Target-Date Retirement Funds:

A Blueprint for Effective Portfolio Construction

Critical Issues and Investment Implications

- *How can target-date retirement funds help individuals fund their own retirements?*

- *How much equity exposure and what asset classes are appropriate?*

- *What is success and how should you measure it?*

- *What are the risks and how should you measure them?*

- *Just how important is an extra 1% return?*

- *To what extent can active management and operational efficiency help?*

- *How can communications improve the likelihood of success?*

About the Author

Thomas J. Fontaine
Senior Portfolio Manager—AllianceBernstein Core/Blend Services

Mr. Fontaine is a senior portfolio manager on the AllianceBernstein Core/Blend investment services team, focusing on Style Blend and Structured Equity portfolios. Prior to his current role, Mr. Fontaine was a senior quantitative analyst responsible for the research and development of our firm's US Structured Equity products, as well as the design of the firm's global equity portfolio analytics systems.

Prior to joining Sanford C. Bernstein & Co. in 1999, Mr. Fontaine was a quantitative analyst at Tudor Investment Corporation, where he designed automated futures trading systems. Mr. Fontaine earned a BS, *cum laude,* in both mathematics and computer science from the University of Wisconsin–Madison in 1988 and a PhD in computer science from the University of Pennsylvania in 1993. He has earned Financial Risk Manager certification from the Global Association of Risk Professionals and is a CFA charterholder. ∎

Table of Contents

Executive Summary

Responsibility and risk for retirement saving has largely shifted from employers to employees, as self-directed defined-contribution plans have replaced traditional defined-benefit plans as the primary vehicle for retirement savings. Most employees, however, admit they are not equipped to make good investment decisions.

Target-date retirement funds can be attractive investment options both for these unprepared investors and their more confident colleagues because target-date funds offer a premixed asset-allocation strategy that automatically adjusts as a participant ages. Research shows that the funds are likely to be superior to the allocation that a participant might choose on his or her own.

Our research shows that most target-date retirement funds are not providing the high-quality investment planning and asset allocation that plan sponsors, as fiduciaries, should require. The primary flaw in most existing target-date retirement funds is that they invest too conservatively. Most fund offerings we surveyed resemble Plans B and C in the display below. They hold too little equity and too much fixed income and cash to generate the growth required to fund participants' spending over what may be several decades in retirement.

It takes a lot of equity to generate sufficient growth. Our analysis of historical US stock and bond data shows that the conservative and moderate equity allocations (represented by Plans C and B, respectively) were likely to generate enough growth to fund spending for only 15 or 20 years (*see display below*). Over longer time horizons, their success rates dropped precipitously.

Cash is an ineffective and expensive risk-reduction tool, even for retirees. Although cash probably is the safest investment over very short investment periods, we demonstrate that only very large cash allocations can significantly reduce the magnitude or frequency of capital losses. Furthermore, the opportunity cost of large cash allocations over long time horizons can be enormous.

Relying on historical returns and traditional mean-variance optimization techniques can lead to spurious fund design. We show that understanding the role of the underlying asset classes and planning for uncertainty through the use of Monte Carlo simulations can lead to better fund design.

Equity Glide Paths in Simple US Stock/US Bond Portfolios
(Display 11, page 18)
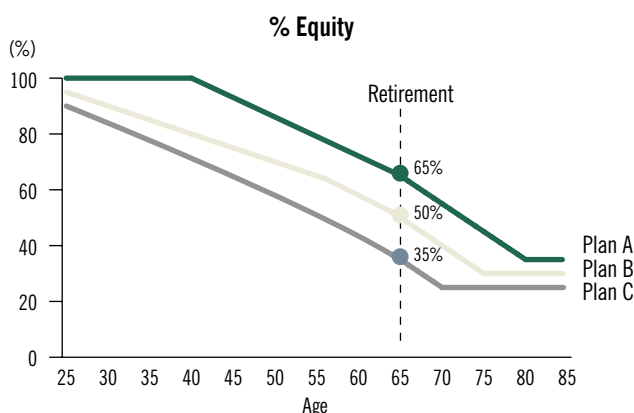
Source: AllianceBernstein

Success Rates for New Retirees
(Display 14, page 21)

% of Historical Periods that Spending Needs Were Met Under Various Spending Horizons

Spending Horizon	Plan A	Plan B	Plan C
15 Years	91	88	86
20 Years	70	62	50
25 Years	47	36	20
30 Years	32	14	8

Starting with $1 million and assuming $63,750 annual real spending, based on all investment periods from 1926 to 2004; all amounts are in present-day dollars. See Notes on Historical Data Preparation on page 19.
Source: Center for Research in Security Prices (CRSP), Roger G. Ibbotson and Rex A. Sinquefield, "Stocks, Bonds, Bills, and Inflation: Year-by-Year Historical Returns," *University of Chicago Press Journal of Business* (January 1976), Lehman Brothers, Standard & Poor's, US Bureau of Labor Statistics and AllianceBernstein

The investment problem for defined-contribution retirement-savings plans is unique. Participants in these tax-qualified funds typically have:

- Extremely long investment horizons;

- Twin objectives of maximizing savings during the working years and prolonging savings in retirement;

- Little or no short-term liquidity needs until retirement; and

- A predictable pattern of cash flows, with inflows during the working years followed by outflows in the retirement years.

To achieve a proper fund design, we assess the likely investment circumstances, objectives and risks of plan participants at different life stages.

Young savers enter the workforce with a valuable asset that resembles a low-risk annuity: their future labor income. Their initial plan contributions represent only a small fraction of their ultimate contributions—perhaps only 1% after the first year. Regardless of how the 1% is invested, it is difficult to view their portfolios as risky, because losses on their 1% investment will not have significant impact on how much savings they amass by retirement. Young savers should simply seek high returns.

Midlife savers have already accumulated significant savings, so strong returns can dramatically compound their savings. For a young saver with just $4,000 in a plan, a 20% return amounts to a gain of $800; for a midlife saver with $200,000 in a plan, a 20% gain produces $40,000. Midlife savers can also accept significant market risk because they have very long investment horizons (possibly 40 years or more) and can still replace lost capital through future labor income. Midlife savers should thus seek high returns, gradually reducing risk as retirement approaches.

New retirees have depleted their labor income and must fund their spending needs through their savings. They must deftly balance market risk, longevity risk and inflation risk, since reducing market risk increases longevity risk and inflation risk. A new retiree's greatest risk is longevity; these investors must seek attractive returns to help fund a possibly protracted spending period.

The Risk Trade-Offs in the Retirement-Savings Problem
(Display 7, page 14)

Type of Risk	"Safer" Assets	"Riskier" Assets
Market	Cash	Equities
Savings Shortfall	Equities	Cash
Longevity	Equities	Cash
Inflation	Equities, Inflation-Protected Securities	Cash, Regular Bonds

Source: AllianceBernstein

Senior retirees have likely spent a large portion of their savings and therefore have less opportunity to compound savings. Thus, a senior retiree should seek to limit the chance of a capital loss while generating sufficient returns to help preserve purchasing power.

This framework leads us to redefine risk. While a classic measure of risk in investments is market risk, measured by the standard deviation of returns, we demonstrate that a myopic focus on this measure of risk is inappropriate for addressing the retirement-savings problem. Broadly speaking, risk for these funds is the likelihood of failing to build enough savings to fund spending throughout retirement.

Different asset classes present different types of risk. Equities present significant short-term market risk—but far less savings shortfall risk, longevity risk or inflation risk. Cash presents little short-term market risk, but significantly increases all the other risks, as the display above shows. Thus, consideration of the relative importance of these risks at various life stages should be a central factor in asset allocation for a target-date retirement fund.

The most important type of risk to consider will change over the participant's life span. In the working years, the main risk is a savings shortfall caused by not contributing enough or from investing too conservatively (or both). In the retirement years, it is longevity risk (risk of outliving your savings) and inflation risk (risk that your savings will lose purchasing power). The risk of capital losses due to adverse market movements is relatively unimportant until well into retirement, when it may deplete savings beyond the point of recovery.

Range of Expected Performance over Entire Saving Phase
(Display 33, page 43)
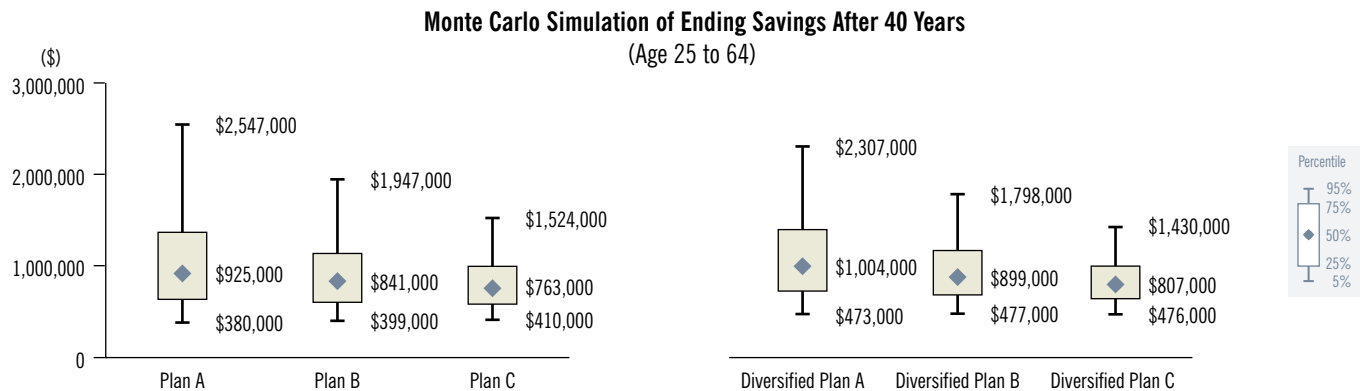
Monte Carlo Simulation of Ending Savings After 40 Years
(Age 25 to 64)

Starting with $0; all amounts are in present-day dollars; reflects Bernstein Capital Markets Engine assumptions as of March 31, 2005
Source: AllianceBernstein

Equities can be effectively diversified to decrease market volatility without sacrificing expected return by combining US large-cap equities, US small- and mid-cap equities, international equities (including emerging markets) and Real Estate Investment Trusts.

The role of bonds is to mute equity volatility, but bonds should deliver a real return. Our findings lead us to recommend using a diversified core bond portfolio, with inflation-protected securities to protect purchasing power in the years just before retirement and thereafter, and short-duration bonds (instead of cash) to gain further stability in the retirement years. We also advocate using high-yield bonds in midlife as a bridge between the high returns needed in youth and the stability needed in late retirement.

Higher equity allocations can lead to lower savings in bad market scenarios but massively higher savings in good market scenarios. The left-hand side of the display above shows the expected ending savings using the equity glide paths shown on page 1, with allocations to US large-cap equities, intermediate bonds and short-duration bonds (for precise allocations, see *Display 26* on page 34). Plan A underperformed Plan C by $30,000 in the 5th percentile case but outperformed by *$1,023,000* in the equally likely 95th percentile case; it also had a much higher median performance.

Effective diversification can narrow the range of expected ending savings while increasing the median outcome. The right-hand side of the display above shows the outcomes after incorporating such diversifying asset classes as US SMID equities, international equities, REITs and IPS (for precise allocations, see *Display 28*, page 36). Diversification narrowed the range of outcomes in each plan and also raised the median outcome.

Effective diversification allows a fund to maintain higher levels of equity and still have superior downside risk characteristics, the display also shows. Diversified Plan A delivered better outcomes in even very bad market scenarios than Plan C, with its low equity allocation.

Insufficient equity exposure is risky. Plan C simply has too little equity exposure over time to benefit from diversification as Plan A does. Thus, while Diversified Plan A has a 45% chance of providing spending power for 25 years after retirement, Diversified Plan C has only a 16% chance of achieving that goal, our Monte Carlo analysis shows (see top display on next page). Given our analyses, we advocate using Diversified Plan A.

Even modest amounts of incremental return over time can make a huge difference to a participant's financial security in retirement: A 1% higher annual return can fund more than 10 additional years of retirement spending (see bottom display).

There is no such thing as a passively managed target-date fund. Substantial active decisions are made during the construction of all such funds: which asset classes to use, how much to allocate to each of them and how to manage them. These permanent active decisions—and in particular the overall equity allocation—play the most important role in investment results.

Active management of the underlying asset classes can readily deliver 1% in incremental annual returns over time, and operational techniques such as efficient rebalancing and cash-flow management can add even more return. The multi-asset-class structure of target-date funds provides an ideal framework for skilled active managers to jointly produce consistent outperformance. Since funds that employ skilled active managers with efficient operations could add 10 to 15 years to participants' retirement spending, we believe plan sponsors should devote the time needed to identify such funds.

Traditional performance benchmarks do not apply. Measuring the effectiveness of the asset-allocation decisions is elusive, since there is no agreed-upon standard. We advocate net-of-fee peer universe performance comparisons for funds with the same target date, but we acknowledge there is insufficient history to compare. Until there is, we recommend traditional performance measurement of the underlying asset-class portfolios coupled with thorough evaluation of additional design aspects, particularly asset allocation. This paper introduces various methods for gauging asset-allocation effectiveness.

Effective employee communications are a crucial adjunct to a well-designed fund and necessary in helping participants stay the course. While market risk is a less significant threat than other forms of risk during most life stages, short-term market drops can make participants feel insecure—and may cause them to flee a prudent investment strategy. Effective communications can help employees resist behavioral biases that often lead to poor investment choices.

Retiree Performance:
Expected Probability of Meeting Spending Needs
(Display 36, page 46)
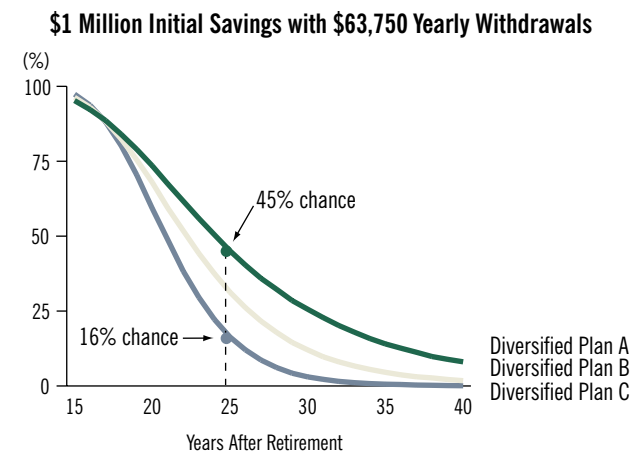
$1 Million Initial Savings with $63,750 Yearly Withdrawals

Reflects Bernstein Capital Markets Engine assumptions as of March 31, 2005
Source: AllianceBernstein

Adding 1% to Annual Returns Could Fund More Than
10 Extra Years of Spending
(Display 43, page 52)
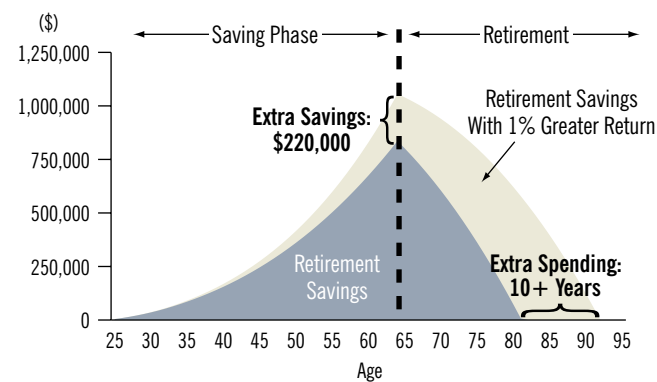
Results are simulated. The saving phase simulates a participant with a salary of $45,000 at age 25, linearly increasing to $85,000 by age 65, making yearly contributions of 6% of salary at age 25, increasing by 0.5% per year to a maximum of 10% and with a 50% company matching contribution up to the first 6% of salary. In retirement, $63,750 (75% of final salary) is deducted at the beginning of each year. The blue-shaded area shows ending savings with an investment return of 9% assumed at age 25, linearly decreasing to 6% at age 80 and remaining constant thereafter. Inflation is assumed to be a constant 3%. The tan-shaded area assumes 1% greater return each year. All amounts are in present-day dollars.
Source: AllianceBernstein

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INTRODUCTION: A SEA CHANGE IN RETIREMENT-SAVINGS RESPONSIBILITY

Janet Smith, a 45-year-old professional earning $65,000 a year, was feeling rather proud of herself for having accumulated $115,000 in her defined-contribution plan. Then, she consulted with a financial advisor and found out that she'd need to accumulate five or six times that amount over the next 20 years in order to support even a moderate lifestyle in retirement. Given her current saving rate and the likely return on her assets (now invested 20% in a money-market fund, 30% in bonds and 50% in stocks, including 30% in company stock), Janet was told her savings were likely to fund less than 10 years of retirement spending—and that her apparently conservative portfolio was actually quite risky.

Janet Smith is fictitious, but her circumstances are quite realistic. In fact, her savings are higher than those of most plan participants. Most Americans aren't saving enough for retirement, and even those who are making the effort frequently make poor investment decisions.[1]

A tectonic shift has dislodged the financial security of most Americans in recent years: Responsibility and risk for retirement saving has shifted to individuals from their employers. Remarkably few of the millions of people affected, however, seem to have noticed. Even fewer seem to have grasped the magnitude of this new responsibility.[2]

With far fewer individuals today covered by defined-benefit plans and Social Security's limited benefits likely to meet only a modest portion of retirement spending needs, defined-contribution (DC) plans are becoming the primary source of retirement savings for an ever-increasing share of Americans.[3] It's now up to individuals to make sure they save and invest well in order to provide for a secure retirement.

Yet the rates of participation and contributions in DC plans remain stubbornly low[4] and savings levels are meager.[5] The problem may be, in part, that individuals simply aren't aware of how much savings are needed to fund a retirement that may last for 30 years. What can Janet Smith and millions of other Americans—and their employers—do to improve the odds of their having enough savings to live on in retirement?

Plan Sponsors Are Trying to Help
Fortunately, sponsors of defined-contribution plans have lately demonstrated a heightened concern about their employees' retirement savings. The number of defined-contribution plans with written investment-

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[1] *See, for example, "Common Sense Reforms to Promote Retirement Security" by J. C. Goodman and P. R. Orszag in the* Retirement Security Project Report 2005-3.

[2] *Only 42% of workers in a 2005 survey said they or their spouse tried to calculate how much money they will need to save for retirement, down from 53% in 2000. The most commonly reported method of determining savings needed for retirement, reported by 46% of workers, was to "Guess." Yet 65% of workers say they are confident that they'll have enough money to live comfortably through retirement. R. Helman, D. L. Salisbury, V. Paladino and C. Copeland, "Encouraging Workers to Save: The 2005 Retirement Confidence Survey," EBRI Issue Brief, No. 280, April 2005.*

[3] *64% of salaried employees reported that their 401(k) plan was their primary retirement income plan in 2005, up from 41% in 1999, according to* Trends and Experiences in 401(k) Plans 2005 *by Hewitt Associates.*

[4] *On average, only 75% of eligible employees participate in 401(k) plans, down from a peak of 79% in 1997. Meanwhile, the average pretax employee contribution rate is just 7%, despite the attractive tax and employer-match benefits. Ibid.*

[5] *Average 401(k) balances are about $70,000. However, this average does not fully reflect retirement savings for several reasons. The foremost is that only 32% of workers leaving their jobs keep their money in a plan, according to a recent Hewitt Associates survey of nearly 200,000 workers. Thus, workers in their 40s who have been employed by a company for less than two years have an average account balance of about $37,000, whereas workers in the same age group with at least 10 years of tenure with their company have a balance of roughly $108,000 at year-end 2003, according to* Perspective Vol. 2/No. 10 *by the Investment Company Institute.*

policy statements has risen sharply—from 67% in 2003 to nearly 75% in 2004.[6] A full 70% of plan sponsors said in a survey that they're likely to initiate steps to increase participation rates in 2005; 75% said they're likely to find ways to increase employee contributions. Nearly half of the plans said they intend to implement auto-matic-enrollment systems, which require employees to decide to opt *out* of a plan rather than to opt *in*.[7] Nearly 90% of plan sponsors said in another survey that they intend to focus in 2005 on making sure that employees appreciate the value of the plan.[8]

While these efforts to boost participation and contri-butions are heartening, significantly less attention has been paid to the investment choices of plan participants and how these choices affect their savings. Poor choices, unfortunately, are all too common among plan partici-pants: Money-market and stable-value funds account for 29% of total plan assets, and at the other end of the risk spectrum, employer stock accounts for 21%.[9] The money-market and stable-value investments are likely far too conservative for most participants, while the employer stock investments are likely far too risky.

The problem is compounded because many DC plan participants are what we call *accidental investors*, often confronted with serious investment decisions for the first time when their employer's human resources department provides a thick folder containing the com-pany's DC plan information. Overwhelmed by the pros-pect of filling out paperwork, deciphering the array of investment options and figuring out a suitable invest-ment plan, accidental investors often make ill-informed choices—or don't participate at all. Indeed, in a survey AllianceBernstein conducted, 62% of employees indi-cated that they are "unprepared" or "reluctant" to man-age their retirement investments themselves (*Display 1*).

Display 1

Most Employees Are "Unprepared" or "Reluctant" Investors

Employee Self-Description

Accidental Investors

62% "Unprepared" or "Reluctant"

38% "Aggressive" or "Confident"

Confident Investors
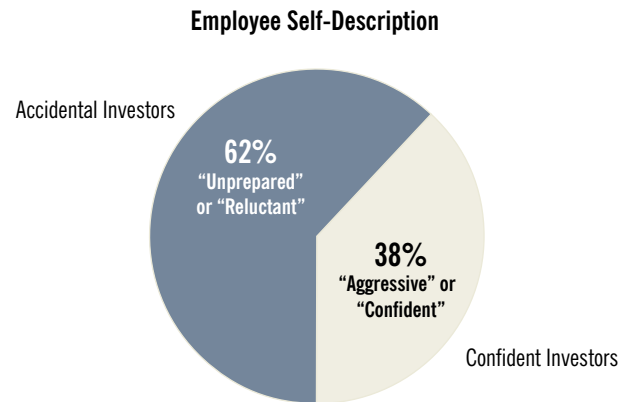
Results of a nationally representative AllianceBernstein survey conducted in February 2005 of employees eligible to participate in their companies' defined-contribution plans
Source: AllianceBernstein

The self-described "aggressive" or "confident" minor-ity, however, may not make better investment decisions than the accidental-investor majority. Individual inves-tors continue to demonstrate an alarming propensity to make poor decisions, with dire results for their long-term investment performance. For example, according to a widely cited study, while the S&P 500 earned an annualized 13.2% per year from 1985 to 2004, the aver-age investor in a stock mutual fund earned just 3.7% per year.[10]

It's unclear whether even considerable educational efforts can help guide most participants toward the sound investment strategies needed to secure a comfort-able retirement. Indeed, research in the growing field of behavioral finance helps explain why even well-informed and otherwise rational people can succumb to emotions and powerful subconscious biases that lead to poor investment choices.[11] (See *Why Rational People Make Irrational Investment Decisions* on the opposite page.)

