we provide some simulation evidence around a general base case.

We simulate income and portfolio paths of 10,000 households. The working years are age 25 to 65, and full retirement occurs at 66. Final preretirement income matches the actual income distribution of households age 60 to 64 in 2009.⁵ Pay raises and portfolio outcomes are jointly drawn from historical distributions of changes in real per capita income and real stock and bond returns over the period from 1930 to 2010.⁶ Each year, the households save a fixed fraction of their gross income in a Roth retirement vehicle. The portfolio is invested in stocks and bonds, with the percent invested in stocks equaling $100\% - \text{age}$.

We assume households with below (above) median final income want to replace 100% (90%) of preretirement spending, where preretirement spending equals gross income—less savings, federal income taxes, and FICA taxes—estimated using current tax laws and standard deductions. A household's spending is partially funded by Social Security, but any shortfall is financed using personal savings. Figure 6 on the following page shows the savings rates needed to achieve this spending level (or more) with 75%–90% probability, assuming the price of a \$1 real annuity is \$20. Even with a Social Security replacement rate of 59% for the

4. The figure shows median nondurable spending by income quartiles. Sample contains 5,356 observations. Source: RAND HRS, waves 1–9 and HRS CAMS 2001–2009.

5. Source: US Census Bureau. 2010 Current Population Survey, Annual Social and Economic Supplement.

6. Real changes in per capita income obtained from Bureau of Economic Analysis. National Income and Product Accounts tables. The assumption that the household does not defer taxes allows me to complete the analysis without having to make predictions about future tax rates.

lowest income quartile, savings must be about 10% to maintain at least the same level of preretirement spending in about 85% of the simulations. For households with annual income exceeding \$25,870, a savings rate in the low teens is required to maintain spending levels with high probability.

Required savings rates might be lower if a household is willing to take more risk or target a lower spending level. Alternatively, savings rates might need to be higher if a person started saving later, did not consistently save, is more risk averse, or would like to target higher levels of retirement spending.

Figure 6. SIMULATION EVIDENCE

	Percentile of Preretirement Income			
	< 25th	25th–50th	50th–75th	> 75th
Preretirement income range	< \$25,870	< \$49,941	< \$86,882	> \$86,882
Median effective tax rate	8%	14%	18%	21%
Savings rate	9%–11%	13%–15%	12%–14%	13%–16%
Spending adjustment	0%	0%	10%	10%
Replacement Rate				
Total	81%–83%	71%–73%	61%–63%	57%–59%
Social Security	59%	38%	31%	21%

PUTTING IT ALL TOGETHER

Replacement rates can differ substantially across households depending on individual retirement goals, tax rates, and accumulated savings. Using preretirement income as a sorting variable, we obtain income replacement rates that range from 58% for highly compensated employees to about 82% for low-wage earners. Replacement rates decline as income increases for a number of reasons:

- High-income households tend to reduce spending as they transition into retirement.
- Tax rates are higher for high-income households.
- Social Security replacement rates are lower, thus necessitating higher savings rates.

Households that consistently save throughout the working years need to target savings rates of 10% to 15%—which is not that far off from observed behavior. Among active DC participants in the 2007 Survey of Consumer Finances, median total contribution rates (including both employee and employer contributions) range from 8% to 12%, depending on income level.

Of course, many participants do not save as early and as consistently as in the previous simulations. This fact leaves room for improvement, perhaps through plan design and education. The current trends toward auto-enrollment and auto-escalation are promising, but we believe plan sponsors should remain vigilant about improving their plans. As we look to the next generation of retirement plans, it's important to move the paradigm from savings to consumption planning.