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[6] 2004 DC Survey *by* PLANSPONSOR *magazine.*
[7] *Prior to an IRS ruling in 2000, employers could automatically enroll only new employees: IRS Revenue Ruling 2000-8 stated that automatic enrollment is also permissible to current employees. Unfortunately, it cited an example of an em-ployer deducting 3% of an employee's pay for contribution into a plan; this led plans to deduct automatically only 3% of an employee's pay, perhaps less than the employee would have chosen if he or she had made an active decision. In 2004, the IRS published a general information letter clarifying that the employer could deduct automatically any amount permissible and could increase the con-tribution amounts over time. Of course, employees must be notified and be given authority to alter the deduction amount or stop contributing altogether.*
[8] Survey Findings: Hot Topics in Retirement 2005 *by Hewitt Associates.*
[9] Trends and Experiences in 401(k) Plans 2005 *by Hewitt Associates.*

[10] *Bond fund investors also made poor choices, earning just 2.0% per year while the Lehman Aggregate Bond index gained 5.7% per year and inflation rose 3.0% per year.* DALBAR Quantitative Analysis of Investor Behavior 2005.
[11] *Behavioral finance, the outgrowth of an unlikely collaboration of economists and psychologists, studies how people make decisions. Daniel Kahneman, a psy-chologist, won the Nobel Prize in economics in 2002 for his contributions in this domain. For an overview of several of the biases that lead investors to make poor investment choices, see* Providing Effective Investment Advice: Insights from Behavioral Finance *by L. Sanders, 2005, AllianceBernstein.*

WHY RATIONAL PEOPLE MAKE IRRATIONAL INVESTMENT DECISIONS

Consider the following two scenarios, taken from the growing literature in the field of behavioral finance.[12]

In Scenario 1, you can choose between two pleasant options:

Choice A: There is an 80% chance that you will receive $4,000 and a 20% chance that you will receive nothing

Choice B: You receive $3,000 with certainty

Which would you choose?

In Scenario 2, you must make a less pleasant choice:

Choice A: There is an 80% chance you are going to *lose* $4,000 but a 20% chance that you can avoid the loss entirely and pay nothing

Choice B: You *lose* $3,000 with certainty

Now, which would you choose?

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[12] *Ibid.*

If you're like 80% of the population, you preferred the certain gain offered by Choice B in the first scenario. If you're like 90% of the population, you preferred the chance of avoiding a loss offered by Choice A in the second scenario.

Yet both of those choices are mathematically irrational in terms of expected value. In the first scenario, the expected value of Choice A is a gain of $3,200, because 80% of $4,000 plus 20% of $0 equals $3,200. That's $200 more than Choice B. In the second scenario, the expected value of Choice A is a loss of $3,200 because 80% of $(4,000) plus 20% of $0 equals $(3,200). That's $200 *worse* than the $(3,000) certain loss in Choice B. In fact, the more often those types of decisions are made, the more often damage is inflicted.

The preferences for certain gains (Scenario 1) and loss aversion (Scenario 2) are just two of the many subtle biases that can adversely affect investment decisions. Even rational people with considerable investment knowledge can succumb to these strong biases, resulting in undisciplined and irrational decisions. ∎

Target-Date Retirement Funds Are A Step in the Right Direction

An increasingly popular approach to helping participants improve their investment elections has been to add target-date retirement funds (also known as "target-date maturity" or "life-cycle" funds) to the plan's investment options.[13] Usually offered as a series of portfolios designed for retirement dates at 5- or 10-year intervals, these broad asset-allocation portfolios are designed to seek high returns when retirement is many years off and to gradually moderate risk over time.

Target-date retirement funds are appealingly simple for the accidental investors in DC plans because all that

is required of a participant is to sign up for the fund designed for the participant's anticipated retirement date. From that point on, investment professionals handle everything: They set the asset allocation, select the investments, rebalance and reduce risk-taking over time. Indeed, even the more investment-savvy investors in a plan could benefit from the disciplined, professional investment management of such funds.

But target-date retirement funds must be more than simple: To generate sufficient growth and protect participants against both sharp market drops and the corrosive effects of inflation on retirement spending power, target-date retirement funds must be well-designed investment portfolios. Far too often, that is not the case.

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[13] *Recent reports suggest that use of target-date retirement funds can improve employee retirement savings. See, for example,* Perspective Vol. 2/No. 10 *by the* Investment Company Institute *or* Automating Your Savings Plan to Provide Retirement Security, *February 2005, by Mercer Human Resources Consulting.*

While the target-date retirement funds available today may offer a better investment mix than what plan participants might choose on their own, few (if any) approach the quality that most plan sponsors and their consultants bring to the architecture of defined benefit plans—or that wealthy individuals and their advisors bring to the architecture of personal portfolios. As fiduciaries, DC plan sponsors should require nothing less.[14]

However, some aspects of the investment problem for individuals in defined-contribution plans saving for retirement are unique:

- *The investment objectives are to maximize savings in the working years and prolong spending in retirement.* Thus, investing in assets with strong growth potential is critical to meeting both objectives.

- *The time horizon is extremely long:* more than half of a century for a young employee and about a quarter of a century for a new retiree.

- *There are no liabilities to match for most of the investment period.* Unlike defined-benefit plans, there are typically no outflows (until retirement) and thus no need to use bonds to match liabilities.

- *Employees' future labor income resembles a low-risk annuity.* The likely sequence of future cash inflows implies that the investment portfolio can seek higher returns and accept higher amounts of market risk than it might otherwise.

- *The sequence of returns matters.* Cash inflows prior to retirement mean that high returns matter more for midlife savers than young savers, while cash outflows in retirement mean that high returns matter more for new retirees than senior retirees.

- *DC plans are tax qualified.* This increases the attractiveness of Real Estate Investment Trusts (REITs) and other relatively tax-inefficient asset classes.

The Elements of a Well-Designed Target-Date Retirement Fund

In this paper, we share our research into solving the investment problem of what constitutes a well-designed target-date retirement fund. We draw heavily upon our firm's 30-plus years of research and experience in portfolio management and investment planning for wealthy private clients and more than 20 years of managing style-pure portfolios for large institutions. We examine common pitfalls in retirement-fund design, and we demonstrate how seemingly innocuous differences can lead to drastically different results, significantly affecting the quality of life in retirement for plan participants.

In particular, we investigate what we believe are the key attributes of a well-designed target-date retirement fund:

- *Sound equity glide path design* to give participants the best opportunity to build savings and provide for spending over potentially long retirement periods;

- *Proper asset-class selection,* with each asset class chosen to play a specific role in the overall target-date retirement portfolio;

- *Effective diversification* to reduce risk without unnecessarily sacrificing return;

- *Enhanced returns* through skilled active management and efficient operational techniques; and

- *Targeted communications* to help increase participation and improve understanding and satisfaction for both confident and accidental investors.

This paper investigates each of these topics in detail, with emphasis on the correct design of the equity glide path, proper selection of asset classes and effective diversification.

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[14] *There is widespread legal agreement that DC plan sponsors are fiduciaries under the Employee Retirement Income Security Act; see* Target-Date Retirement Funds and the Defined-Contribution Plan Sponsor's Fiduciary Responsibility *by D. Notto, 2005, AllianceBernstein. However, a recent AllianceBernstein survey of 1,200 sponsors of (mostly small) defined-contribution plans found that while most sponsors know they should be aware of the fiduciary issue, only 40% of them view themselves as fiduciaries. See* Inside the Minds of Plan Sponsors *by D. Gangemi, 2005, AllianceBernstein.*

Key Findings

Our review of existing target-date retirement funds found most to be too conservative and improperly diversified. Therefore, some of our conclusions may appear provocative to those already familiar with some of the well-accepted target-date retirement funds currently available. Our recommendation that the equity allocation should be as high as 95% for young savers and 60% at retirement may be especially startling.[15]

Yet our research shows that:

- Just one percentage point of incremental return throughout life can fund more than 10 extra years of spending in retirement.

- Higher returns matter much more in midlife than in youth and also matter more in early retirement than in later retirement, since investors are able to compound savings from a larger capital base. Therefore, significant equity exposure through early retirement is essential to a successful retirement strategy.

- The common practice of simply comparing total equity exposure to gauge the risk of alternative plans is misleading and leads to poor conclusions.

- While lower equity allocations may modestly reduce the short-term risk of losses, the opportunity cost of this myopic increase in stability is unacceptably high.

- A reduction in market risk results in an increase in savings shortfall risk, longevity risk and inflation risk. These increased risks are not apparent in the short term, so they are frequently overlooked.

- The combination of multiple sources of excess return from style-pure actively managed portfolios can result in highly consistent outperformance versus a passive index approach.

We also introduce unconventional, but important, operational techniques that can increase returns for participants. Finally, we recommend an approach to providing high-quality targeted communications to boost participation and contribution levels and to instill participants with the confidence they need to adhere to a well-designed target-date retirement fund—through good times and bad.

Indeed, we demonstrate that if Janet Smith and her colleagues step up their participation and contribution rates, invest all or most of their retirement assets in a well-designed and well-implemented target-date retirement fund, and stay the course through good markets and bad, they can greatly increase the likelihood of amassing enough savings to fund a comfortable lifestyle throughout even a lengthy retirement.

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[15] *The most aggressive portfolio in the AllianceBernstein Retirement Strategies contains 90% equities and 10% REITs. For purposes of quoting total equity exposure, we will generally split REIT exposure equally between equities and fixed income, since REITs possess characteristics of both asset classes. Thus, in this example a portfolio with 90% in stocks and 10% in REITs will be described as having "95% equity exposure."*

RETIREMENT PLANNING FOR THE ACCIDENTAL INVESTOR

Ideally, an individual's investment-policy statement would take into account all of his or her financial circumstances. When our colleagues in our private-client practice, Bernstein Investment Research & Management, meet with a new client, they ask for detailed information on the client's family income, financial assets and liabilities, annual spending and lifestyle, as well as their retirement goals, plans to educate their children or support their elderly parents, and estate-planning goals.

Our first impulse in tackling the investment-planning problem for defined-contribution plan participants was to seek all the information necessary to develop similarly tailored investment-policy statements and investment strategies. We would have liked to offer a host of target-date retirement strategies, with alternatives suitable to participants in varying financial circumstances.

Such an approach, we soon realized, would defeat the purpose of a target-date retirement fund aimed at accidental investors—the very people who are least inclined to sit down and think through their financial circumstances and investments. Even if we could get accidental investors to answer questions to help us create a more customized solution, we would need to maintain such customization by meeting with them regularly to reassess their portfolios as their circumstances changed. This extra layer of customization would burden the plan with considerable costs and ask too much of accidental investors. To get accidental investors to participate and remain on a path to success, it's crucial to keep what is required of them limited and simple.

Moreover, further research and reflection convinced us that information participants could easily provide—the year they are likely to retire—yields a wealth of information. Indeed, we have found that the variation between the objectives of different clients at the same life stage is relatively modest compared to the variation in the objectives of a given client at different life stages. Thus, the first step in our analysis of the target-date retirement strategy problem was to thoroughly consider the likely circumstances of plan participants throughout their lives and identify the investment implications for determining an appropriate portfolio at each life stage.

The Hypothetical Plan Participant

Throughout this paper, we consider the circumstances of a hypothetical plan participant. He (she) starts making contributions at the beginning of the year at age 25, when earning $45,000, and contributes each year until retirement at age 65, when earning nearly $85,000 (in present-day dollar terms[16]). The employee is able to contribute 6% of earnings at age 25 and increases the contribution by 0.5% per year (to a maximum contribution of 10%). The employer offers a 3% contribution in all years.[17] This savings pattern is summarized in five-year increments in *Display 2*.

These assumptions are largely in line with surveys that characterize typical plan participant salary ranges.[18] We assume modestly higher contribution rates than have occurred historically, to reflect DC plan sponsors' recent efforts to boost contribution and participation rates.

Several objections could be raised concerning these assumptions: What if an employee earns or contributes considerably less (or more), changes jobs, begins working later in life or stops working for several years for child rearing, or stops working earlier in life due to death or disability, and so forth?

Our approach and conclusions hold under a wide range of these variant cases. For example, someone saving somewhat less may accrue less, but the recommended allocation would stay the same (see *Sensitivity to Participant Contributions* on page 50). Similarly, a change of jobs may result in a rollover of DC plan assets into an Individual Retirement Account (IRA), but the recommended allocation for the IRA would stay the same. Economic uncertainty arising from death or disability can (should) be mitigated by purchasing insurance policies and so forth. The key, in our opinion, is to approach the general problem by first understanding the likely circumstances of the great majority of participants at each stage of life.

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[16] *All future dollar amounts in this paper are expressed in terms of present-day (real) purchasing power, unless otherwise specified.*
[17] *We assume the employer offers a 50% match up to 6% of the employee's salary. Since we're assuming that the participant contributes at least 6% per year, we assume the employer contributes 3% each year.*
[18] *See, for example,* How Well Are Employees Saving and Investing in 401(k) Plans: 2003 *by Hewitt Associates.*

Display 2
The Hypothetical Plan Participant: Income and Pretax Contributions over Time

Age	Salary ($)	% Employee Contribution	% Employer Contribution	Total % Contribution	Total $ Contribution	Cumulative $ Contribution	Cumulative $ Contribution as % of Lifetime Total
25	45,000	6.0	3.0	9.0	4,050	4,050	1.2
30	50,000	8.5	3.0	11.5	5,750	29,300	9.0
35	55,000	10.0	3.0	13.0	7,150	62,980	19.3
40	60,000	10.0	3.0	13.0	7,800	100,680	30.8
45	65,000	10.0	3.0	13.0	8,450	141,630	43.3
50	70,000	10.0	3.0	13.0	9,100	185,830	56.8
55	75,000	10.0	3.0	13.0	9,750	233,280	71.4
60	80,000	10.0	3.0	13.0	10,400	283,980	86.9
65	—	—	—	—	—	326,880	100.0

All amounts are in present-day dollars.
Source: AllianceBernstein

A Life-Stage Model for Plan Participants

We approached the investment-planning problem in terms of two broad phases of life: the *saving phase* during the employment years, when people live off their labor income while accumulating assets, and the *retirement phase*, when they have no labor income and must fund their consumption from their accumulated assets. We further subdivided each of these phases into two stages.[19] In the saving phase are *young savers*, age 25 to 44, and *midlife savers*, age 45 to 64. In the retirement phase are *new retirees*, age 65 to 79, and *senior retirees*, 80 and older. We shall show that this subdivision of life stages is necessary because the circumstances of young savers are quite different from those of midlife savers. Likewise, the situations of new retirees differ significantly from those of senior retirees.

Display 3 depicts these four life stages in terms of accumulated savings and subsequent retirement spending, using simplified assumptions for the sake of illustra-

tion. (We will consider more realistic cases in *Stress Testing the Design* on page 39). Here, we assume contributions are made according to Display 2, with inflation running at a constant 3%, and with the portfolio achieving nominal returns ranging from 9% at age 25 and linearly declining each year to 6% at age 80 and thereafter. In the retirement phase, we assume a real yearly withdrawal rate of $63,750 (75% of our hypo-

Display 3
Hypothetical Participant: Saving and Spending of Plan Assets
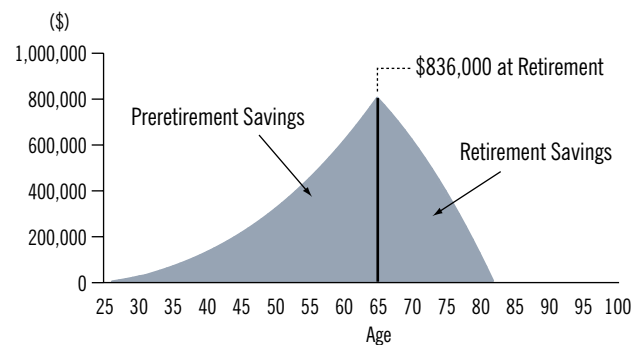
Saving Phase		Retirement Phase	
Young	Midlife	New	Senior

Results are simulated. The savings phase simulates a participant with a salary of $45,000 at age 25, linearly increasing to $85,000 by age 65, making yearly contributions of 6% of salary at age 25, increasing by 0.5% per year to a maximum of 10% and with a 50% company matching contribution up to the first 6% of salary. In the spending phase, $63,750 (75% of final salary) is deducted at the beginning of each year. An investment return of 9% is assumed at age 25, linearly decreasing to 6% at age 80 and remaining constant thereafter. Inflation is assumed to be a constant 3% and dollar values are expressed in real purchasing power terms.
Source: AllianceBernstein

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[19] *We use the term "life-stage model" to differentiate our approach as practitioners designing a target-date retirement fund from theoretical "life-cycle" economic frameworks. Economic theories involving patterns of savings and consumption date back to Irving Fisher's* The Theory of Interest (1930) *and Roy Harrod's* Towards a Dynamic Economics (1948), *which hypothesized that savings would be "hump-like," with the highest savings point in the middle years of life. Since the 1950s, considerably more rigorous frameworks have been developed by economists to model preferences and choices involving income, savings, consumption, intergenerational wealth transfer and other life-decision variables. A seminal work was Modigliani and Brumberg's* Utility Analysis and the Consumption Function: An Interpretation of Cross-Section Data, *published in 1954. Modigliani was awarded the Nobel Prize in economics in 1985 for his pioneering work in saving behavior and corporate finance.*

thetical participant's final salary) and show how long the savings would last using our assumed rates of return in retirement.

Participants in each of our four life stages have distinct and identifiable circumstances, objectives and risks that can offer substantial insight into the investment planning process.

Young savers typically have limited financial or real assets. They may own a car and have some equity in their home—or be saving to make a down payment on one. They have just begun saving, and they're still usually earning a relatively low salary that limits their contributions. In fact, they are likely to be in debt, borrowing from their future labor income to finance current spending needs. Most directly relevant for this discussion, if they have been putting money into a retirement account, it hasn't added up to much yet.

Thus, the young saver's greatest asset is his ability to work and generate *future* income. At 25, he potentially has 40 years or more of employment ahead, most likely at a higher inflation-adjusted wage. From an investment perspective, the future stream of plan contributions can be viewed as a relatively low-risk annuity, paid into the plan from labor income.[20] Once we consider that the participant possesses this very large and relatively low-risk asset, how should plan contributions for the young saver be invested?

The young saver's retirement objective is to accumulate as much wealth as possible. Whether his current annual income is $25,000 or more than $100,000, his total future income over the next 40 years will typically far exceed his current wealth or retirement savings. In the case of our hypothetical plan participant, the value of the first year of contributions into the plan is $4,050, amounting to just 1.2% of the expected total life contributions.

Viewing the future 98.8% of total life contributions as a low-risk asset within the total portfolio, it is clear that it would be difficult, if not impossible, to construct a par-

Display 4
Young Savers' Contributions Are Modest vs. Potential Total
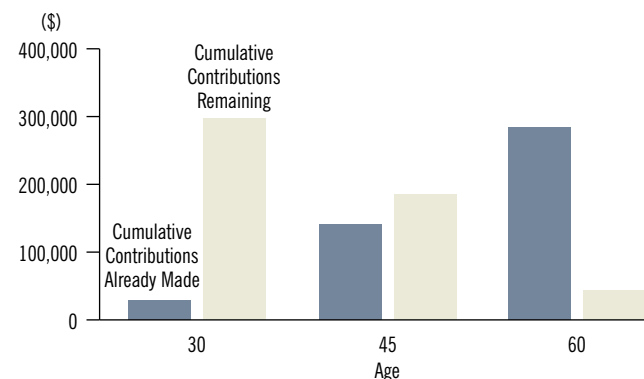
The bars represent the cumulative contributions of a hypothetical investor with a salary of $45,000 at age 25, linearly increasing to $85,000 by age 65, who makes yearly contributions into a plan equal to 6% of the worker's salary at age 25 and increasing by 0.5% per year to a maximum of 10% and with a constant 3% company match. All amounts are in present-day dollars.
Source: AllianceBernstein

ticularly risky portfolio. This can readily be seen by how rapidly lost capital can be replaced: The value of the second year of contributions into the plan is $4,370, more than enough to completely replace the initial contribution of $4,050. Put another way, when plan assets are a small fraction of future contributions, the risk of investment losses in a bad year isn't really significant relative to total life savings expected by retirement. *Display 4* shows that even the cumulative contributions over the first five years, to age 30, are still modest compared to the potential contributions remaining over the course of a lifetime.

Indeed, the greatest risk a young saver faces is not the risk of a capital loss on investment. It is savings shortfall risk, the risk of not contributing adequately and of investing too conservatively, and thus impairing savings accumulation, possibly severely. For example, suppose our hypothetical participant had $4,050 invested in his company's default option of a money-market fund, a not unlikely scenario considering that a money-market or stable-value fund is the default investment option of roughly 56% of plans.[21] The opportunity cost to the young saver of remaining in that option would be enormous, leading to much greater shortfall risk.

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[20] *There is a wealth of academic literature investigating asset-allocation frameworks that include labor income in conjunction with traditional asset classes. See, for example,* "Understanding Risk and Return" *by J. Campbell in the* Journal of Political Economy *(1996) or* "Equity Allocations and the Investment Horizon: A Total Portfolio Approach" *by R. D. Van Eaton and J. Conover in* Financial Services Review 11 *(2002).*

[21] Trends and Experiences in 401(k) Plans 2005 *by Hewitt Associates.*

Display 5
Sizing the Opportunity Cost of Investing in Cash

	Cash	Bonds	Stocks
Historical Real Annual Return (%)	0.8	2.2	7.2
Growth of $4,050 over 40 Years ($)	5,596	9,570	64,886
Cumulative Savings Above Cash (%)	—	71	1,060

Annualized inflation-adjusted returns from 1926 to 2004 of 30-day T-Bills, US
bonds and US stocks; see Notes on Historical Data Preparation, page 19.
Source: Center for Research in Security Prices (CRSP), Roger G. Ibbotson
and Rex A. Sinquefield, "Stocks, Bonds, Bills, and Inflation: Year-by-Year
Historical Returns," *University of Chicago Press Journal of Business* (January
1976), Lehman Brothers, Standard & Poor's, US Bureau of Labor Statistics and
AllianceBernstein

Analyzing total return data from 1926 to 2004, we found cash has had an annualized real rate of return (return in excess of inflation) of about 0.8%. US bonds have achieved about a 2.2% real return, and US stocks have returned about 7.2% (*Display 5*). Compounding at those rates for 40 years, a cash investment would have missed an opportunity to earn 71% more by investing in bonds and a whopping 1,060% more by investing in stocks!

Young savers are in an enviable position, because they have the longest time frame to seek high returns and compound savings, yet the impact of a loss is softened by their ability to rapidly replace lost capital from future income.

While a large annual percentage loss, say 25%, on savings of $4,050 might not have a particularly significant impact on a young saver's ultimate savings at retirement, such a loss is likely to have an immediate impact on how that participant *feels*. To address this second but equally important issue, it is critical to 1) diversify wisely to lower expected risk without unduly sacrificing expected return and 2) provide ongoing, effective communications to prevent the participant from making poor investment decisions based on his emotional reaction to short-term market movements. We will discuss both of these important points in later sections.

In sum, the primary investment mistake a young saver can make is to incur the opportunity cost from contributing too little and investing too conservatively. Later, we will see that the largest problem faced by an employee nearing retirement is that the employee real-

ized savings shortfall risk and did not accrue sufficient savings to fund a comfortable lifestyle in retirement.[22] This risk will continue to be magnified not only by the reduction of retirement support from defined-benefit plans and Social Security, but by medical advances resulting in increased longevity. Thus, young savers should seize the opportunity to seek high returns afforded to them by their long investment horizons and by their ability to replace lost capital through future labor income.

Midlife savers are more likely than young savers to have amassed substantial retirement savings, but by 45 they typically have only 20 years or less of employment income ahead of them. They are likely to be nearing or passing the point of having earned the majority of their lifetime labor income and may have made the majority of their lifetime plan contributions. As time marches midlife savers inexorably toward retirement, their ability to replenish lost investment capital with future contributions diminishes.

Thus, a midlife saver's retirement-savings objective differs subtly, but importantly, from a younger colleague's objective: The need to accumulate savings competes with the need to avoid significant capital losses. Since their future labor income is shrinking relative to their accumulated retirement savings, midlife savers are less likely to be able to replace lost capital, and therefore can't take as much risk in their investment portfolios. Midlife savers need to be increasingly wary of a market drop.

At the same time, however, midlife savers also have far more to gain from a market rally. Because they have accumulated substantial savings, high returns are important. For a 25-year-old with $4,000 in his savings plan, the 20% return he might get on equities in a good year might feel good, but it's still only $800. To a 45-year-old with $200,000 in his retirement plan, a 20% return will generate $40,000. (See *Why Strong Returns Matter Most in Midlife and Early Retirement* on page 16).
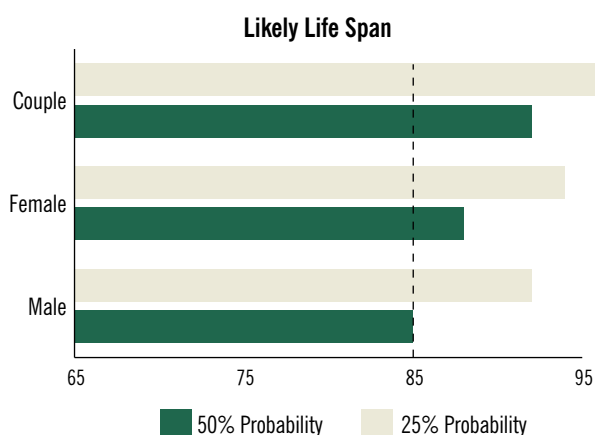
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[22] *Indeed, 24% of American workers in 2005 said they will need to work beyond retirement to provide necessary income, compared to just 13% in 2000, according to* A Work-Filled Retirement: Workers' Changing Views on Employment and Leisure, *August 2005, by S. Reynolds, N. Ridley and C. E. Van Hornat, the John J. Heldrich Center for Workforce Development.*

Participants in the transition from being young savers to being midlife savers are at what we call a "sweet spot" of investment opportunity: Not only do they still have a long time horizon in which to invest and earn labor income, but their sizable asset base provides a rich opportunity to compound their savings. As we will show later in this paper, being too conservative during this phase—and therefore incurring opportunity cost and increasing savings shortfall risk—is one of the key weaknesses in existing target-date retirement funds: It has the potential to cost participants hundreds of thousands of dollars by retirement.

Compounding savings is of paramount importance when the individual is in his 40s and early 50s, but when the individual moves into his late 50s and 60s, the risk of a loss on an increased asset base—and not being able to replace lost investment capital from labor income—becomes increasingly significant. These changing priorities have important implications for asset allocation, as we will discuss in more detail later.

New retirees have no future labor income, but if they've planned well, they have significant assets. Their problem is that their assets may have to last as long as 25 years, possibly more, particularly in a joint account. The American man who makes it to 65 has a 50% chance of living beyond 85 and a 25% chance of living past 90. Women are even longer-lived. And for couples who live to 65, there's a 50% chance that one or both will live beyond 92 and a 25% chance that one or both will live beyond 97 (*Display 6*).

Assuming a retiree will need approximately 75% of his or her ending salary to live comfortably, as many financial advisors recommend, our hypothetical participant with an $85,000 ending salary will need $63,750 in pre-tax income to live comfortably. While retirement assets of $500,000 may look substantial, it won't even provide a decade of retirement income if it doesn't continue to grow in excess of inflation.[23]

Most investors think it is safer to limit equity exposure, but that view is shortsighted. As we've discussed, savings shortfall risk is the greatest risk in the savings phase. At retirement, constructing a suitable personal portfolio requires a delicate balancing act among three kinds of risk:

- *Market risk*, the risk of adverse market movements;

- *Longevity risk*, the risk of being blessed with a long life and possibly outliving one's savings; and

- *Inflation risk*, the risk that inflation can eat away at the purchasing power of accumulated savings, possibly very rapidly.

Indeed, an excessive focus on market risk can significantly increase longevity risk and inflation risk. For example, while a retiree may achieve a reduction in market risk by choosing to reduce equity exposure in favor of cash investments, the retiree (perhaps unwittingly) creates substantially more longevity and inflation risk (*Display 7*).

Display 6
Retirees Are Likely to Live Well Past 85

Likely Life Span

Data for couples show likely life span for at least one member of the couple.
Source: 2000 Annuity Table

Display 7
The Risk Trade-Offs in the Retirement-Savings Problem

Type of Risk	"Safer" Assets	"Riskier" Assets
Market	Cash	Equities
Savings Shortfall	Equities	Cash
Longevity	Equities	Cash
Inflation	Equities, Inflation-Protected Securities	Cash, Regular Bonds

Source: AllianceBernstein

[23] *Other income sources such as personal savings and Social Security may also help to fund spending needs, although it is quite likely that future Social Security benefits will be deferred or trimmed, and personal savings rates have been steadily declining. In any case, it is clear that long-lived participants will not be able to maintain their standard of living with such modest savings.*

These trade-offs require careful analysis in retirement because the proper balance changes as a function of the amount of remaining capital, withdrawal rate and time. Consider the case of a recently retired, wealthy individual who has accumulated $5,000,000 and now needs to withdraw $100,000 per year to support her lifestyle. Since her required withdrawal rate is just 2% of her capital, she can replenish her capital each year by earning an investment return of only 2% above inflation, which could probably be achieved by just investing in inflation-protected securities. This wealthy individual is largely immunized from each of the three risks, since her spending needs are a relatively small percent of the initial retirement capital she has amassed.

The best way for a participant to reduce market, longevity and inflation risk in retirement is to take full advantage of his or her company's savings plan and invest wisely *before* retiring. Of course, most participants in defined-contribution plans won't accumulate $5 million by retirement. Suppose instead that a retiree accumulates a still sizable $1,000,000 and intends to withdraw $63,750 per year. One cannot expect with certainty that investment returns will generate enough to replenish this 6.4% real annual withdrawal rate. Therefore, this retiree very likely will experience a reduction in savings, or *dissavings*, as time passes, perhaps even to depletion. In this case, the specters of all three risks—market, longevity and inflation—appear and must be thoughtfully managed.

Because we can expect dissavings in retirement for most participants, the investment choice near the beginning of retirement is critical. At that point, the retiree is most vulnerable to *inflation risk*, since inflation would have its greatest impact on spending power when the accumulated savings is at or near its peak. The new retiree is also most vulnerable to *longevity risk*, since that is when the potential spending horizon is longest. While a new retiree cannot afford to take as much market risk as a participant in the savings phase, the new retiree is still likely to have the luxury of a long time horizon and enough savings to recover from short-term market downturns, so market risk is not paramount.

Thus, the asset allocation for new retirees should seek a degree of capital protection, but must also be able to provide high enough investment returns to help offset both inflation and withdrawals that might be needed over a very long retirement period.

Display 8
Life Expectancy Extends as You Age

Single Life Expectancy
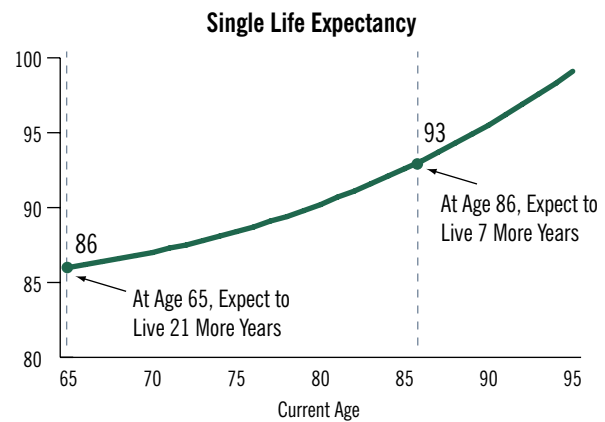
Source: Internal Revenue Service 2005, Publication 590

Senior retirees are *realizing* longevity risk, yet remain quite exposed to it. Life expectancy is an increasing function of age: When someone is 65, he might be expected to live another 21 years on average, but if he *does* live another 21 years, he can be expected to live even longer. As *Display 8* shows, even after 21 years of spending, an 86-year-old is expected to need enough savings to support another seven years of spending.

But as a retiree continues to age, the investment time horizon shortens, so market risk becomes the dominant risk factor. Because senior retirees are likely to have depleted a significant portion of their assets, incremental return is not nearly as attractive for them as for a new retiree: Compounding off a much smaller asset base is likely to provide only a small fraction of a year's withdrawal amount. Simply put, this incremental benefit is not likely to be worth taking the risk of a market downturn that could further deplete remaining savings.

Nonetheless, a real positive return is required to offset inflation. While senior retirees don't have to make their assets last for as many years, their key objectives are to ensure that they don't deplete their assets before dying and to preserve their real spending power. While longevity risk remains, it is less significant; managing inflation risk and market risk have become the key objectives. Thus, senior retirees should seek the highest real rates of return commensurate with only a small risk of capital loss.

WHY STRONG RETURNS MATTER MOST IN MIDLIFE AND EARLY RETIREMENT

In investment problems that deal with cash flows, it is essential to consider their likely nature and sequence. In target-date retirement fund design, midlife savers will typically have far more assets than young savers, and new retirees will have more than senior retirees. Thus, it is critical to recognize that investment returns matter most in midlife and early retirement.

The performance of investment managers is typically measured by using *time-weighted* returns, which seek to eliminate the effects of cash flows in order to compare investment managers fairly. In the calculation of time-weighted returns, the order in which the periodic—say yearly—returns occur is irrelevant: The compound return is the same regardless of the sequence of returns. A portfolio that is up 6% in the first year and up 8% in the second would have the same time-weighted performance as a portfolio that gains 8% in the first year and then 6% in the second.

But in investment problems dealing with saving or spending, the order of returns is highly relevant. As the term implies, *dollar-weighted* return calculations give more weight to the returns in periods with higher initial dollar amounts. While time-weighted returns are important for manager performance compari-

sons, investors *experience* dollar-weighted returns. Strong returns are more important to individuals after they have accumulated significant amounts of savings—and before they have spent a large part of their savings. Let's look at two examples that illustrate this phenomenon.

The Impact of the Sequence of Returns In the Saving Years

First, let's consider an individual who contributes $5,000 into a plan at the beginning of each year from age 25 through age 64 (and assume a zero inflation rate for simplicity's sake). Suppose that an 8% investment return is achieved each year for the first decade, from ages 25 through 34. Then in the next decade, a 7% return is achieved each year, followed by a 6% return and then a 5% return each year in each of the subsequent two decades. We'll refer to this as Scenario 1.

Now suppose that in Scenario 2 the returns occur in exactly the opposite order, with a 5% return achieved each year for the first decade, and then a 6%, 7% and 8% return in each year of the next three decades, respectively. Would there be any difference in accumulated savings at retirement between Scenario 1 and Scenario 2? Which is more desirable?

Display 9

Higher Returns Matter More in Later Periods of Saving

| Age Range | Yearly Cash Inflow ($) | Scenario 1: Higher Returns Occur First | | Scenario 2: Higher Returns Occur Last | |
		Beginning Savings ($)	Time-Weighted Annual Return (%)	Beginning Savings ($)	Time-Weighted Annual Return (%)
25–34	5,000	5,000	8	5,000	5
35–44	5,000	83,000	7	71,000	6
45–54	5,000	233,000	6	193,000	7
55–64	5,000	483,000	5	449,000	8
At 65		**844,000**	**6.5**	**1,037,000**	**6.5**

All amounts are in present-day dollars.
Source: AllianceBernstein

Display 9 illustrates that the sequence of returns makes a large difference when there are cash inflows: Scenario 2 ends up with $1,037,000, about 23% more savings than the $844,000 accumulated in Scenario 1. Although the time-weighted returns were the same in both scenarios, Scenario 2 delivered higher savings.

The Impact of the Sequence of Returns In the Spending Years

Now, let's consider a simplified version of retirement spending, in which a new retiree with $1,000,000 decides to withdraw $50,000 at the end of each year to support her needs. Suppose that a 5% investment return is achieved each year for the first decade, from ages 65 through 74. Then in the next decade, a 4% return is achieved each year, followed by 3% in the third decade until the retiree is 95. We'll refer to this as Scenario 3.

Now suppose that in Scenario 4 the returns occur in exactly the opposite order, with a 3% return achieved each year for the first decade, and then a 4% and 5% return in each year of the next two decades, respectively. Again, both scenarios have the same time-weighted return. Which is more desirable?

Display 10 illustrates that the sequence of returns makes a large difference when there are cash outflows, too. In Scenario 3, the 5% yearly return is sufficient to offset the headwind of withdrawals in the first decade, since a 5% return on initial capital of $1,000,000 produces $50,000, exactly the amount that the retiree is withdrawing. Scenario 4 is producing too little return to completely offset these withdrawals and, therefore, the capital declines. The high returns are achieved only when a significant portion of savings has already been depleted, and thus are less beneficial.

In the retirement-savings investment problem, we expect cash inflows during the saving phase, so investment returns in the later years of savings play a much larger role in final accumulated retirement savings than returns in the earlier years do. Similarly, we expect cash outflows during the spending phase, so investment decisions at the onset of retirement are likely to play a much greater role in how long retirement savings will last than at any other point later. (For most individuals, retirement savings are likely to reach their peak at the time of retirement.) A well-designed target-date retirement fund must continue to seek attractive returns through the later stages of the saving phase and through the early retirement years. ∎

Display 10
Higher Returns Matter More in Earlier Periods of Spending, Too

Age Range	Yearly Cash Outflow ($)	Scenario 3: Higher Returns Occur First		Scenario 4: Higher Returns Occur Last	
		Beginning Savings ($)	Time-Weighted Annual Return (%)	Beginning Savings ($)	Time-Weighted Annual Return (%)
65–74	(50,000)	1,000,000	5	1,000,000	3
75–84	(50,000)	1,000,000	4	771,000	4
85–94	(50,000)	880,000	3	541,000	5
At 95		**609,000**	**4**	**252,000**	**4**

All amounts are in present-day dollars.
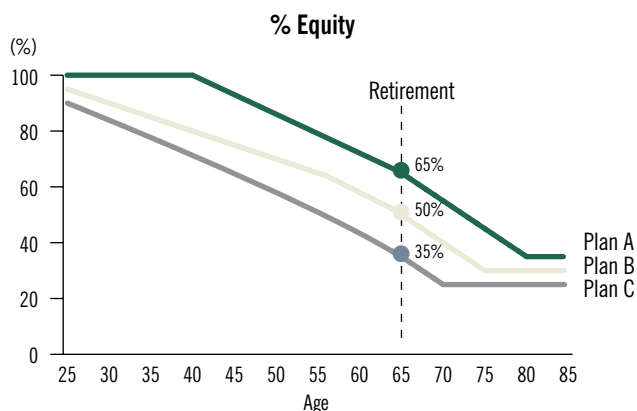Source: AllianceBernstein

EQUITY GLIDE PATH DESIGN

Among the greatest distinguishing characteristics of competing target-date retirement funds is the total equity exposure over time, known as the *equity glide path*. As the number of available target-date retirement funds has grown, popular financial magazines and newspapers have increasingly distilled the differences among competing funds down to the equity exposure at retirement. While we agree that the equity allocation is a primary driver of return, total equity exposure can be a misleading gauge of risk.

To assess the risk and return characteristics of various equity glide paths—at least in hindsight—we investigated how three simple equity glide paths would have performed historically. For this exercise, equities include only US stocks, while US bonds make up the rest of the asset allocation (see *Notes on Historical Data Preparation* on page 19). The three glide paths, Plans A, B and C, are depicted in *Display 11* in terms of their target equity allocation for a participant from age 25 to 85. Later we will consider more realistic and complex asset allocations.

The glide paths for Plans B and C resemble the typical glide paths used in many target-date retirement fund offerings, which allocate a high percentage of equities to a young saver and decrease the allocation fairly steadily until age 65, when the equity allocation typically ranges from 35% to 50%. Most glide paths retain the same equity allocation after age 65 or perhaps age 70. Our research suggests that the glide path depicted in Plan A would serve participants much better.

Display 11
Equity Glide Paths in Simple US Stock/US Bond Portfolios

Source: AllianceBernstein

Of course, Plan A appears to be the highest risk alternative. All of the assets are allocated to equities for the first 15 years. At age 40, the equity allocation begins to diminish; it hits 65% by retirement at age 65 and 35% by age 80, when it levels off. Plan B appears to be the middle-risk alternative. The equity allocation starts at 95%, then falls to 75% by age 45, to 50% by age 65 and to 30% by age 75, when it levels off. Finally, Plan C appears to be the most conservative. The equity allocation starts at 90%, then falls to 65% by age 45, to 35% by age 65 and to 25% by age 70, when it levels off.

Most readers are probably comfortable with the above characterizations of the risk levels of the three equity glide paths. After all, higher equity exposure is riskier, right? Not necessarily. The answer hinges on your definition of risk, often characterized in investment management as the probability of loss, usually over the near term. But as we discussed in the previous section, the greatest risks a participant faces are not having enough savings at retirement and not generating sufficient returns in retirement to help offset inflation and longevity risk.

We will show that, historically, Plan A would indeed have been the riskiest of the three plans when measured over *short time periods*, but the least risky over *longer time periods*. By definition, retirement saving is all about a *very* long investment period—perhaps 40 or 50 years or even more. Our analysis of the target-date retirement funds currently on the market found that most appear to be focused on minimizing short-term volatility. This focus, presumably adopted to serve the best interests of investors, in fact is likely to come at the cost of an unacceptably large reduction in potential long-term savings.

We think a more accurate way to characterize these three funds is that Plan A seeks the most appreciation, Plan C is very conservative, and Plan B is in between them. (These characterizations also have the advantage of providing a simple mnemonic device for recalling which plan is which—A is for appreciation, C is for conservative, and B is for in-between).

In the remainder of this section, we quantify the cost to long-term savings of higher allocations to bonds by looking at the results of our three simple US stock/US bond glide paths, based on historical data. Later in this paper, we use more sophisticated techniques to investigate the return and risk characteristics of more realistic glide paths.

Historical Glide Path Performance in the Savings Phase

We first analyzed how much savings a young saver might have accumulated historically over 20 years from age 25 to 44. Since results are highly sensitive to the initial and ending years of study, we looked at all possible 20-year periods from 1926 through 2004. The first of these 60 different periods began in 1926 and ended in 1945, the second period began in 1927 and ended in 1946, and so forth through the most recent period, 1985 to 2004.

For each 20-year period, we assumed that the participant made contributions according to the schedule shown in Display 2 on page 11 and invested in a stock/bond mix in each year as prescribed in Plan A. For each period, we calculated the ending savings amount and adjusted the ending amount for the 20 years of inflation in that period, in order to express the savings in present-day dollars. We repeated the exercise for Plans B and C.

For all plans, we assumed that the participant achieved index returns in both the stock and bond portions of the portfolio. We assumed annual rebalancing, and no management fees, no transaction costs and no incremental return (positive or negative) from active management.

Display 12 plots the ending dollar amounts (in present-day dollar terms) in each of the strategies using so-called box-and-whisker charts. The diamond in the middle of each box represents the median ending dollar amount of the 60 rolling 20-year periods. The top and bottom of the rectangular boxes represent the 75th and 25th percentile results, respectively. The topmost and bottommost points of the perpendicular "whiskers" represent the results at the 95th and 5th percentile, respectively. Lower percentiles always represent poorer performance.

Display 12
Range of Performance for a Young Saver in Simple US Stock/US Bond Allocations, Using Historical Data
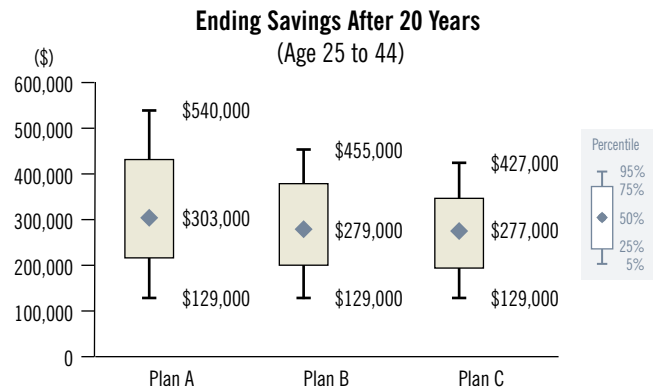
Starting with $0, based on all 20-year investment periods from 1926 to 2004; all amounts are in present-day dollars. See Notes on Historical Data Preparation below.
Source: CRSP, Ibbotson and Sinquefield, Lehman Brothers, Standard & Poor's, US Bureau of Labor Statistics and AllianceBernstein

During the youthful saving years, from age 25 through 44, the total real contributions into each plan (the cost basis) reaches $133,180. In the median case, investment returns more than doubled the assets for all three plans, but Plan A ended up well ahead, with just over $303,000 compared to Plan B's $279,000 and Plan C's $277,000.