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ABOUT THE AUTHOR

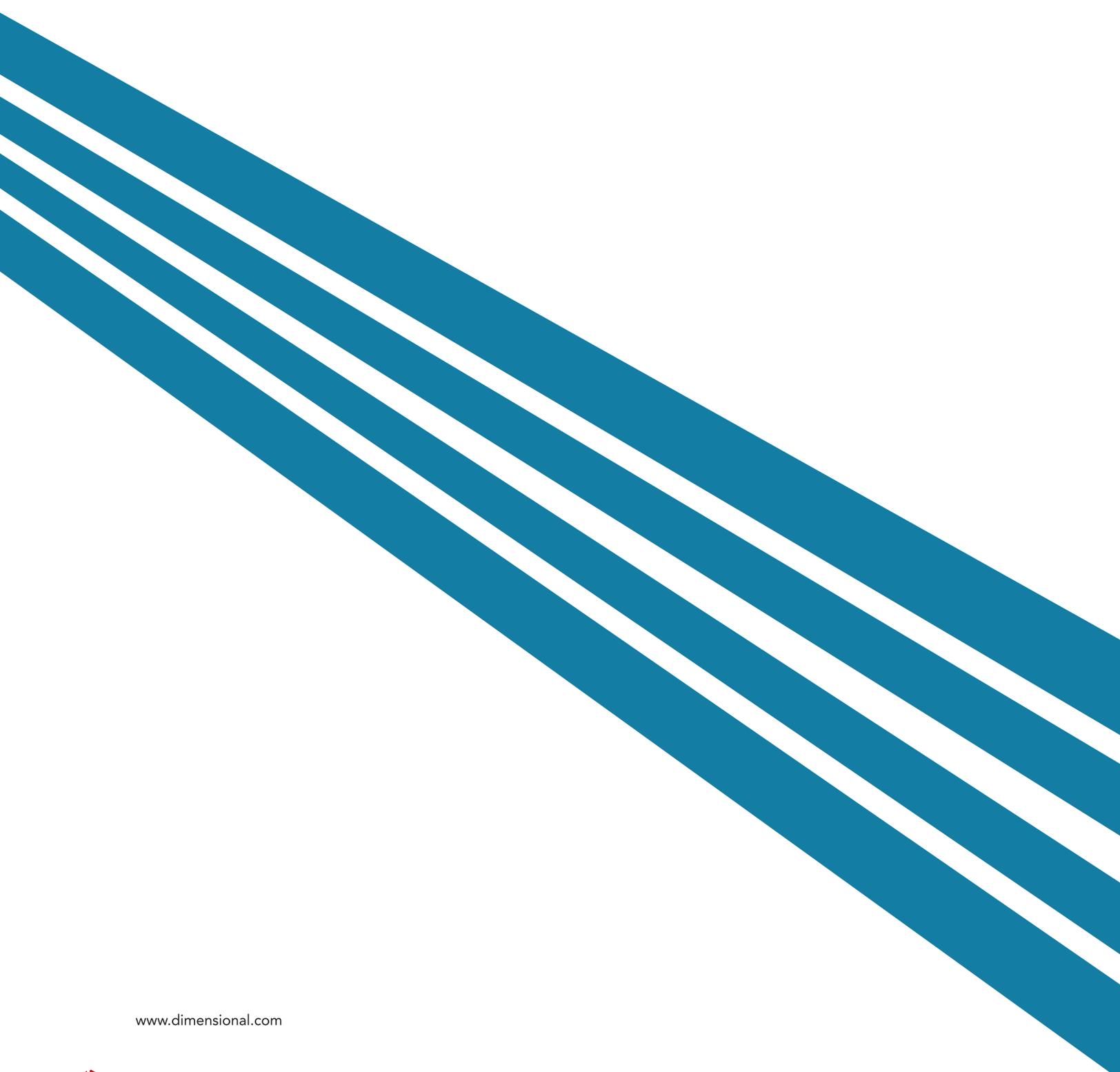


As a vice president on Dimensional's Research team, **Marlena Lee** conducts research in asset pricing and macroeconomics. She shares the results through published research and in presentations to institutions and financial advisors who work with Dimensional. Prior to joining Dimensional, Marlena gained experience explaining complex financial concepts as a teaching assistant for several professors, including Professor Eugene Fama. She has also worked as an economic consultant on antitrust litigation cases and as a research assistant at the Manhattan Institute of Policy Research.

Marlena earned her PhD in finance from the University of Chicago Booth School of Business. She also holds an MBA from the Booth School of Business, and an MS in agricultural and resource economics and a BS in managerial economics from the University of California, Davis.

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