In the 5th percentile of time periods, all three plans ended with slight losses: Each plan was down to about $129,000. At the 95th percentile of time periods, their results diverged widely: Plan A ended up with nearly $540,000, Plan B with $455,000 and Plan C with $427,000.

The asymmetry of results is remarkable. While the median outcome of choosing Plan A vs. Plan C was that an investor ended up about $26,000 ahead, in equal probability cases—the 5th and 95th percentiles—an investor in Plan A was either equal to an investor in Plan C or nearly $113,000 ahead!

Notes on Historical Data Preparation

Unless otherwise noted, returns of US stocks are represented by the S&P 500 stock returns from 1926 to 2004. Returns of US bonds are represented by US long-term government bonds from 1926 to 1974; the Lehman Government/Corporate Index in 1975 and the Lehman Aggregate Bond Index from 1976 to 2004. Cash returns are represented by 30-day T-bills from 1926 to 2004.
Source: Center for Research in Security Prices (CRSP), Roger G. Ibbotson and Rex A. Sinquefield, "Stocks, Bonds, Bills, and Inflation: Year-by-Year Historical Returns," *University of Chicago Press Journal of Business* (January 1976), Lehman Brothers, Standard & Poor's, US Bureau of Labor Statistics and AllianceBernstein

The asymmetry was even more striking for midlife savers. Recall that midlife savers have a sweet spot for building retirement savings because their savings can compound off a much higher base, yet they have enough time to recover from market downturns. Our historical analysis strongly reinforces this observation.

Let's suppose a 45-year-old was able to start with $225,000 in accumulated assets (we'll start the participant at the same amount regardless of the investment glide path chosen in the young-saver period). This appears to be reasonable if a participant had saved and invested well, based on what one might have achieved historically, although it may seem like a lot compared to surveys showing average

THE BELOW-AVERAGE SAVINGS OF THE AVERAGE DC PLAN PARTICIPANT

Given the fact that average defined-contribution plan balances for all plan participants are only about $70,000,[24] our assumption of a 45-year-old with $225,000 of plan savings may seem unrealistic. We don't think it is.

First, plan sponsors are in the midst of an ongoing transition from viewing defined-contribution plans primarily as a supplementary compensation tool used to attract and retain employees to viewing them as the primary retirement-savings vehicle for their employees. Given the extensive efforts employers are now making to educate their employees on the need to participate and to contribute, as well as the growing use of automatic enrollment, we expect contribution levels to increase substantially in coming years.

Our figure also reflects the assumption that the participant stayed with an investment plan (an extremely simple but disciplined combination of US stocks and US bonds). In fact, even if the participant had made only 75% of the contributions in each period in Display 2 and had chosen Plan C (the worst-performing of our three simple glide paths) from 1985 to 2004, he would have ended up with nearly $208,000—more than double the average account balance for a long-tenured worker in his 40s.

While plan sponsors continue to offer participants a broad array of investment choices—the average num-

ber in 2004 increased to 18.6 from 16.7 in 2003[25]—the wider menu doesn't necessarily help participants. Indeed, more choices may actually have an adverse effect. It requires educating employees on each of the investment choices and on how to properly allocate their funds between the choices—and that's only the beginning. Getting them to stay with a long-term plan may be an even greater challenge: Strong biases can cause the best-intentioned participant to make such poor choices as chasing after the latest hot fund or failing to rebalance away from a strongly outperforming asset class (such as growth stocks in 2000, bonds in 2002, and value stocks and REITs today).

The introduction of target-date retirement funds into plans is an important step in helping participants avoid these strong biases. A well-considered asset-allocation strategy puts a participant on the right track, systematic rebalancing keeps him on track, and the multi-asset-class structure helps prevent participants from obsessing about the outperformance or underperformance of an individual asset class in the fund.

In sum, we think our assumption of $225,000 in accumulated savings for a 45-year-old is quite reasonable: Increased participant contributions, increased and improved educational efforts by employers, and increased use of target-date retirement funds (preferably as the default investment option) should help to erase the current shortfall in average plan savings. ∎

[24] *According to* Perspective Vol. 2/No. 10 *by the Investment Company Institute, the average participant account balance over all surveyed plans was about $52,000 while the average balance for a consistent group of participants tracked over a five-year period was about $77,000 in 2003.*

[25] 2004 DC Survey *by* PLANSPONSOR *magazine.*

Display 13
**Range of Performance for a Midlife Saver
in Simple US Stock/US Bond Allocations, Using Historical Data**

Ending Savings After 20 Years
(Age 45 to 65)
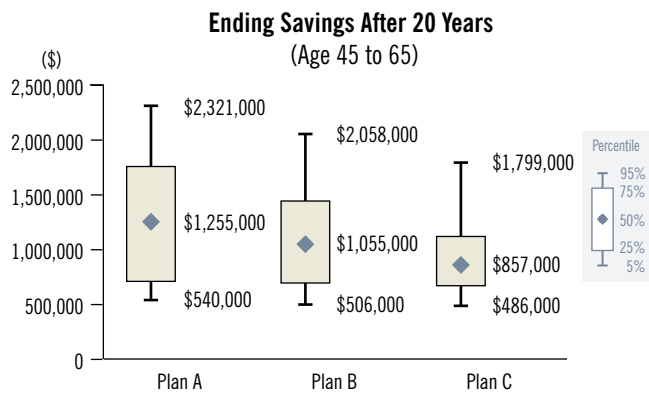
Starting with $225,000, based on all 20-year investment periods from 1926 to 2004;
all amounts are in present-day dollars. See Notes on Historical Data Preparation
on page 19.
Source: CRSP, Ibbotson and Sinquefield, Lehman Brothers, Standard & Poor's,
US Bureau of Labor Statistics and AllianceBernstein

participant savings in DC plans. (For an explanation of
why average participant savings are so low, see *The Below-
Average Savings of the Average DC Plan Participant* on
page 20.) As long as we assume that the midlife saver has
a higher amount of starting capital than a young saver, the
effect of dollar-weighted returns can be seen.

Display 13 shows the results for our 45-year-old saver, who
started with $225,000, continued to make contributions
according to Display 2, invested for 20 years in each of Plan
A, B or C, and earned US stock and US bond index returns.

The median result for the participant in Plan A was
$1.26 million, compared to about $1.06 million in Plan
B and just $857,000 in Plan C. Note that *even at the 5th
percentile*, the ending dollar amount is actually highest
in Plan A, with $54,000 *more* than Plan C. At the 95th
percentile, investors in Plan A would have accumu-
lated some $552,000 more than those invested in Plan
C. That is, given historical returns, Plan A would have
offered a win-win situation versus Plans B and C in
the midlife saving phase when participants are able to
compound wealth from a higher initial asset base.

Of course, Plan A's superior savings accumulation under
median, near-worst and near-best market conditions
did not occur without short-term market downturns.
We'll return to that topic shortly. Let's first continue our
historical analysis for all three simple plans.

Historical Glide Path Performance in the Retirement Phase

Since our midlife saver entered retirement with between
$857,000 and $1.26 million in the median case (depending
on which of the three plans she chose), let's suppose that
she enters retirement with $1 million of savings and needs
to spend 63,750 real dollars per year to support her needs
(75% of her ending salary of $85,000). Now, there are two
key questions: How long would her money have lasted
under each plan, and how much savings would she have
remaining after spending for a given number of years?

We began our analysis by determining whether her mon-
ey would have provided for at least 15 years of spending,
assuming that she had invested alternatively in Plan A, B
or C. We then repeated the analysis to see if her money
would have lasted for at least 20 years, then at least 25
years and, finally, at least 30 years.

As before, in order to reduce start- and end-point sensitiv-
ity, we analyzed all rolling historical periods. For example,
in investigating whether her money would have lasted at
least 15 years, we first assumed that she retired in 1926
and calculated whether her savings would have provided
spending through 1940 and, if so, how much was remain-
ing (in real-dollar terms). We then repeated the analysis
for the period of 1927 to 1941 and so on through 1990 to
2004. We aggregated the results for each of our three plans
over all historical periods and then calculated the percent
of periods in which her money would have lasted 15 years,
as well as summary statistics on the amount of savings
remaining. *Display 14* shows the percent of periods that the
savings lasted over each spending horizon in each plan.

Display 14
Success Rates for New Retirees

**% of Historical Periods that Spending Needs
Were Met Under Various Spending Horizons**

Spending Horizon	Plan A	Plan B	Plan C
15 Years	91	88	86
20 Years	70	62	50
25 Years	47	36	20
30 Years	32	14	8

Starting with $1 million and assuming $63,750 annual real spending, based on all
investment periods from 1926 to 2004; all amounts are in present-day dollars. See
Notes on Historical Data Preparation on page 19.
Source: CRSP, Ibbotson and Sinquefield, Lehman Brothers, Standard & Poor's,
US Bureau of Labor Statistics and AllianceBernstein

It is immediately apparent that despite entering retirement with $1 million in accumulated savings—which most people would agree is a fairly good-sized nest-egg—the success rate of the plans is high only for the 15-year spending horizon. The success rates all fall off sharply beyond 15 years, with Plan C falling precipitously in longer horizons. Even with only a 20-year investment horizon (the average expected life span of a 65-year-old man), money invested in Plan C lasted for 20 years in just 50% of the historical periods. If our participant were blessed with long life, living to be 95, Plan C would have successfully provided the spending needs in just 8% of the historical periods. While Plan B had the greatest success rate in the 15-year horizon, Plan A turned in the best performance at all other horizons.

Another way to compare the plans is to return to our box-and-whisker charts. *Display 15* shows the ending real-dollar value at the 95th, 75th, 50th, 25th and 5th percentiles for each plan after 15, 20, 25 and 30 years.

In the 15- and 20-year spending horizons, all three plans experienced historical periods in which the savings would have compounded to well above the initial amount of $1,000,000, evidenced by the 95th percentile results.[26] This isn't too surprising: Spending $63,750 on a base of $1,000,000 corresponds to an initial 6.4% withdrawal rate, so as long as a portfolio achieves real rates of return above 6.4%, the portfolio will grow. There have been many years in which our three glide paths could have achieved such returns.

The enormous difference in median ending dollar values of the three plans at the 15-year horizon is striking: Appreciation-oriented Plan A still had $658,000 remaining in the median case. Conservative Plan C had $356,000, or 46% less than Plan A. Plan B once again was in between, with only $470,000.

The asymmetry of results after 15 years between the near-worst and near-best cases is also striking. In the 5th percentile case, all three plans ran out of money. In the

Display 15
Range of Performance for a New Retiree in Simple US Stock/US Bond Allocations, Using Historical Data

Ending Savings After Various Periods of Spending
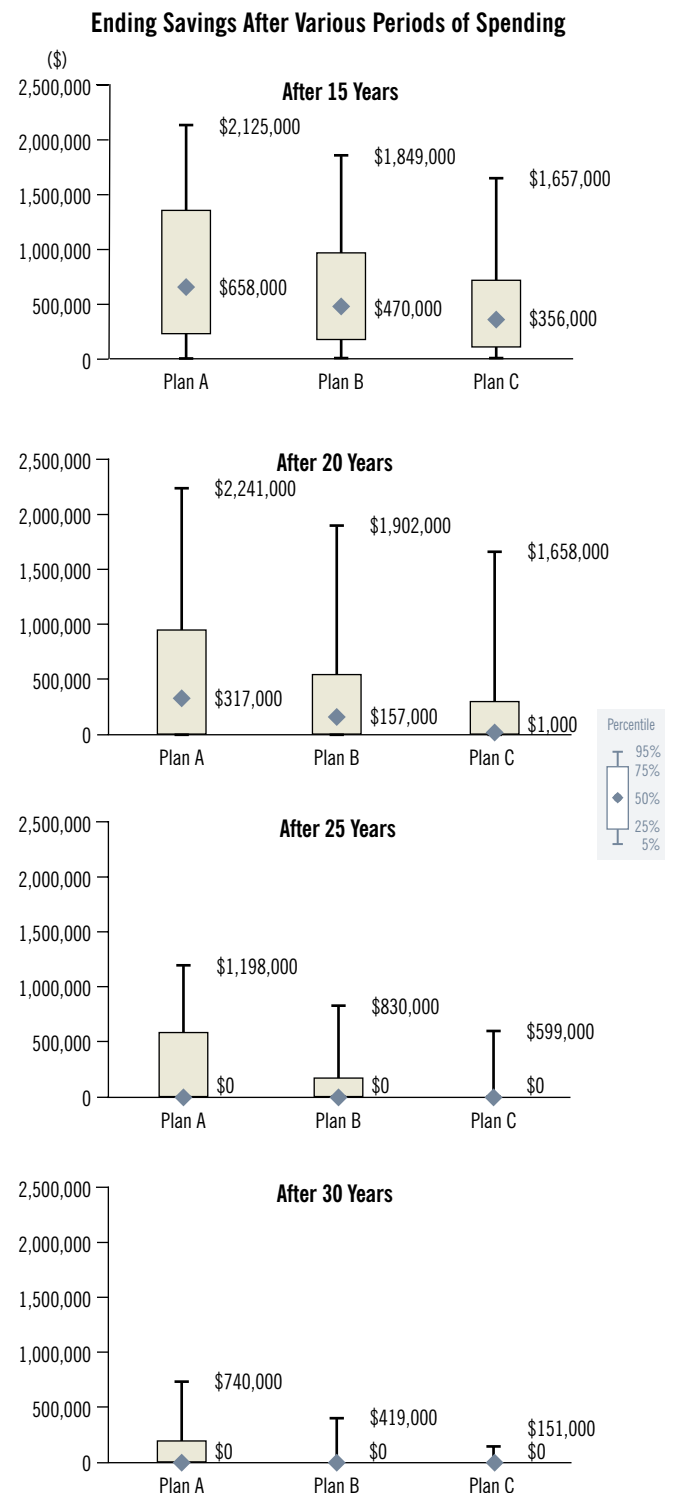
Starting with $1 million, based on all 20-year investment periods from 1926 to 2004; all amounts are in present-day dollars. See Notes on Historical Data Preparation on page 19.
Source: CRSP, Ibbotson and Sinquefield, Lehman Brothers, Standard & Poor's, US Bureau of Labor Statistics and AllianceBernstein

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[26] *Tax law requires that individuals withdraw a minimum amount from their retirement accounts each year. We do not model these required minimum distributions, which are often not triggered when there is a pattern of dissaving. In scenarios with large savings amounts, however, distributions would likely be required, which would accelerate taxation and decrease the final savings relative to what we depict in some scenarios.*

95th percentile case, Plan A had more than $2 million, outpacing Plan B by $276,000 and outpacing Plan C by $468,000. In both the 25th and 75th percentile cases, Plan A also handily outperformed.

Perhaps the most telling pattern of all is revealed by observing how each plan's box-and-whisker changes over time from the 15-year spending horizon to 20, then 25 and finally 30 years. The change can be quite dramatic over just five years: Once the spending horizon reaches 25 years, *all* plans ran out of money in the median case. In fact, Plan C provided enough in only about the best 20% of historical 25-year periods, whereas Plan B provided enough in about the best 36% and Plan A in the best 47%.

Similarly, over the 30-year spending horizon, Plan C nearly ran out of money even at the 95th percentile. Plan B fared better, while Plan A provided for spending in over 34% of all historical 30-year periods. And in the very good periods (at the 95th percentile), Plan A still had over $740,000 remaining.

When the spending rate is so large that it precludes guaranteed replenishment of the portfolio's capital base through investment returns, participants risk running out of money. The best one can hope for is to prolong the savings as long as possible. This gets to the heart of longevity risk and why apparently less risky plans with lower equity exposure can produce surprisingly bad results for participants.

Historical Short-Term Risk Assessment

But what about the short-term losses that a participant would have experienced along the way with Plan A? Could the participant have stomached it?

For young savers, invested initially almost entirely in equities under all three plans, there were periods of significant loss. We first measured how often a loss occurred, expressed as the percentage of years with a negative nominal[27] return in each 20-year period. The average frequency of loss over all rolling 20-year periods is shown in the first column of *Display 16*.

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[27] *Although we express all dollar amounts in real inflation-adjusted terms in our displays to gauge investment performance, we express return losses in nominal terms, since nominal performance is what an investor relates to and experiences emotionally.*

Display 16

Historical Risk Characteristics for a Young Saver Over 20 Years of Saving (Age 25–44)

	Frequency of Loss (%)	Median Worst-Year Return (%)	5th Percentile Worst-Year Return (%)
Plan A	26.3	(25.4)	(43.3)
Plan B	24.9	(19.5)	(40.3)
Plan C	23.4	(16.6)	(38.1)

See Notes on Historical Data Preparation on page 19.
Source: CRSP, Ibbotson and Sinquefield, Lehman Brothers, Standard & Poor's, US Bureau of Labor Statistics and AllianceBernstein

We also measured the worst annual return in each 20-year period as a measure of the magnitude of downside risk. The median case over all 20-year periods was a loss of (25.4)% for Plan A, versus (19.5)% for Plan B and (16.6)% for Plan C. We further calculated the 5th percentile of the worst annual returns over all 20-year periods to help gauge the worst yearly returns in bad bear markets and found losses of (43.3)%, (40.3)% and (38.1)% in Plans A, B and C, respectively.

Because all three plans have reasonably high equity exposures, particularly in a participant's 20s and early 30s, downside risk is a very real possibility in all of the plans. In our opinion, individuals who see their accumulated assets fall 38% in a year are probably just as likely to become very upset—and perhaps want to withdraw their funds—as individuals who see their accumulated assets fall 43%.

Display 17 shows the same risk characteristics for midlife savers. While the overall pattern is similar, the spreads in the frequency and the 5th percentile worst years of loss between A and C are wider than for young savers.

Display 17

Historical Risk Characteristics for a Midlife Saver Over 20 Years of Saving (Age 45–64)

	Frequency of Loss (%)	Median Worst-Year Return (%)	5th Percentile Worst-Year Return (%)
Plan A	23.6	(16.8)	(39.1)
Plan B	21.8	(12.2)	(32.7)
Plan C	19.8	(7.6)	(28.3)

See Notes on Historical Data Preparation on page 19.
Source: CRSP, Ibbotson and Sinquefield, Lehman Brothers, Standard & Poor's, US Bureau of Labor Statistics and AllianceBernstein

For the midlife saver, who has a lower equity exposure under all three plans, the periods of very poor capital-market performance were also painful, but less so in percentage terms. Frequency of loss was 23.6% for Plan A, 21.8% for Plan B and 19.8% for Plan C. The median worst-year return was (16.8)% in Plan A, (12.2)% in Plan B and (7.6)% in Plan C. In the 5th percentile case, the worst year ranged from (39.1)% in Plan A to (28.3)% in Plan C. Clearly, midlife savers in Plan C appear to have had less cause to question their investment strategy, since they experienced less frequent and smaller short-term losses than their colleagues in Plan A. Yet *there was not a single 20-year historical period in which Plan C would have outperformed Plan A.*

And what about short-term losses in the retirement years? Retirees are right to be more concerned with loss of capital than young or midlife savers, since retirees cannot replace lost capital with additional labor income (or are unlikely to relish being forced to do so!).

The spread in downside risk measures between the alternative plans is smaller in the retirement years than in the midlife years (*Display 18*). Frequency of loss in the 20-year spending period, for example, was 20.4%, 19.3% and 17.6% for Plans A, B and C, respectively. The median worst-year loss was (6.7)%, (6.1)% and (5.9)%. In the majority of cases historically, there was little difference between downside risk measures. In the worst 5th percentile, however, the risk differential was more significant: Plan A suffered a (27.8)% loss, Plan B a (22.1)% loss and Plan C a (16.4)% loss. These levels of loss are likely all too high for a retiree (particularly Plan A).

In all life stages, Plan A was the most likely to make investors *be* more secure, but it wouldn't necessarily have always made them *feel* more secure. There is clearly a gap between what would have been the correct decisions by participants (patiently invest in Plan A) and how they might have behaved (fleeing the markets when faced with a short-term loss).

Fortunately, there are two ways to help bridge this gap: effective portfolio diversification—employing a much

Display 18
Historical Risk Characteristics for a New Retiree Over 20 Years of Spending (Age 65–84)

	Frequency of Loss (%)	Median Worst-Year Return (%)	5th Percentile Worst-Year Return (%)
Plan A	20.4	(6.7)	(27.8)
Plan B	19.3	(6.1)	(22.1)
Plan C	17.6	(5.9)	(16.4)

See Notes on Historical Data Preparation on page 19.
Source: CRSP, Ibbotson and Sinquefield, Lehman Brothers, Standard & Poor's, US Bureau of Labor Statistics and AllianceBernstein

broader array of asset classes than just US stocks and bonds—and effective communications. We will discuss diversification in the next section of this report, and communications later on.

Equity Glide Path Design: Conclusions and Observations

Our analysis of the investment results of three equity glide paths using annual US stock and US bond data from 1926 to 2004 shows that in the overwhelming number of cases, investors would have been significantly more financially secure by following Plan A. The conservatism of Plans B and C incurred enormous opportunity costs, particularly for midlife savers. The heavier emphasis on bonds in retirement of Plans B and C decreased growth potential so much that retirees would likely have run out of money far too soon—even if they weren't particularly long-lived.

On short-term risk measures, however, Plan A was riskier than Plan B, which in turn was riskier than Plan C. We showed that in the working years, the difference in short-term performance would probably not have resulted in different participant reactions: Since all three plans have relatively high equity allocations, bad bear markets punished all portfolios with large double-digit losses. For midlife savers, spreads were wider since the plans are more differentiated. For retirees, spreads again were more modest, but spreads at the 5th percentile were larger, and overall levels were probably too high for retirees to stomach.

ASSET-CLASS SELECTION

In our review of existing target-date retirement funds, we found an array of asset mixes of widely varying quality. At worst, some appear to have been designed by a marketing department cobbling together its favorite funds. Others appear to have employed traditional asset-allocation techniques, such as mean-variance optimization, to help guide their asset allocation.

Yet even theoretically sound portfolio-optimization techniques, such as mean-variance optimization, can be misapplied to investment problems, producing questionable recommendations.

Avoiding the Lure of Myopic Portfolio Construction

In the classic mean-variance optimization approach (which appears in almost every portfolio-management textbook), estimates of expected return and covariance for a set of candidate asset classes, and possibly constraints, are fed into an optimizer, which then produces a target asset allocation that maximizes the expected return per unit of expected risk. This approach has considerable merit and can provide valuable insight, particularly when applied to short-horizon investment problems by those who are skilled in their expected return and covariance forecasts. It can also be egregiously misapplied, however, in the development of target-date retirement funds.

For example, the asset allocation for a "2045 Fund," for those who intend to retire in the year 2045, might be constructed by first (somehow) determining the correct target risk level for a 25-year-old and the appropriate set of candidate asset classes. Then, you would feed the optimizer forecasts of expected returns and covariances, and it would produce a recommended asset allocation for the "2045 Fund." The process could be repeated for the "2040 Fund," and so on, to construct the full array of target-date retirement funds and infer the overall equity glide path.

The problem with this approach is twofold. First, classic mean-variance optimization is well known to be highly sensitive to the return and covariance assumptions; even very small differences in the assumptions can lead to dramatically different allocations. Second, classic mean-variance optimization is a one-period, or "myopic," technique. A growing body of academic literature[28] shows that myopic techniques produce spurious results when applied to problems which, by nature, involve longer investment horizons and temporally sequenced events such as cash flows.

We can illustrate a particularly severe problem that could result from misapplying these classic techniques—a problem that manifests itself in many of the target-date retirement funds that we reviewed. Consider the problem of developing a suitable asset allocation for a 65-year-old. Applying the classic mean-variance approach and setting the target risk relatively low, an optimizer typically recommends an allocation to cash, due to its highly efficient, one-period return and risk profile. Cash probably *is* the safest investment over very short investment periods, so it's not surprising an optimizer would recommend it: After all, the optimizer is only myopically considering a one-period investment horizon. Yet in longer investment horizons, cash is well known to be a weak asset class. Traditional defined-benefit plans rarely have explicit allocations to cash (and often equitize any incidental cash by purchasing index futures) for a very good reason: The opportunity cost of holding cash is just too high. (To see how high, see *Cash: The Most Expensive Insurance Policy a Participant Can Buy* on page 26.)

Our firm investigated target-date retirement fund design through the lens of mean-variance optimization, as well as other techniques, as we shall discuss in later sections of this report. We firmly believe, however, that to construct effective portfolios for plan participants, it is critical to identify the *role* that each asset class can play throughout a participant's life, both on its own and in conjunction with other asset classes, and to apply well-considered and sensible time-tested investment strategies to ensure that the components are assembled together appropriately. In the remainder of this section, we survey the roles of various asset classes. In the next section, we discuss the effective assembly of these components.

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[28] *See, for example,* Strategic Asset Allocation: Portfolio Choice for Long-Term Investors *by J. Campbell and L. Viceira, Oxford University Press (2002).*

CASH: THE MOST EXPENSIVE INSURANCE POLICY A PARTICIPANT CAN BUY

Cash instruments such as US Treasury bills are often viewed as the closest proxy to a risk-free rate, since bills tend to have little variation in value over short horizons and are issued and backed by the full faith and credit of the US government. When viewed in terms of nominal return, cash is an extremely efficient asset class, with a high ratio of return per unit of volatility.

Thus, cash often receives a dedicated allocation in multi-asset-class funds designed to appeal to investors with lower risk appetites: Adding a slice of cash can help reduce a portfolio's expected volatility. The majority of target-date retirement funds have allocations to cash, some of them very large, as participants move into their retirement years. Some funds have sizable allocations to cash even before the participant retires.

If the investor has a multiyear investment horizon—perhaps 20 years or more—an allocation to cash can be very costly. First, while inflation risk is generally quite tame over short time frames, the possibility of encountering a spike in inflation increases as the investment horizon increases. When inflation does outpace cash, a cash investment loses purchasing power. Second, using cash to mute volatility decreases the magnitude of both negative and positive returns, so a cash investment will likely incur a hefty opportunity cost.

To investigate the trade-off between risk reduction and opportunity cost from an explicit allocation to cash, we looked at the historical risk and return profile of a portfolio with a fixed 60/40 allocation to US stocks and bonds, and how it would have changed if 5% had been allocated to cash (and the stock/bond allocation adjusted to 57/38). What about a 10% allocation to cash? A 15% allocation and so forth? Since the intended purpose of a cash allocation is to help prevent portfolio losses in market downturns, we looked at risk in terms
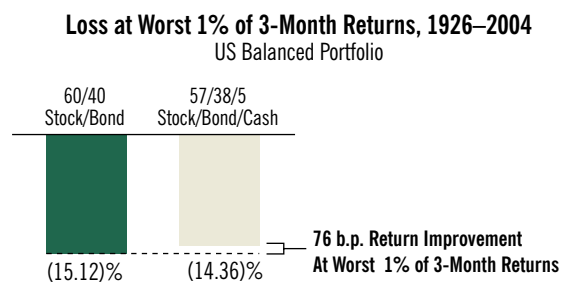
of the worst three-month periods the portfolio would have encountered with and without the cash allocation.

We performed our analysis using monthly total returns from 1926 to 2004 (see *Notes on Historical Data Preparation* on page 19). We found that the annualized nominal return for the 60/40 stock/bond portfolio was about 8.83%.[29] The return for the 57/38/5 portfolio was about 8.61%, or 22 basis points less. To measure risk, we looked at the loss in the worst 1% of all rolling three-month periods. The 60/40 portfolio lost (15.12)%, while the 57/38/5 portfolio lost (14.36)%, an improvement of just 76 basis points (*Display 19*).[30]

In other words, a 5% cash allocation historically had the effect of reducing annualized return by (0.22)% a year, and this (0.22)% essentially bought an investor an insurance policy that offered some short-term downside risk protection: Instead of losing (15.12)% in a very bad three-month period, the investor lost (14.36)%. Was it worth it? In 99% of the cases, the difference in worst three-month returns was even smaller. In our opinion, the incremental short-term safety has little merit: An investor losing (14.36)% in a bad bear market isn't going to be much happier than one who loses (15.12)%.

While the incremental risk protection is modest, the opportunity cost can be high when compounded over time. Let's quantify the insurance premium paid by holding a 5% cash position over a 20-year investment

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Display 19

Risk-Reduction Benefit of 5% Cash Allocation Is Small

Loss at Worst 1% of 3-Month Returns, 1926–2004
US Balanced Portfolio

60/40
Stock/Bond

57/38/5
Stock/Bond/Cash

76 b.p. Return Improvement
At Worst 1% of 3-Month Returns

(15.12)%   (14.36)%

See Notes on Historical Data Preparation on page 19.
Source: CRSP, Ibbotson and Sinquefield, Lehman Brothers, Standard & Poor's, US Bureau of Labor Statistics and AllianceBernstein

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[29] *Our analysis assumed monthly rebalancing back to target with no transaction costs. Inflation over the period was 3.04%.*

[30] *We use nominal returns to express short-term risk measures since investors typically don't factor in inflation when reacting to short-term losses. If measured using inflation-adjusted returns, the incremental risk reduction is even less appealing.*

horizon. Starting with $1,000,000, a 60/40 stock/bond portfolio compounding at 8.83% per year would grow to about $2,984,000 (adjusted for 20 years of inflation at 3.04% per year). A 57/38/5 portfolio compounding at 8.61% per year for 20 years would grow to about $2,866,000. The cost of the 5% cash allocation "insurance premium" is *$118,000!* That's an awful lot to pay to avoid a modest incremental loss at the 1st percentile.

Some funds have a much higher allocation to cash, so we thought we'd see how expensive some of those insurance policies could be. The horizontal axis of *Display 20* represents a range of cash allocations. The 0% cash allocation represents our 60/40 stock/bond portfolio, the 10% cash allocation point represents the 54/36/10 portfolio, and so forth. The left vertical axis represents the opportunity cost of holding a given amount of cash, using the methodology above. The right vertical axis represents the loss reduction at the 1st percentile over all three-month rolling periods from 1926 to 2004.

For example, an investor with $1,000,000 invested in a stock/bond portfolio with a 10% cash allocation would give up $229,000 to reduce the worst 1% of rolling three-month losses from (15.1)% to (13.6)%, an improvement of about 1.5 percentage points. An investor with a 20% cash allocation paid nearly half a million dollars in order to reduce the 1st percentile loss from (15.1)% to (12.1)%, or just three percentage points!

We've expressed the opportunity cost of an allocation to cash in terms of protection against the *magnitude* of loss. What about its *frequency*? Perhaps the opportunity cost could be justified if the cash allocation provided significantly fewer incidences of loss. We found that adding cash doesn't help reduce the frequency of loss much, either (*Display 21*). A 60/40 US stock/bond portfolio incurred a nominal loss in 29.9% of the rolling three-month periods from 1926 to 2004. The same portfolio with a 5% cash allocation incurred a loss in 29.3% of all the periods—a virtually unnoticeable improvement. In fact, investors probably wouldn't have felt a risk-reduction benefit even with a 40% cash allocation (a loss in 26.0% of the periods)! A really significant benefit wasn't achieved

Display 20
Using Cash to Decrease Magnitude of Worst Losses Is Costly

US Balanced Portfolios
1926–2004
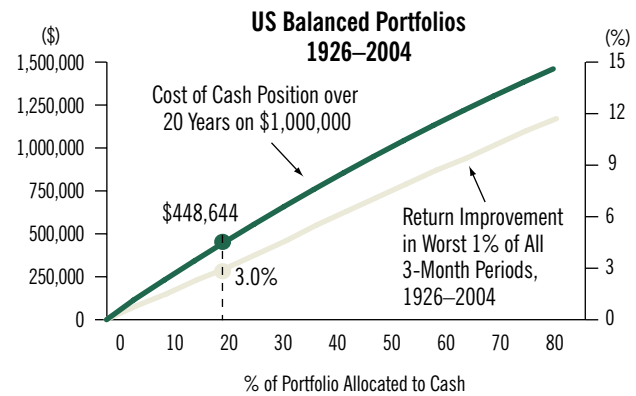
60/40 stock/bond portfolios with varying amounts redistributed to cash; all amounts are in present-day dollars.
See Notes on Historical Data Preparation on page 19.
Source: CRSP, Ibbotson and Sinquefield, Lehman Brothers, Standard & Poor's, US Bureau of Labor Statistics and AllianceBernstein

Display 21
It Takes a Lot of Cash to Reduce Frequency of Losses
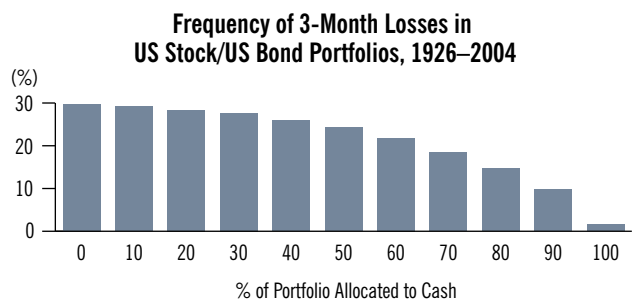
Frequency of 3-Month Losses in
US Stock/US Bond Portfolios, 1926–2004

See Notes on Historical Data Preparation on page 19.
Source: CRSP, Ibbotson and Sinquefield, Lehman Brothers, Standard & Poor's, US Bureau of Labor Statistics and AllianceBernstein

until about a 60% cash allocation, which dropped the frequency of loss to 21.9%. Unfortunately, the "insurance premium" on a 60% cash allocation over 20 years amounted to $1,217,000!

In sum, only a cash allocation that is very large—and thus prohibitively expensive in terms of opportunity cost—would have provided a recognizable reduction in the magnitude and frequency of short-term losses. Since the future life span of a retiree investing in a target-date retirement fund is highly likely to be more than a few years, a well-designed fund should not needlessly squander participant return by investing in cash. ∎

Surveying the Components of a Well-Designed Fund

Equities: The Engine for Growth

Equities, we have demonstrated, are the engine for real portfolio growth: Their far superior returns over nearly seven decades of historical data (see Display 5 on page 13) made them among the safest investments in terms of savings shortfall, longevity and inflation risks, despite their considerable market risk (see Display 7 on page 14).

Many investors now question, however, whether we can reasonably expect their returns to remain strong. After all, consensus expectations for the coming years call for equity performance to be more modest than the average returns over the past several decades. The same concern also applies to bonds, however, now that long-term interest rates are near their 40-year low.

The key issue is whether one believes, as we do, that equities can be expected to command a long-term risk premium over bonds. Even an assumption of an equity risk premium that is modest relative to historical levels would compound over time to add dramatically to savings: For example, the difference between an annualized return of 7% in stocks and 5% in bonds translates into 46% more accumulated savings in stocks over 20 years. In our opinion, significant exposure to equities is a key component in providing a successful retirement solution for plan participants.

We have so far discussed exposure only to US large-cap equities, as represented by the S&P 500. It is important, however, to consider other segments of stocks: US small- and mid-cap equities and non-US equities.

US small- and mid-cap equity (SMID) returns have had a fairly high correlation to US large-cap returns over long time periods, and their extra volatility has largely erased long-term diversification benefits. Nonetheless, SMID exposure offers two key advantages. First, over relatively short periods, the two market segments can perform quite differently (particularly near the peaks and troughs of economic cycles). Exposure to SMID equities can thus smooth returns over these periods and help investors feel more secure by giving them exposure to the segment that happens to be in favor at the moment. Second, the higher volatility and relative

Display 22

Leadership Rotates Between US and Non-US Equities

	Annualized Return (%)				
	1970–79	**1980–89**	**1990–99**	**2000–04**	**1970–2004**
S&P 500	5.9	17.6	**18.2**	(2.3)	**11.3**
MSCI EAFE	**8.8**	**22.0**	7.0	**(1.1)**	10.4

Source: Morgan Stanley Capital International (MSCI), Standard & Poor's and AllianceBernstein

inefficiencies in the SMID segment provide ripe opportunities for skilled active managers to add excess returns over the benchmark. (Obviously, the second point is only a consideration for target-date retirement funds that are actively managed.)

Non-US equity exposure has historically helped increase portfolio efficiency because of the relatively low correlation of these returns to US equity returns. The performance of non-US equities has alternated leadership with US equities (*Display 22*). While non-US stocks, measured by the unhedged MSCI EAFE Index, outperformed the S&P 500 Index by nearly 4% per year in the 1970s and 1980s, US stocks turned in a whopping 11% annualized outperformance in the 1990s. Non-US stocks have again gained the upper hand so far in this decade, but still modestly lag US stocks over the full 35-year period.

If US stocks have outperformed over the long run, and if an investor has a long investment horizon and believes that US stocks will continue to outperform, why bother at all with non-US stocks?

First, about 50% of the world's investable equity market capitalization is found outside the US.[31] In fact, certain industries are dominated by foreign firms: 60% of the market capitalization of the oil and gas industry, 72% of the commercial-banking industry, and 82% of the automotive industry. Not investing outside the US means missing the opportunity to invest in some of the best companies in the world. Furthermore, by restricting investment to US equities, a portfolio takes a (perhaps unintentional) bet that the US economy will indefinitely outperform all others.

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[31] *Measured by the MSCI All Country World Index as of December 31, 2004.*

Second, when someone buys a foreign stock, they also buy the foreign currency. The currency exposure that comes with foreign equity investment provides diversification since currency movements have a low correlation to both stocks and bonds. Furthermore, investment managers with currency expertise can add extra value by managing a portfolio's currency exposure.

Third, widening the international equities universe to include emerging markets, such as China, can provide attractive return potential, diversification benefits and opportunity to produce incremental returns through active management (given the relative inefficiencies inherent in emerging markets). Over the three years ending 2004, for example, the MSCI Emerging Markets (EM) Index outpaced the S&P 500 by over 19% *per year*. From its inception in 1988 through 2004, the EM Index has achieved 13.2% annualized returns, outpacing the S&P 500's 12.4% return in the same period.

Finally, although US stocks have achieved better returns over the full 35-year period, an investor could have attained the same 11.3% annualized return with less volatility by holding 30% of the portfolio in non-US stocks. Historically, a 30% to 50% allocation to non-US equities has minimized portfolio volatility, leaving participants with less reason to question their investment strategies in reaction to short-term losses (*Display 23*).

Display 23
Substantial Foreign Exposure Is Needed to Reduce Volatility

Annualized Volatility
1970–2004

(%)
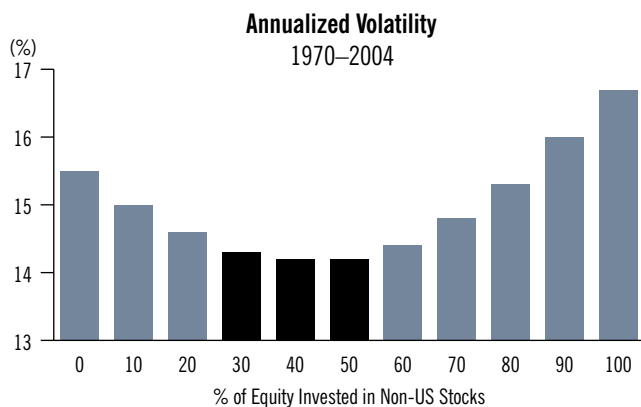
US stocks are represented by the S&P 500, non-US stocks by MSCI EAFE. The chart presents various combinations of the US and foreign stock components, rebalanced monthly. Volatility is defined as the annualized standard deviation of monthly portfolio returns.
Source: MSCI, Standard & Poor's and AllianceBernstein

For all these reasons, our firm typically recommends that clients in the US allocate at least 30% of their total equity exposure to non-US equities. Our recommended foreign exposure can sometimes be substantially higher, depending on the circumstances and objectives of a particular client.

Separate growth and value allocations are also important elements of the asset allocation for active managers. Our research and experience over many years have led us to conclude that controversy, misunderstanding and emotion in the marketplace can create disconnects between the current price of a security and its intrinsic value, providing significant opportunity for both growth and value managers to add excess return.

While we will discuss in greater detail later why we think active management of target-date retirement funds is important to maximizing the chances of long-term success, a key point from an asset-allocation perspective is that the premiums generated by growth and value managers tend to have low correlations to each other. As a result, combining the stock picks of a skilled growth manager and a skilled value manager allows one to preserve the premiums generated by the two managers, while drastically reducing tracking error (deviation of relative returns) to the benchmark over full market cycles (due to the low correlation of their premiums). The result is a much more consistent portfolio premium than either of the two component pieces.

We have found that an allocation between active growth and value managers that is near 50/50 provides alpha with the most consistency. (See *How to Live with Style— Investment Style, That Is* on page 30 for a summary of our firm's key findings on this topic.) Thus, for actively managed style strategies, we recommend an equal allocation to growth and value equities in all portfolios. In the context of target-date retirement funds, we recommend an equal allocation to growth and value styles within both the US large-cap and SMID-cap equity allocations and within the non-US-equities allocation.

HOW TO LIVE WITH STYLE—INVESTMENT STYLE, THAT IS

Investors across the globe acknowledge the valuable role that style decisions can play in enhancing portfolio returns and diversifying risk, but how to make the most of style opportunities remains controversial.

A previous AllianceBernstein study examined these issues.[32] It first looked at the common view that portfolios should favor a strategic tilt toward value because value indices have historically outperformed growth indices. From inception through 2003, the Russell 1000 Value Index outperformed the Russell 1000 Growth Index by 2.0% per year and the S&P/Barra Value Index outperformed the S&P/Barra Growth Index by 2.1%.

Why? The classic style indices are constructed on the basis of systematic rules that favor value. For example, the classic S&P/Barra style indices rank all the stocks in the index by price to book. The stocks with lower price-to-book ratios that account for half of the S&P 500's market capitalization are defined as "value"; the remainder, with higher price-to-book ratios, is defined as "growth." In this context, growth is characterized as "not value," or expensive.
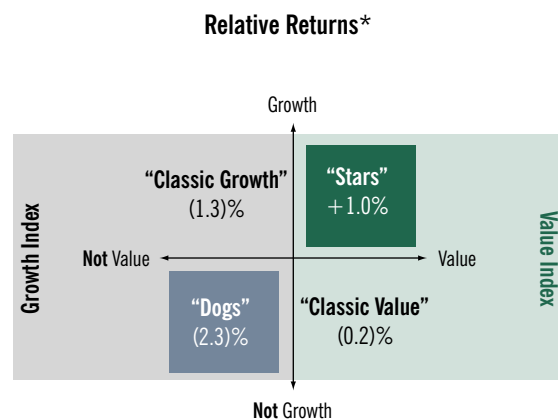
[32] Managing Style from the Bottom Up, S. Masters, A. Chin and C. Nikolich, 2004, AllianceBernstein
[33] Some style indices have considerably more involved construction rules and strive to better distinguish growth stocks from expensive stocks. Yet these methods rely on backward-looking earnings or consensus earnings estimates, neither of which has demonstrated any particular predictive power. The key bias is that the cheap stocks reside in the value index, and stocks that will truly continue to grow in the near term are difficult to identify without extensive forward-looking research efforts.

But not all stocks fit the mold: About one-sixth of the market is composed of expensive, low-growth stocks (which we call the "dogs"); these reside in the growth index despite their low growth. Another one-sixth of the market is made up of stocks that are both attractively priced and offer healthy earnings growth (the "stars"); these stocks—despite their strong earnings growth—are placed in the value index (*Display 24*). This helps explain why value indices systematically beat growth indices. The value indices get both classic value stocks (cheap stocks that are not growing) plus the stars; the growth indices get classic growth stocks and are saddled with the dogs because they aren't cheap.[33] Over time, this gives the value indices a performance edge.

Display 24
Classic Style Indices Systematically Favor Value over Growth

Relative Returns*

	Growth	
"Classic Growth" (1.3)%		"Stars" +1.0%
Not Value ← → Value		
"Dogs" (2.3)%		"Classic Value" (0.2)%
	Not Growth	

Growth Index / Value Index

*Relative to Citigroup US Broad Market Index 1989–2003
Source: Citigroup and AllianceBernstein

Bonds: The Stabilizers

If equities command a risk premium over bonds, why bother with bonds at all? In general, the role of bonds in the retirement-strategy problem is to complement equities by acting as a stabilizer: Bonds provide diversification that mutes the market risk from equities. That is, they provide portfolio stability needed to reduce the chances that a short-term loss might reduce savings to an unacceptable degree, possibly causing the investor to make a bad, emotion-driven investment decision.

As a participant goes from being a young saver to a midlife saver (and throughout retirement), the need to protect against loss of capital grows; this suggests that the allocation to bonds should gradually increase. We think the bond strategy deployed should offer not only strong and immediate diversification, but also good return potential. A core bond portfolio invested across sectors (benchmarked to the Lehman Aggregate Bond index, for example) serves this purpose well—and a modest allocation to international bonds can help provide further stability while diversifying interest-rate risk.[34]

But active managers generally don't define their opportunity set based on style indices. Growth managers generally try to identify companies that are expanding sales or earnings rapidly and should continue to do so. As a result, active growth managers may find investment ideas outside their classic style index: Growth managers tend to hold stars and not dogs, which helps them generate better returns over time than growth indices. Accordingly, from 1981 (as far back as we have data) to 2003, the 2.9% annual outperformance the Russell 1000 Value Index achieved over the 1000 Growth Index faded in the active management realm: Active value managers outperformed active growth managers by just 0.3%.

Active value and growth managers also outperform the broad market with about the same frequency. Between 1981 and 2003, the median value manager outperformed the market in 52% of the rolling three-year periods, and the median growth manager outperformed 53% of the time.

Most importantly, both styles offer the opportunity to gain a premium over time, and they do so at different times: The premiums of active value and growth have a median correlation of (0.21). The result of this negative correlation is that the median 50/50 combination of active value and growth outperformed the market in 57% of the rolling three-year periods between 1981 and 2003—more than

either style alone. The combination provides equal exposure to opportunities in both domains while also offsetting the risks of either style on a stand-alone basis, thereby increasing consistency.

Perhaps surprisingly, a 50/50 asset mix of growth and value styles does not always produce a combined portfolio that is style neutral. Because style-pure active value and growth managers are continually responding to separate opportunity sets that become more or less attractive as market conditions change, their independent stock selection will yield varying degrees of style risk at different times. The style risk of the combination will vary accordingly.

Thus, equal allocations—in terms of dollar amounts—to growth and value portfolios may not produce a style that is completely style neutral: The style risk of the overall combined portfolio will reflect how much risk the managers of the underlying growth and value portfolios take in response to the opportunities they perceive. If the growth manager sees massive opportunities but the value manager sees limited opportunities, the combined portfolio will tilt to growth. If the value manager sees massive opportunities but the growth manager doesn't, the combined portfolio will tilt to value. Thus, a 50/50 style blend can harness the return potential of shifting style cycles from the bottom up. ∎

Three other bond components are also important: short-duration bonds, inflation-protected securities and high-yield bonds. We discuss the first two here, and the last in the next section.

Short-duration bonds, despite their lower expected returns, play an important role in effectively muting the market risk of a portfolio. As we discussed in *A Life-Stage*

Model for Plan Participants on page 11, as retirees continue to spend and move toward being senior retirees, market risk becomes increasingly important versus longevity risk; therefore, the portfolio needs an increasing degree of stability.

As discussed above, cash is a safe investment over short time horizons, because it poses little risk of capital losses due to adverse market movements. However, cash can be a very risky investment over longer time horizons, because it provides too little return to sufficiently

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[34] *We recommend that an allocation to international bonds be hedged in order to retain the benefit of interest-rate diversification without taking on additional currency risk.*

protect against longevity risk and inflation risk. In the retirement-strategy problem, the investment horizon is unknown (because you don't know how long the retiree will live), but it is likely to be fairly long: Even senior retirees may live for another 15 to 20 years. The highest-quality short-duration bonds (those with a one- to three-year maturity, for example) are a superior investment alternative to cash: They offer similar risk reduction benefits with significantly higher return potential.

Inflation-protected securities[35] (IPS) are becoming more widely accepted as the best protection against inflation risk: They protect purchasing power over long time horizons because their return is directly linked to inflation.[36] In our view, IPS are an essential component of a target-date retirement fund and should be used to provide an inflation hedge when an investor is spending from accumulated savings or expects to do so in the near future. In other words, young savers should not hold IPS, since IPS don't offer sufficient return potential. In a young saver's portfolio, the best way to outpace inflation is to harness the growth potential of equities.

As a participant approaches retirement—most likely between 60 and 65 years old—the need for inflation protection approaches its highest level, since the participant is likely to have the greatest amount of savings at risk to inflation (unless the portfolio continues to outpace inflation and withdrawals, in which case the retiree will have even more savings at risk to inflation).

IPS are not a complete replacement for regular bonds, however, since in a deflationary environment IPS sacrifice return (the inflation-protection insurance premium is built into the price of IPS) with no realized benefit. IPS should be used in conjunction with regular bonds; their share of the total bond allocation should be highest at the life stage when a portfolio is most exposed to inflation risk. That is likely to be in the last years of saving, near the inception of spending.

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[35] *We prefer to use the more general term "IPS" to "TIPS" (short for Treasury Inflation Protected Securities), which is commonly used in the US. We think an inflation-protected portfolio can benefit from a range of inflation-linked instruments beyond US TIPS, including non-US issues and other inflation-linked taxable bonds.*
[36] *The inflation protection is only as good as the method used to measure inflation, of course, and no metric captures all types of inflation. US CPI, however, captures most of the types of inflation a retiree might care about.*

Display 25
REITs Have Been Very Attractive Investments (1976–2004)

	Performance		Correlation		
	Annualized Return (%)	Annualized Volatility (%)	REITs	S&P 500	Bonds
NAREIT	16.1	13.0	1.00	0.50	0.20
S&P 500	13.0	15.1	0.50	1.00	0.25
Lehman Aggregate	9.0	6.0	0.20	0.25	1.00

Volatility and correlation values are based on monthly total returns; NAREIT inception was 1976.
Source: Lehman Brothers, National Association of Real Estate Investment Trusts (NAREIT), Standard & Poor's and AllianceBernstein

Other Asset Classes

Real Estate Investment Trusts (REITs) can be viewed as debt-equity hybrid instruments, since they possess both stocklike and bondlike characteristics.[37] The (limited) historical performance of REITs has been impressive, achieving annualized returns higher than equities with less volatility (*Display 25*). In addition, REITs offer attractive diversification opportunities through relatively low correlation to both stocks and bonds.

In the five-year period ending in 2004, REITs delivered a particularly strong performance, outperforming the S&P 500 by 180%. Thus, Display 25 exhibits a degree of end-point sensitivity; it may not be reasonable to expect such strong performance from the asset class over the long-term future (let alone the short term). Nonetheless, US REIT performance from 1976 to 1999 is also impressive, with a 14.9% annualized return and 13.7% volatility. REITs possess extremely attractive risk and return characteristics and, in our opinion, are an important component of a well-designed target-date retirement fund that should receive a significant allocation at *all* stages of life.

One concern about including REITs in our allocation is that many DC plan participants *already* have a large exposure to real estate through their home ownership; therefore, an additional allocation to REITs in

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[37] *REITs are traded on stock exchanges, and REIT operating companies are influenced by many of the same economic factors that affect the broad stock market. At the same time, REITs must distribute 90% of their taxable income as dividends to shareholders, and that income is primarily derived from a REIT's underlying property leases, which are influenced by many of the factors that affect the bond market.*

their investment portfolio might be extraneous. While we believe there's a sliver of truth in that concern, discussed later, personal homes are expenditures, typically requiring mortgage financing that incurs cash *outflows*, whereas REITs primarily invest in real estate to generate cash *inflows* from rental leases.[38]

Average home prices in the United States increased by an annualized nominal rate of 6.1% from 1976 to 2004[39] (*before* the deduction of mortgage-interest expense). That is, their returns have been far lower than the returns of stocks, bonds and REITs in the same time period. Furthermore, the "return" of an individual home due to price appreciation is not particularly related to the overall REIT market: The change in the value of a home in New York City has little to do with the income-generating potential of a shopping mall in Des Moines, for example.

Another possible concern is that the US real-estate market is currently frothy (and some geographic pockets may be experiencing a bubble); this may portend a prolonged stretch of poor future performance for REITs. But equities and bonds are also subject to investment performance extremes, as we have all been reminded in recent years. Short-term tactical outlooks should not play a role in the design of asset-allocation strategies that are meant to serve participants for decades.

A better solution to the risk that REITs may slump in the near term is to seek additional return and diversification by including non-US REITs in the REIT portfolio. In fact, some of the most attractive real-estate investment opportunities today can be found overseas. We recommend a global REIT portfolio because exposure to foreign REITs not only provides more return opportunity, but also helps smooth returns over real-estate cycles around the world: An office building in Paris has little to do with that shopping mall in Des Moines.

High-yield bonds, like REITs, have historically been diversifying to both stocks and investment-grade bonds, offering annualized return and volatility lower than stocks but higher than investment-grade bonds. When should high-yield bonds be used? For young savers, an allocation to high yield would come at the expense of equities and would likely sacrifice return unnecessarily. At the other end of the life-stage spectrum, senior retirees rely on bonds to provide solid portfolio stability; an allocation to high-yield bonds would incur undesirable risk. For midlife savers and new retirees, however, high-yield bonds can be quite attractive, and high yield serves as an important bridge asset class providing higher returns and lower risk during the transition from a portfolio primarily seeking high return to a portfolio primarily seeking stability. We, therefore, recommend making an initial high-yield allocation for midlife savers, increasing it toward retirement and then diminishing it as a retiree ages.

Alternative investments such as direct real-estate investment, private equities and hedge funds are theoretically attractive diversifiers and potential sources of extra return. We considered including these in our own target-date retirement fund offering. We concluded, however, that the gap between the theory and practice in these asset classes is too large. Our primary concerns are the relative illiquidity of these alternative investments, their higher costs and event risk, and their inability to cope efficiently with frequent cash flows from investors. Fund-of-fund structures help moderate some of these concerns, but their benefit is likely to be erased by the additional layer of fees. While our firm includes its own hedge funds in its recommended asset allocations for many of our private clients, these clients are wealthier, more sophisticated investors who are qualified to understand the additional risks—and we give them very detailed explanations to help them gauge their comfort with such investments.

In sum, we do not think it's prudent to include these investments in a target-date retirement fund. Wealthy, sophisticated investors qualified to invest in them can independently pursue such investments.

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[38] *To qualify as a REIT, a company must distribute at least 90% of its taxable income to shareholders in the form of dividends. Since the majority of REIT dividends are taxed at the maximum ordinary income rate, REIT holdings are generally not attractive in taxable accounts, but are much more attractive in tax-qualified vehicles like 401(k) plans.*
[39] *Based on the Federal Home Loan Mortgage Corporation's Conventional Mortgage Home Price Index.*

EFFECTIVE DIVERSIFICATION

Armed with careful consideration of the typical circumstances and goals of plan participants, a historical perspective on the likely performance of three possible equity glide paths and an assessment of the qualities of a range of key asset classes, we're now ready to assemble the components to provide effective diversification.

Stabilizing the Portfolio in Retirement

Recall that in our earlier historical analysis of the three glide paths, the level of loss at the 5th percentile for retirees was likely too high in all of the plans. In our life-stage model, we noted that as a retiree moves toward being a senior retiree, the need for protection against market downturns increases. One clear improvement would be to incorporate an explicit allocation to short-duration bonds to provide the extra risk-reduction benefits. *Display 26* shows our original three glide paths, summarized in five-year increments, in which a portion of the bonds have been reallocated to short-duration bonds. We'll continue to refer to these three improved plans as Plans A, B and C.

We start by refining Plan A by switching a portion of the bond allocation to short-duration bonds just after retirement, when the bond allocation was at 35%; we increased the short-duration allocation each year through age 80. In Plans B and C, we also introduced short-duration bonds once the bond allocation reached 35%.

Plan A remains the allocation aiming for the highest appreciation, Plan C remains the most conservative, and Plan B remains in between. Thus, in line with Plan A having the highest (and Plan C the lowest) equity allocation in all life phases, Plan A's terminal allocation has a modestly larger allocation to intermediate bonds than short-duration bonds, Plan B's has an equal allocation of intermediate and short-duration bonds, and Plan C's has a slightly smaller allocation to intermediate bonds than short.

The glide paths for Plans A, B and C are shown in *Display 27*, with the green-shaded area representing the equity allocation, light blue representing intermediate-duration bonds and dark blue representing short-duration bonds.

As mentioned earlier, the vast majority of current offerings we surveyed have an equity glide path similar to Plan B or Plan C, with varying levels of diversification. We focus the remainder of this section on what we believe constitutes effective diversification of Plan A in order to improve short-term risk characteristics while retaining attractive return potential. We will refer to the fully diversified version of Plan A as Diversified Plan A. *Diversified Plan A is our recommended glide path and is used in the AllianceBernstein Retirement Strategies portfolios.*

Display 26
Improving Plans A, B and C with Allocations to Short-Duration Bonds

		Allocation by Participant Age (%)											
		25	30	35	40	45	50	55	60	65	70	75	80
Plan A	US Equity	100.0	100.0	100.0	100.0	93.0	86.0	79.0	72.0	65.0	55.0	45.0	35.0
	US Int. Bond	—	—	—	—	7.0	14.0	21.0	28.0	35.0	36.0	37.0	37.5
	US Short Bond	—	—	—	—	—	—	—	—	—	9.0	18.0	27.5
Plan B	US Equity	95.0	90.0	85.0	80.0	75.0	70.0	65.0	57.5	50.0	40.0	30.0	30.0
	US Int. Bond	5.0	10.0	15.0	20.0	25.0	30.0	35.0	35.0	35.0	35.0	35.0	35.0
	US Short Bond	—	—	—	—	—	—	—	7.5	15.0	25.0	35.0	35.0
Plan C	US Equity	90.0	83.7	77.5	71.3	65.0	57.5	50.0	42.5	35.0	25.0	25.0	25.0
	US Int. Bond	10.0	16.3	22.5	28.7	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
	US Short Bond	—	—	—	—	—	7.5	15.0	22.5	30.0	40.0	40.0	40.0

Source: AllianceBernstein

Display 27

Improving Plans A, B and C with Short-Duration Bonds

Plan A Glide Path

Plan B Glide Path

Plan C Glide Path
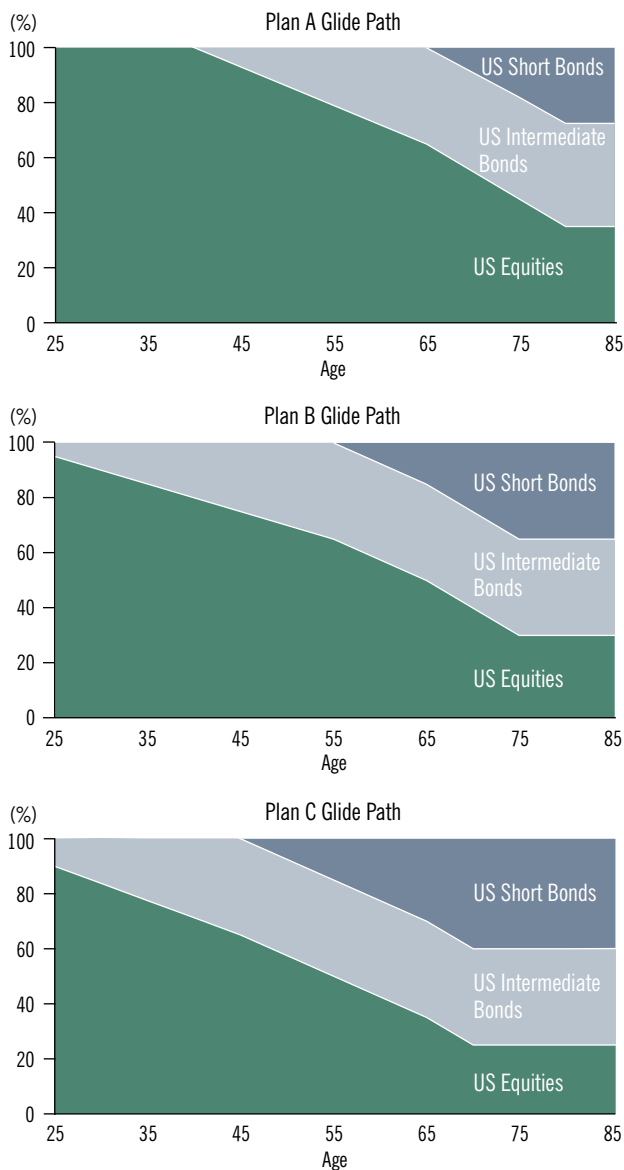
Source: AllianceBernstein

For completeness, we will also provide a Diversified Plan B and a Diversified Plan C, using the same diversification approach. Note, however, that we know of no existing funds with the structure of Diversified Plan B and Diversified Plan C. Indeed, the vast majority of target-date retirement funds available today are generally structured like Plan B or C in Display 27, or somewhere between those plans and their diversified versions.

A Fully Diversified Target-Date Retirement Fund

In order to effectively diversify Plan A, we employ the other important asset classes and allocation guidelines reviewed in the previous section. Recall that:

- The equity allocation should be diversified between US large-cap, US SMID-cap and non-US equities (including both developed and emerging markets), and all three categories should be equally allocated to growth and value equities.

- Inflation-protected securities should be combined with regular bonds to construct an inflation hedge in the late saving years and in retirement.

- REITs are attractive at all life stages; thus, they should receive a considerable allocation at all life stages.

- High-yield bonds serve as a bridge asset class and should be held from midlife through early retirement; they aren't appropriate for portfolios seeking the highest return or the most stability.

The detailed allocation for Diversified Plan A is shown in *Display 28* on page 36. While the allocations might look somewhat complicated, the derivation of the numbers is primarily the result of the application of simple rules, many of which we have already discussed.

At all participant ages, we divide the total equity allocation into US and non-US equities in a 70/30 proportion. For example, a 25-year-old has a 90% total allocation to equities, with a total US equity allocation of 63% (because 70% x 90% = 63%) and a non-US equity allocation of 27% (because 30% x 90% = 27%).

We further split the total US equity portion of the allocation into large-cap and SMID-cap equities in approximately an 80/20 proportion, largely in line with the market-cap weighting of those segments of the US equity market.[40]

We divide each equity segment—US large-cap, US SMID-cap and non-US equities—into separate value and growth portfolios in a 50/50 proportion, for reasons discussed in *How to Live with Style—Investment Style, That Is* on page 30.

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[40] *The 500 largest-cap stocks in the Russell 3000 Index account for about 80% of the index's market capitalization. For younger savers, we slightly overweight SMID because the extra return potential from alpha generation adequately compensates younger savers for taking on the modestly higher volatility associated with a higher SMID allocation. For senior retirees, we slightly underweight SMID, because senior retirees are primarily seeking safety.*

Display 28
Diversified Plan A: Asset Allocation by Participant Age

	Age											
	25	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65**	**70**	**75**	**80**
US Large-Cap Value	24.0	24.0	24.0	24.0	22.3	20.5	18.5	17.0	15.5	13.0	10.3	7.5
US Large-Cap Growth	24.0	24.0	24.0	24.0	22.3	20.5	18.5	17.0	15.5	13.0	10.3	7.5
US SMID Value	7.5	7.5	7.5	7.5	6.7	6.0	5.5	4.7	3.7	2.7	2.0	1.3
US SMID Growth	7.5	7.5	7.5	7.5	6.7	6.0	5.5	4.7	3.7	2.7	2.0	1.3
Non-US Value*	13.5	13.5	13.5	13.5	12.5	11.5	10.5	9.3	8.3	6.8	5.2	3.7
Non-US Growth*	13.5	13.5	13.5	13.5	12.5	11.5	10.5	9.3	8.3	6.8	5.2	3.7
REITs	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
High Yield	—	—	—	—	5.0	7.0	7.0	7.0	7.0	5.0	2.5	—
Core Bonds†	—	—	—	—	2.0	7.0	10.0	12.0	14.0	16.0	19.5	22.5
Inflation-Protected Securities	—	—	—	—	—	—	4.0	9.0	14.0	15.0	15.0	15.0
US Short-Duration Bonds	—	—	—	—	—	—	—	—	—	9.0	18.0	27.5
Total Equity and REITs	100.0	100.0	100.0	100.0	93.0	86.0	79.0	72.0	65.0	55.0	45.0	35.0
Total Fixed Income	—	—	—	—	7.0	14.0	21.0	28.0	35.0	45.0	55.0	65.0

* = 10% of both the non-US value and non-US growth equity allocation is invested in emerging markets.
† = 10% of the core bond allocation is invested in hedged international.
Source: AllianceBernstein

We maintain an allocation of 10% to REITs at all ages. US REITs have historically achieved returns comparable to equities but with lower risk. At the same time, they have had a low correlation to both stocks and bonds, offering attractive diversification that increases portfolio efficiency. Indeed, a classic mean-variance optimization, using return and covariance assumptions based on past performance, would produce an optimal portfolio that contains very little stock exposure, preferring a heavy allocation to REITs. If REITs are so attractive, why even allocate to stocks at all? Why not construct a 60/40 REIT/bond portfolio instead of a 60/40 stock/bond portfolio, for example?

First, although we think REITs will remain attractive over the long run, we don't expect REITs in the coming decades to match their performance through year-end 2004 (due to the end-point sensitivity of ending the measurement period after five years of nearly unprecedented returns, as discussed above).

Second, the REIT market is simply not large enough to justify such a large allocation: As of December 31, 2004, the US NAREIT index contained 193 REITs with a total market capitalization equal to about 2% of the combined total market capitalization for the US stock, bond and REIT markets.[41] A portfolio that eschews stocks and uses only REITs would have a large exposure to a relatively small market and, therefore, take on considerable concentration risk. Also, a systematic event that could devalue the entire REIT market, such as an adverse regulatory or tax ruling, is a possibility. We believe a 10% exposure to REIT can markedly enhance portfolio efficiency while staying within prudent risk levels.

Why not give younger savers, whose objective is to seek high return, a higher REIT allocation? After all, they can generally accept more concentration risk, given their ability to replace capital losses with future labor income. In this case, however, another factor comes into

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[41] *As of December 31, 2004, the total market capitalization of REITs in the US NAREIT Index was about $0.3 trillion, while the total capitalization of the Russell 3000 Index was about $10.1 trillion and the total capitalization of the Lehman Aggregate Bond Index was about $8.2 trillion.*

play: Although REIT returns are largely independent of changes in personal property values, the relationship can be more significant if the personal property is leveraged, as it usually is. Most young savers who own a home bought it by taking on a mortgage (perhaps a sizable one). Therefore, an event that delivers a negative impact on both the REIT market and personal property values could have a negative impact on the young worker's home value as well as any REIT investments.[42] While we might otherwise consider a slightly higher REIT allocation for younger savers, the issue of leverage in personal mortgages leads us to start with the same 10% allocation we deem prudent later. As time passes and a homeowner reduces leverage—perhaps paying off the home by retirement—no higher allocation is recommended since the concentration risk of an allocation larger than 10% is likely not appropriate for the now-older participant.
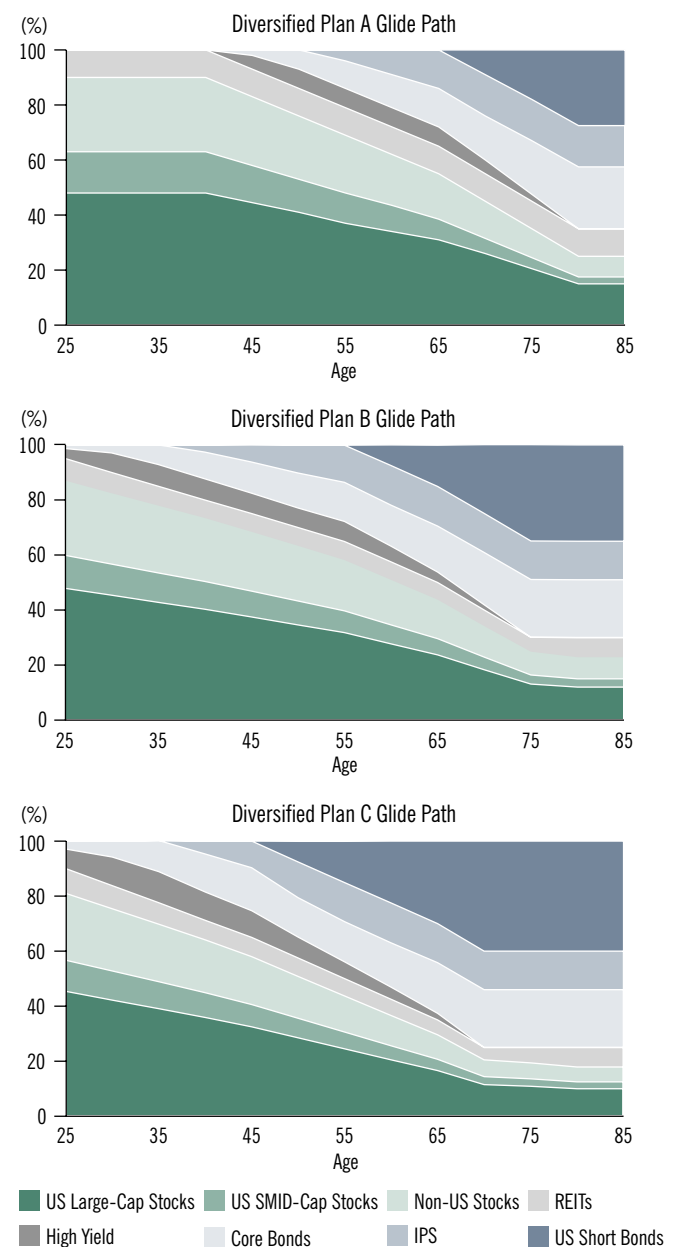
Now let's turn to the bond portion of the Diversified Plan A. As a participant transitions from being a young saver to a midlife saver, we introduce a bond allocation, since the need to preserve capital begins to compete with the need for portfolio growth. Following the guidelines presented in the previous section, high yield receives the largest, earliest allocation (serving as a bridge asset class), followed by a core portfolio of taxable bonds, inflation-protected securities as the spending phase approaches, and finally short duration as protection becomes paramount.

In Diversified Plans B and C, we set the allocation to each equity sub-asset class, as a proportion of total equity exposure (including REITs), to be the same as in Diversified Plan A. Since the bond sub-asset classes are introduced at different times in Diversified Plan A, we also introduce them at different times in B and C, but in the same proportion (including high yield) as in Plan A. (That is, the allocation schedule for B is stretched out in time a little more, and C's allocation is stretched even farther). Therefore, Diversified Plans B and C use the same diversification strategies as Diversified Plan A, but retain a more conservative overall equity posture in their glide paths.

[42] *It's possible that today's environment with (1) a surging popularity in highly leveraged mortgage products such as interest-only loans, (2) a sharp recent appreciation in REIT prices from strong capital inflows in a low-interest environment, further buoyed by increases in property values, and (3) the possibility of continued, perhaps rapid, increases to interest rates could create a scenario that concurrently creates losses in both a young saver's personal property value and REIT investments.*

Display 29

Improving Plans A, B and C with Broader Diversification

Diversified Plan A Glide Path

Diversified Plan B Glide Path

Diversified Plan C Glide Path

US Large-Cap Stocks | US SMID-Cap Stocks | Non-US Stocks | REITs
High Yield | Core Bonds | IPS | US Short Bonds

Source: AllianceBernstein

The glide paths of the three diversified plans are shown in *Display 29*. For clarity we do not break out value and growth equity allocations separately, but each equity component of each plan uses a 50/50 allocation between the two styles. By construction, the total equity and REIT exposure for each age in the diversified plans is the same as the total equity allocation in the simple plans, shown in Display 27. Diversified Plan A has a

100% total allocation to equities and REITs for a 25-year-old, whereas Diversified Plan B has a 95% allocation and Diversified Plan C has a 90% allocation. For a 45-year-old, the total equity and REIT allocation for the three diversified plans is 93%, 75% and 65%. And for a 65-year-old, the total equity and REIT allocation drops to 65% for Diversified Plan A, 50% for Diversified Plan B and 35% for Diversified Plan C.

We now have six candidate plans for further consideration. Plans A, B and C use a mix of US equities, US intermediate-term bonds and US short-duration bonds, with Plan B constructed to be more conservative than Plan A and Plan C to be more conservative than Plans A and B. Diversified Plans A, B and C have the same overall equity and bond allocations as Plans A, B and C, respectively, but the diversified versions employ a larger number of diversifying asset classes.

Diversified Plan A is our recommended glide path and is used in the AllianceBernstein Retirement Strategies portfolios. The vast majority of target-date retirement funds available today are generally structured like Plans B and C, or somewhere between those plans and their diversified versions. In the next section, we investigate the return and risk characteristics of each glide path.

STRESS TESTING THE DESIGN

In *Equity Glide Path Design* on page 18, we offered our insights into the performance implications of choosing different glide paths constructed from a straightforward combination of US stocks and US bonds, based on historical data. It would be useful to assess the historical performance of our diversified plans using historical data as well, but several important asset classes have relatively short histories: US inflation-protected securities were introduced in 1997, for example, and REITs and high-yield bonds have been around less than three decades. Lack of long historical data makes it impossible to gauge how our candidate glide paths would have performed historically.

But even if we had long histories of asset-class returns, we would have to be careful not to rely too heavily on past performance to predict future performance, for three reasons: Historical performance is sensitive to the time period chosen; market trends are unlikely to unfold in the future exactly as in the past; and future economic conditions may be quite different than past conditions. In our opinion, well-crafted investment strategies must not only *acknowledge* that future market movements are uncertain, they should *plan* for it.

Planning for Uncertainty

The approach of planning for uncertainty was embraced many years ago by our private-client practice, Bernstein Investment Research & Management. Its financial advisors help clients understand the *probabilities* of achieving their financial goals, given their often quite complex circumstances. Our view has been that good planning involves a complete assessment of the complex interactions between many interrelated factors over time: the market movements of many asset classes, inflation, client spending or saving, charitable donations, taxation, income-generation requirements, estate planning and so forth. The need to help clients understand the likelihood of achieving their goals in order to help them make sound decisions led to the creation of the Bernstein Wealth Forecasting Analysis (WFA) system.

We turned to the Bernstein WFA to help assess the expected ranges of future outcomes for a participant at each life stage using each of our glide paths.

Bernstein's WFA planning process is a multistep process:

- *Client-profile input:* We configure the WFA to understand client-specific information such as income, expenses, tax rate (if applicable), asset allocation and other life circumstances, as well as questions that the client would like guidance on, such as how long retirement savings are expected to last, given an assumed withdrawal rate.

- *Capital-market scenarios*: Our Monte Carlo model uses Bernstein's proprietary research and historical data to create a vast range of possible future market returns. (Not all Monte Carlo models are created equal. See *Monte Carlo Simulation: A Powerful Tool if Used Properly* on page 40.)

- *Resulting output:* A probability distribution of outcomes describes the likelihood that the specified goals will be achieved.

For our retirement-strategy analysis, we configured the system to understand our different glide paths and to answer our questions concerning retirement savings and spending. To analyze the efficacy of the different glide paths for a young saver, for example, we configured the WFA to understand that our client was a 25-year-old making contributions into a tax-exempt vehicle according to Display 2 on page 11. We asked the WFA to tell us the range of savings that the participant should expect by age 45 and by retirement, if consistently invested in each of the six candidate plans.

After configuring the client profile, we recorded the investment performance for each glide path in each of 10,000 possible future capital-market scenarios. The end result was a probability distribution of expected savings for each glide path. We then repeated the analysis for midlife savers and then again for retirees.

We analyzed the likely investment outcomes based on *asset-class returns*, not *product returns*. That is, we assessed our glide-path performance by assuming that the portfolios are not actively managed (and thus are not producing excess returns). We also assumed yearly rebalancing, no management fees and no transaction costs.

MONTE CARLO SIMULATION: A POWERFUL TOOL IF USED PROPERLY

Monte Carlo simulations are a useful approach to problems that are too difficult or impossible to solve analytically. A simulation represents, or models, some sort of a system. A Monte Carlo simulation uses random numbers to model the uncertain variables of the system, allowing a researcher to generate thousands of alternative scenarios and build a probability distribution describing the likelihood that a particular event might occur.

Monte Carlo simulation is not a new technique[43] and has widespread application today in fields such as nuclear physics, meteorology, biology and finance. The usefulness of Monte Carlo analysis can be seen by noting that a standard approach to retirement planning is to assume a rate of return (perhaps based on historical asset-class performance over a chosen period) and then apply an amortization algorithm found on handheld calculators to determine an answer, such as how much money a 65-year-old retiree can withdraw each year for 25 years. This approach is unrealistic for several reasons. Perhaps the most significant is that it conveys a false sense of deterministic certainty to a problem that is inherently probabilistic: What really matters is the *likelihood* of certain outcomes.

Monte Carlo simulations can help overcome this problem because they produce a probability distribution of outcomes, but they are only as good as the underlying modeling and assumptions. In fact, a poorly constructed Monte Carlo simulation can produce insidiously bad results, since the appearance of accuracy and sophistication may lend credibility to incorrect output.

One such approach, called "static return–generation," models asset-class returns using probability distributions based on historical performance. That is, since the S&P 500 achieved an arithmetic average yearly nominal return of 12.4% with a 20.2% standard deviation from
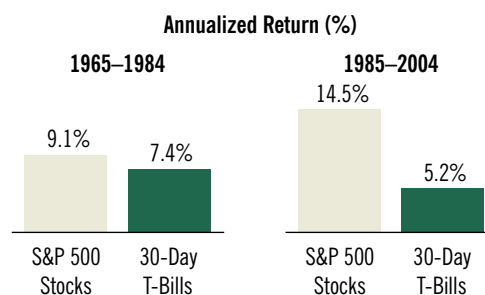
1926 to 2004, we could generate a simulated return for next year by randomly selecting from a normal probability distribution with a mean of 12.4% and a deviation of 20.2%. We could do the same for the other asset classes, thereby generating one possible scenario for capital-market returns in the next year. We could then repeat the process for each subsequent year, generating random capital-market returns for, say, 40 years. The result would be one "trial" consisting of one possible way that the capital markets might unfold in the next 40 years. We could then generate thousands of such trials, and finally, we could assess how each of our candidate glide paths would perform over time in each trial building up a probability distribution of outcomes. This all-too-common approach is riddled with problems.

The Historical Data Trap

First, the historical period chosen can have an enormous impact on the inputs, and thus the model's outputs. If we had measured S&P 500 performance from 1985 to 2004 instead of from 1926 to 2004, our assumption for stock returns would have been 14.5% a year with a 16.6% standard deviation—2.1% more return with 3.6% less volatility. An even starker example is presented in *Display 30*, which shows the performance of the S&P 500 and US Treasury bills over the past 20 years (1985–2004), compared to the preceding 20 years (1965–1984). If we had employed a static return-generation approach 25 years ago, using return data from 1965 to 1984, our assumptions might have

Display 30
Choice of Historical Period Can Skew Assumptions

Annualized Return (%)

1965–1984		1985–2004	
9.1%	7.4%	14.5%	5.2%
S&P 500 Stocks	30-Day T-Bills	S&P 500 Stocks	30-Day T-Bills

See Notes on Historical Data Preparation on page 19.
Source: CRSP, Ibbotson and Sinquefield, Standard & Poor's, US Department of Labor and AllianceBernstein

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[43] *Monte Carlo techniques have roots predating the 20th century, but their use advanced rapidly in the 1940s with the birth of modern computing and the race to produce nuclear weapons. Indeed, the formulas to model neutron diffusion were too difficult to be solved mathematically, and traditional scientific experiments weren't always practical: A failed experiment could have considerable cost!*

called for nominal S&P 500 stock returns of just 9.1% per year and cash returns of 7.4%! These assumptions would have served as a poor basis for modeling returns in the subsequent 25 years, when the S&P 500 returned 14.5% per year versus 5.2% for T-bills. [44]

Modeling Return Drivers

Second, the static return-generation approach treats each year independently, as if economic and market conditions in one year had no impact on the subsequent year. In fact, the process is completely blind to the factors that drive capital-market returns and how those factors interact; it has no memory of what has recently happened and therefore has no sense of logical continuity. If bonds have surprisingly good returns in one year, for example, they are likely to have lower yields in the following year. A static process doesn't capture this.

To arrive at sensible forecasts using a Monte Carlo approach, it is important to study history, examine current market pricing and economic conditions, and understand how the capital markets work. It is also crucial to recognize that there is uncertainty about our estimates for both capital-market returns and economic conditions such as inflation, and to model it.

Bernstein developed a return-generating process we call our Capital Markets Engine (CME). Rather than modeling returns directly, Bernstein models the fundamental drivers of return, such as inflation, yield, yield spreads, stock earnings and price multiples. The CME also models the dynamic interactions between those drivers. Modeling the markets at this level allowed Bernstein to separate the income and capital-appreciation components of total return, which is important for taxable investors and led to greater insight and more robust modeling.

The Bernstein CME models several types of relationships between return drivers:

* *Self-lagged relationships:* The future value of a driver depends on its current value;

* *Contemporaneous relationships:* The future value of a driver is influenced by the change in another driver;

* *Normal-expectation relationships:* The future value of a driver tends to move toward a normal relationship with other drivers;

* *Random relationship:* The future value of a driver is influenced by random noise; and

* *Definitional relationships:* The future value of a driver is completely determined by the values of one or more other drivers.

We can illustrate these relationships with US T-bills. Their yield in the near future depends on the current yield (self-lagged relationship), the change in inflation (contemporaneous relationship), whether the current T-bill yield is quite different from a long-term expectation (normal-expectation relationship) and a degree of unexplained market movement (random relationship). Once we have determined the path of the T-bill yield, we can calculate its return (definitional relationship).

Furthermore, the change in T-bill yield influences longer bonds: The change in short-term interest rates combines with other return drivers that influence the yield curve to determine intermediate-term interest rates; intermediate-term interest rates plus the change in those rates produce intermediate bond returns.

The core of Bernstein's CME consists of several dozen equations that define the behavior of these building blocks, allowing us to model asset classes in the major investment categories in some detail. The CME creates scenarios that reflect history but are not dependent on it and provides realistic moving pictures of the financial markets over time, rather than a sequence of snapshots that probably violate common sense.

Over the past decade, our firm has invested enormous time, money and intellectual capital into the development of the Bernstein CME; we're proud of its sophistication. We're even prouder that it does what it was built to do: It helps our clients make sound financial decisions in the face of very complicated circumstances. ∎

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[44] *Average yearly inflation was 6.3% from 1965 to 1984 and 3.0% from 1985 to 2004.*

Monte Carlo Performance in the Saving Phase

We begin by reporting how much savings a 25-year-old might build over a 20-year period by following the contribution schedule presented in Display 2 and investing in each of our six candidate glide paths. *Display 31* shows the results using box-and-whisker charts to depict the ending real-dollar savings amount (inflation-adjusted to represent present-day purchasing power) for each plan at the 95th, 75th, 50th, 25th and 5th percentiles of the 10,000 possible future scenarios generated by the Bernstein Capital Markets Engine.

In the median case of the regular plans, Plan A ended up with more dollars than Plan B, and Plan B ended with more than Plan C. The pattern was reversed at the 5th percentile, with Plan C ending with $10,000 more than Plan A. Just as in our earlier historical analysis, we see remarkable asymmetry at the 95th percentile, with appreciation-oriented Plan A outpacing Plan B by $77,000 and conservative Plan C by $110,000.

Note the results for the three diversified plans, shown on the right side of the chart. At the 5th percentile, each diversified plan ended with more money than its undiversified counterpart. At the 95th percentile, the diversified plans did uniformly worse. This is as expected: Diversification has the effect of contracting the distribution of returns, reducing the chances of both very bad and very good outcomes. Perhaps more surprising is that the median return of each diversified plan is higher than its nondiversified counterpart, indicating that our diversified asset allocations had the effect of both narrowing the range of returns and shifting the overall return distribution upward. This is

the result of a phenomenon known as risk drag, the damage that volatility inflicts on compound returns. All other things being equal, a portfolio with lower volatility will provider greater compound returns.

Comparing regular Plan C to Diversified Plan A is also revealing. Although Diversified Plan A maintains a high equity allocation from age 25 to 44 while Plan C ratchets down its equity exposure, Diversified Plan A outperformed Plan C even at the 5th percentile: Diversified Plan A ended with $124,000 in accumulated savings, while Plan C had $120,000. This is a prime example of why simply comparing the overall equity allocation of different glide paths at a point in time without regard to the detailed asset allocation of each plan can be misleading as to which plan is actually riskier!

Diversified Plan C turned in the best performance of all plans at the 5th percentile, ending with $10,000 more than Diversified Plan A. However, the distribution is quite asymmetric, with Diversified Plan A ending with $14,000 more in the median case and $94,000 more at the 95th percentile.

Now, let's turn to a midlife saver, age 45, who has managed to accumulate $225,000 in savings, the same amount that we assumed in *Historical Glide Path Performance in the Savings Phase* on page 19. Again using the savings schedule presented in Display 2 and investing for 20 years, *Display 32* shows the range of ending dollar values for our six plans.

The pattern of results is broadly similar to the case of our young saver, but the differences are magnified because the midlife saver is at the sweet spot of opportunity, pos-

Display 31
Range of Expected Performance for a Young Saver
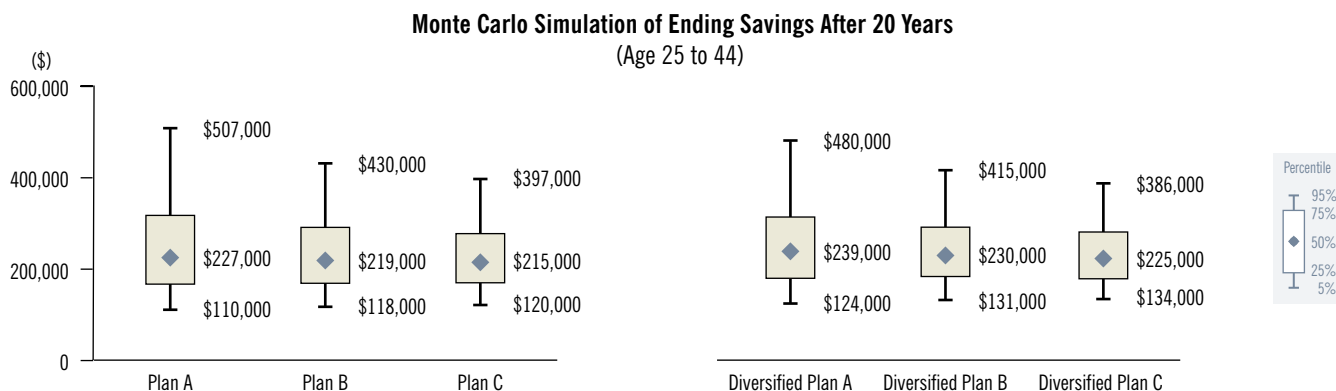
Monte Carlo Simulation of Ending Savings After 20 Years
(Age 25 to 44)

Starting with $0; all amounts are in present-day dollars; reflects Bernstein Capital Markets Engine assumptions as of March 31, 2005.
Source: AllianceBernstein

Display 32
Range of Expected Performance for a Midlife Saver

Monte Carlo Simulation of Ending Savings After 20 Years
(Age 45 to 64)
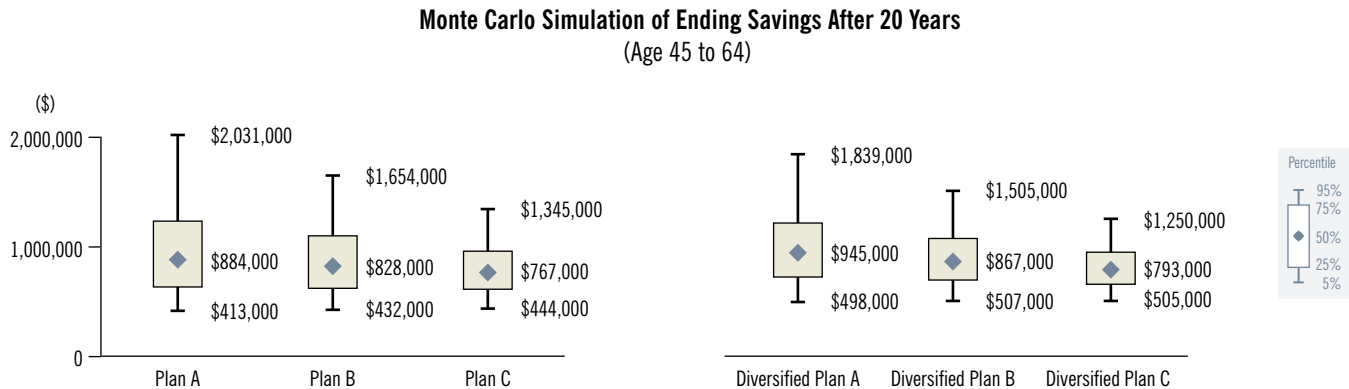
Starting with $225,000; all amounts are in present-day dollars; reflects Bernstein Capital Markets Engine assumptions as of March 31, 2005.
Source: AllianceBernstein

sessing both a long investment time horizon and a higher initial capital base on which to compound savings. The median savings of Diversified Plan A was far and away the greatest of all six plans, outpacing Diversified Plan B by $78,000 and Diversified Plan C by $152,000.

The asymmetry is remarkable: At the 5th percentile, Diversified Plan A underperformed Diversified Plan C by only $7,000, but at the 95th percentile, Diversified Plan A outperformed Diversified Plan C by a whopping $589,000.

To complete our analysis of the savings phase, let's now look at each glide path over the entire 40-year savings period, rather than starting all plans on equal footing at age 45. That is, supposing a 25-year-old made contributions according to Display 2 and invested for 40 years,

what level of savings could the employee expect to have under each of our six candidate plans?

Display 33 shows the final results. Diversified Plan A was the best performer in the median case, with over $100,000 more than Diversified Plan B and almost $200,000 more than Diversified Plan C. It also had the strongest performance at the 25th and 75th percentiles, and lagged the best performer by only $4,000 at the 5th percentile. Across the entire savings period, as in the separate young and midlife savings periods, Diversified Plan A was the clear winner.

The attentive reader may have noticed that our projections of future savings are somewhat less optimistic in our Monte Carlo analysis than our analysis based on his-

Display 33
Range of Expected Performance over Entire Saving Phase
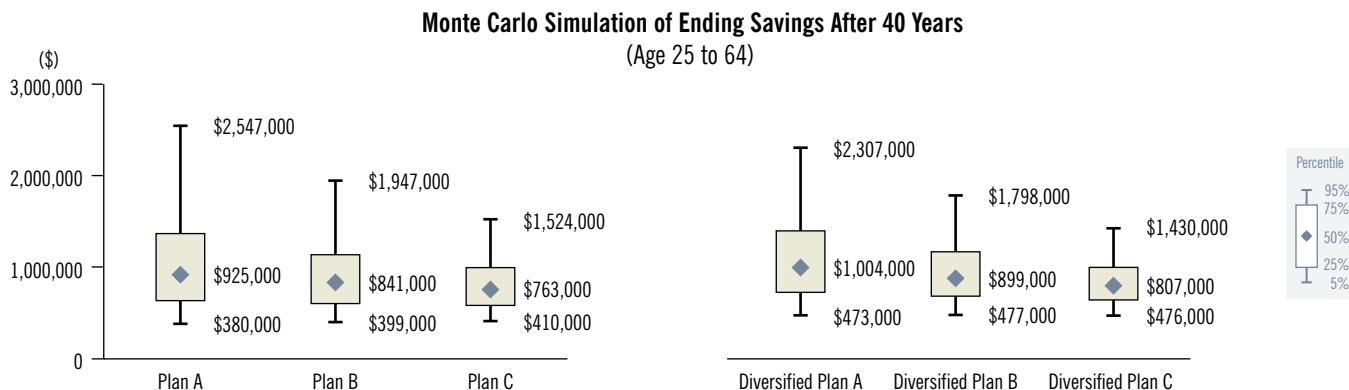
Monte Carlo Simulation of Ending Savings After 40 Years
(Age 25 to 64)

Starting with $0; all amounts are in present-day dollars; reflects Bernstein Capital Markets Engine assumptions as of March 31, 2005.
Source: AllianceBernstein

torical returns. In the case of a 45-year-old starting with $225,000, our Monte Carlo analysis produced a median expected savings of $884,000 for an investor in regular Plan A. The historical analysis presented in Display 13 on page 21, however, showed that Plan A resulted in $1,255,000 savings at retirement in the median case over all historical 20-year periods from 1926 to 2004.

This difference is no mistake. It reflects the fact that the Bernstein Wealth Forecasting Analysis does not naively rely on average historical returns in making its projections. For example, from 1982 to 2004 the S&P 500 achieved an annualized real return of 10.2% versus just 6.0% from 1926 to 1981. The expansion of the S&P 500 price-to-earnings multiple from about 8.1 at the beginning of 1982 to about 20.7 at the end of 2004 explains most of the strong recent performance. Propelled by a deep and protracted decline in interest rates, US bonds also achieved much higher returns in the period from 1982 to 2004 than in the 1926 to 1981 period. What are the chances that stocks and bonds will repeat their stellar performance over the coming two decades? Pretty slim, we'd say.

An important component of the Bernstein Wealth Forecasting Analysis system is that it takes into consideration *current* market conditions. As can be seen in our analysis, its forecast performance for stocks and bonds is thus somewhat less rosy than the market performance over the past two decades—an additional reason for participants to save more and invest wisely in a well-designed plan.

Monte Carlo Performance in the Retirement Phase

Turning to the retirement phase, let's again assume that the worker saved diligently, invested wisely and was able to accumulate $1,000,000 in savings for retirement. While financial planners often state that a retiree will need to withdraw about 75% of their final salary to maintain their standard of living, an astute financial planner may recognize that a retiree would likely not be able to withdraw 6.4% (75% of $85,000 = $63,750, or about 6.4% of the $1 million saved) of their savings and still have enough money to last a lifetime. A 6.4% withdrawal rate is probably too high, particularly in the light of more modest expectations for returns in the coming years.

Another rule of thumb for spending in retirement is to withdraw only 4% to 5% of the initial savings amount to provide spending for a lifetime with a good chance of not depleting savings. To make our analysis as realistic as possible, we'll assume that our retiree will withdraw $50,000 (5% of $1 million savings) per year, perhaps with additional spending derived from other income sources such as Social Security. (We'll return to the implications of a $63,750 withdrawal assumption later in this section.)

Assuming $1 million in savings and a real yearly withdrawal of $50,000, we recorded the percent of the 10,000 Monte Carlo trials that our retiree's money lasted 15, 20, 25 and 30 years for each of our six candidate plans (*Display 34*).

In our analysis, the retiree is virtually certain of being able to spend for at least 15 years without depleting savings and has a very high likelihood of being able to spend for at least 20 years (particularly with the diversified plans).[45] At the 25-year horizon, the chances drop down to 85% for Diversified Plan A; they drop down to a 68% chance at the 30-year horizon. While Diversified Plan C has similar odds of success at a 20-year horizon (with a 97% chance), it has much lower odds of success than Diversified Plan A at the 25- and 30-year horizons.

Display 35 shows the ending savings amounts for each of the plans over 15-, 20-, 25- and 30-year horizons. Although the likelihood of savings lasting 15 years was nearly 100% for all

Display 34
Retiree Performance:
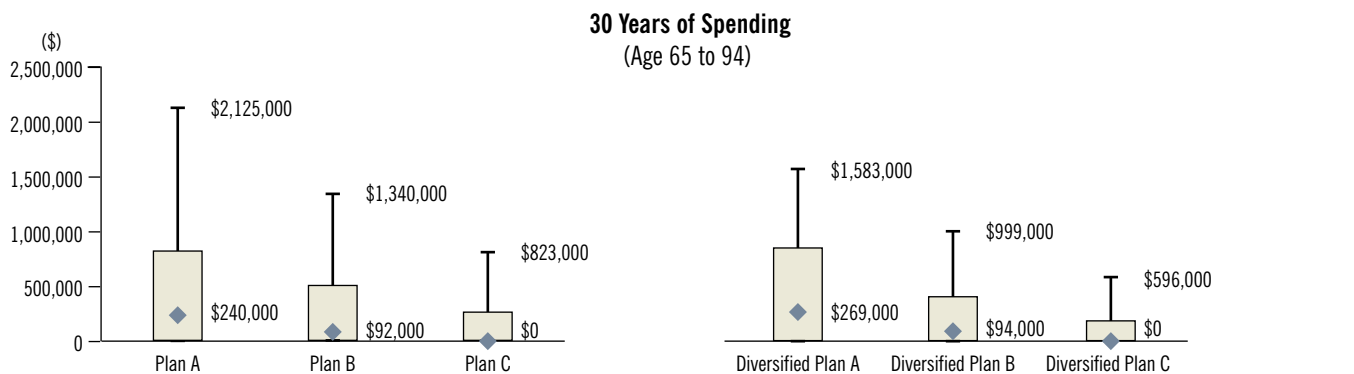**Expected Probability of Meeting Spending Needs (%)**

	15 Years	20 Years	25 Years	30 Years
Plan A	99	92	78	63
Plan B	>99	93	77	57
Plan C	>99	94	74	47
Diversified Plan A	>99	96	85	68
Diversified Plan B	>99	97	82	59
Diversified Plan C	>99	97	78	46

Starting with $1 million and spending $50,000 a year; all amounts are in present-day dollars; reflects Bernstein Capital Markets Engine assumptions as of March 31, 2005
Source: AllianceBernstein

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[45] *As in our historical analysis, we do not model required minimum distributions.*

Display 35
Range of Expected Performance over Various Spending Horizons

15 Years of Spending
(Age 65 to 79)

($)

Plan A: $1,909,000 / $747,000 / $153,000
Plan B: $1,463,000 / $667,000 / $190,000
Plan C: $1,150,000 / $601,000 / $219,000

Diversified Plan A: $1,640,000 / $771,000 / $249,000
Diversified Plan B: $1,276,000 / $670,000 / $263,000
Diversified Plan C: $1,028,000 / $598,000 / $273,000

Percentile
95%
75%
50%
25%
5%

20 Years of Spending
(Age 65 to 84)

($)

Plan A: $1,986,000 / $609,000
Plan B: $1,440,000 / $506,000
Plan C: $1,065,000 / $419,000

Diversified Plan A: $1,635,000 / $631,000 / $33,000
Diversified Plan B: $1,208,000 / $509,000 / $48,000
Diversified Plan C: $907,000 / $413,000 / $48,000

25 Years of Spending
(Age 65 to 89)

($)

Plan A: $2,024,000 / $437,000
Plan B: $1,398,000 / $315,000
Plan C: $965,000 / $212,000

Diversified Plan A: $1,600,000 / $465,000
Diversified Plan B: $1,099,000 / $317,000
Diversified Plan C: $756,000 / $204,000

30 Years of Spending
(Age 65 to 94)

($)

Plan A: $2,125,000 / $240,000
Plan B: $1,340,000 / $92,000
Plan C: $823,000 / $0

Diversified Plan A: $1,583,000 / $269,000
Diversified Plan B: $999,000 / $94,000
Diversified Plan C: $596,000 / $0

Starting with $1 million and spending $50,000 a year; all amounts are in present-day dollars; reflects Bernstein Capital Markets Engine assumptions as of March 31, 2005.
Source: AllianceBernstein

plans, the difference in median savings is quite large. Diversified Plan A is expected to have $771,000, the highest of any plan. Diversified Plan C had the *worst* median outcome, at $598,000—even slightly worse than regular Plan C.

In fact, Diversified Plan C uniformly performed worse than its nondiversified counterpart in the median case—a sign that the diversification, while shrinking the tails of the return distribution as intended, was also shifting the entire return distribution toward modestly lower returns. This problem arises because Plan C is too heavily invested in bonds for diversification purposes and, therefore, did not properly utilize the additional diversification afforded by other asset classes. Thus, Plan C unnecessarily sacrificed return to reduce the short-term risk of capital losses due to market volatility: It could have employed a higher equity allocation and diversified more effectively by other means.
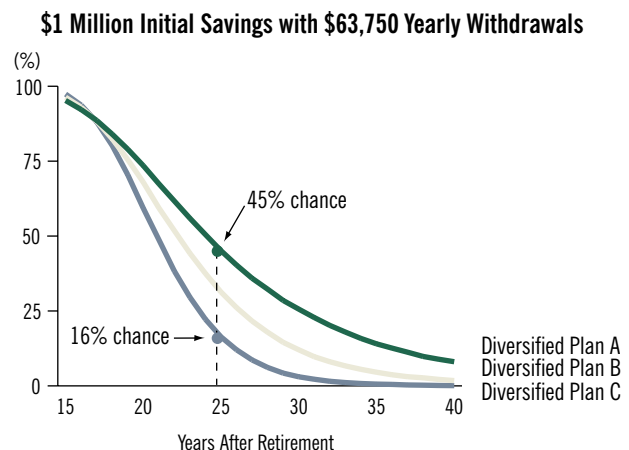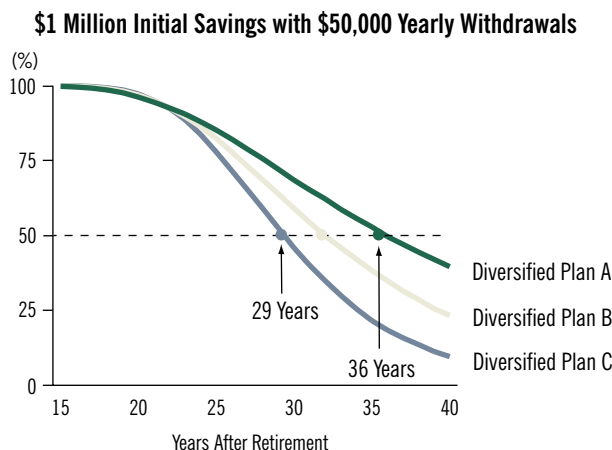
Only Diversified Plan A enjoyed a considerable pickup in ending money in the median case versus its undiversified counterpart, suggesting that volatility was indeed being decreased without sacrificing expected return. On the other hand, Diversified Plan C had the best result at the 5th percentile after 15 years, edging out Diversified Plans B and A by $10,000 and $24,000, respectively. That extra protection was expensive, as can be seen not only in the median outcome but in the heady $612,000 difference at the 95th percentile outcome between Diversified Plans A and C.

Display 35 also illustrates the threat of longevity risk: Over a 30-year horizon, the median case of the best plan (Diversified Plan A) has $269,000 remaining, and the median case of the worst plan (Diversified Plan C) has *no* money remaining. While 30 years may seem like a long horizon, a married 65-year-old couple faces almost a 50% chance of one spouse living that long—and life expectancy continues to increase.

So far we've investigated expected ending savings over different investment horizons, but we haven't fully quantified the probability of running out of money, perhaps the most relevant measure of all for retirees. The left-hand side of *Display 36* shows this view of risk for our three diversified plans, plotting the expected probability that each plan would meet the retiree's spending needs through each year over a 40-year investment horizon. The expected probability of meeting spending needs is close to 100% in all three plans until roughly 20 years of spending, at which point the probabilities diverge rapidly. Diversified Plan C, for example, has about a 50% chance of running out of money after about 29 years of spending; Diversified Plan A doesn't face those odds until after 36 years of spending.

The right-hand side of Display 36 shows how longevity risk becomes even more threatening by assuming our original $63,750 withdrawal rate, rather than the more modest $50,000 withdrawal rate. This exercise is quite important, since $1,000,000 in savings might seem like

Display 36
Retiree Performance: Expected Probability of Meeting Spending Needs

$1 Million Initial Savings with $50,000 Yearly Withdrawals
$1 Million Initial Savings with $63,750 Yearly Withdrawals

45% chance
16% chance

29 Years
36 Years

Diversified Plan A
Diversified Plan B
Diversified Plan C

Years After Retirement

Reflects Bernstein Capital Markets Engine assumptions as of March 31, 2005
Source: AllianceBernstein

a lot to new retirees, leading them to withdraw larger amounts than might be prudent. Furthermore, in order to provide for $50,000 of actual spending, significantly more must be withdrawn on a pretax basis, since withdrawals are taxed as ordinary income. Increasing the withdrawal rate from $50,000 to $63,750 helps assess the performance of the different investment plans under these very real situations.

This high spending rate greatly accelerates savings depletion, further illustrating why Diversified Plan C is the much-higher risk alternative: It simply has too little growth potential to offer a significant chance of offsetting withdrawals, so it rapidly succumbs to the pressure of spending. While there's a 97% chance of savings lasting 15 years, there's only a 16% chance of savings lasting 25 years. By comparison, Diversified Plan A still has about a 45% chance of savings lasting 25 years.

Monte Carlo Performance over All Life Stages

In our retirement analysis, we assumed that our retiree had $1,000,000 in savings regardless of the investment strategy he may have chosen in his earlier years. To complete our analysis of expected savings and spending, we now investigate how a participant might fare by using the same investment plan *throughout* life, from age 25 up to age 100 (should the participant live that long). We again assume that a participant makes contributions as shown in Display 2 during the savings phase and withdraws $50,000 each year in the retirement phase.

The top of *Display 37* shows the median expected savings at each year throughout life assuming consistent investment in each of our three diversified plans. In the median case, Diversified Plan A ended with a little over $1,000,000 at retirement, about 12% more than Diversified Plan B and 24% more than Diversified Plan C. In retirement, Diversified Plan A provided nine more years of spending than Diversified Plan B and 15 more years than Diversified Plan C.

But what about when times were bad? The middle of Display 37 shows the yearly ending savings amounts for each plan in the 5th percentile case. There is essentially no difference in their outcomes. Diversified Plan B ends with about $477,000 by retirement, nudging out both of the other plans by a few thousand dollars. Diversified Plan C provides about nine years of spending, roughly a

Display 37
Expected Savings over Time: Monte Carlo Simulation

Year-end savings; all amounts are in present-day dollars; assumes $50,000 in annual withdrawals starting at age 65; reflects Bernstein Capital Markets Engine assumptions as of March 31, 2005.
Source: AllianceBernstein

half-year more than Diversified A or B. Clearly, participants weren't able to hide from bad markets regardless of which plan they were invested in: All suffered equally.

What about when the markets are good? The bottom of Display 37 shows the 75th percentile case (the 95th percentile case favors Plan A even more). Even Diversified Plan C managed to build over $1,000,000 in savings by age 65, providing a comfortable living through retirement. But Diversified Plan A was able to pay for spending *and* continue growing. Of course, a participant in Plan A who had accumulated higher savings may have decided to live more comfortably and spend more. Would this affect our results? It would affect the expected ending savings each year, but if a participant is spending the same *percentage* of his capital, all the results presented earlier in this section still apply.

Monte Carlo Short-Term Risk Assessment

Our analysis shows Diversified Plan A is the clear winner for participants in terms of building retirement savings and prolonging spending in retirement. But just as in our historical analysis, it's important to address the question of whether participants could have tolerated the short-term losses along the way.

Before proceeding, recall that while the AllianceBernstein Retirement Strategies funds are structured according to Diversified Plan A, no existing target-date retirement fund (to our knowledge) has a structure similar to Diversified Plan B or C. Existing funds diversify in various ways and to various degrees, but for the most part can probably be viewed as having structures somewhere between Plans B and C and their diversified versions. In this section, we primarily focus on comparisons between Diversified Plan A and Diversified Plans B and C—that is, what the risk characteristics of *our* asset allocation might look like depending on the overall equity allocation. For comparison against most competing approaches, the fairest measure is probably to compare Diversified Plan A to regular Plan B or C, or perhaps somewhere in between the regular and diversified versions of Plans B and C.

Display 38 summarizes the short-term losses encountered by young savers in each of the plans. All plans suffered a loss with roughly the same frequency, from 34.5%

for Plan A to 30.4% for Diversified Plan C. (To measure frequency, we counted the number of annual losses in each of the 20-year scenarios, figured the percent for each scenario and then calculated the average for our 10,000 scenarios.) The worst annual nominal loss experienced over 20 years, in the median case of the 10,000 trials, was (23.5)% for Plan A, versus (20.1)% for Plan B and (18.4)% for Plan C. At the 5th percentile of the 10,000 trials, the worst year over the 20-year investment period was (36.0)%, (31.5)% and (29.1)%, respectively. As expected, the diversified plans all fared better, with the higher equity plans benefiting more from increased diversification in terms of reducing the magnitude of losses. The worst annual loss experienced over 20 years in the 5th percentile case in Diversified Plans A, B and C was (32.8)%, (29.3)% and (27.5)%, respectively.

Display 39 shows the same characteristics for midlife savers. While the overall pattern is similar, the spreads in the loss characteristics between the higher equity plans (Plan A and Diversified Plan A) and lower equity plans (Plan C and Diversified Plan C) are larger than for young savers. This is expected, since the plans are more differentiated for midlife savers: In youth, all plans have a fairly high equity allocation, but in midlife, Plan A and Diversified Plan A retain a significantly higher equity allocation than the other plans, particularly Plan C and Diversified Plan C.

But we reach the same conclusions in this analysis as in the historical analysis. Since all plans have a fairly high equity exposure in the youthful stage, the worst losses are similar and the dispersion between the plans probably isn't

Display 38
Young Saver Results:
Monte Carlo Simulation of Risk Characteristics (Age 25–44)

	Frequency of Loss (%)	Median Worst Year	5th Percentile Worst Year
Plan A	34.5	(23.5)	(36.0)
Plan B	33.3	(20.1)	(31.5)
Plan C	32.4	(18.4)	(29.1)
Diversified Plan A	32.6	(21.1)	(32.8)
Diversified Plan B	31.2	(18.3)	(29.3)
Diversified Plan C	30.4	(17.0)	(27.5)

Reflects Bernstein Capital Markets Engine assumptions as of March 31, 2005
Source: AllianceBernstein

significant: An investor is going to feel bad in any of the plans. The spreads for midlife savers are somewhat wider. In the median case, a participant in Diversified Plan A is expected to experience at least one year with a loss of (16.8)%, whereas a participant in Plan C is expected to experience a (12.0)% loss and a participant in Diversified Plan C is expected to experience a loss of (10.6)%. In the 5th percentile, the spread is greater, again, and the investor will likely feel quite bad in any of the plans.

Display 40 shows risk characteristics for a 65-year-old with a 20-year investment horizon. Just as we saw in the historical analysis, to obtain the return benefits of the higher equity paths in Plan A and Diversified Plan A, the retiree faced more frequent and larger short-term losses. Fortunately, diversification helps to shrink the short-term losses. The worst annual nominal return experienced over 20 years in the median case was (9.1)% for Diversified Plan A, versus (11.2)% for regular Plan A.

In each of our life stages, it is clear that Plan A can be expected to experience larger short-term losses than Plan B; in turn, Plan B can be expected to experience larger short-term losses than Plan C. The median expected losses tend to be larger than what we identified in our historical analysis, since return expectations are lower than what has been achieved historically. Nonetheless, the 5th percentile losses are expected to be smaller than those that we identified in our historical analysis, since the introduction of short-duration bonds helped reduce the magnitude of losses in bad periods. And by adding other diversifying asset classes to the portfolios,

we reduce the expected short-term losses for Diversified Plans A, B and C even further.

For young savers, since all plans have fairly high risk levels, the variation among the plans' downside loss characteristics is not large. The variation is more pronounced for midlife savers, because midlife savers have the opportunity to compound wealth from an initially higher capital base, yet have a long investment horizon to ride out short-term volatility; Diversified Plan A seeks to take full advantage of this opportunity. The expected cost of choosing Diversified Plan C instead of Diversified Plan A is nearly $200,000 by retirement. In our view, the modestly higher frequency and magnitude of expected short-term losses in some of the worst expected cases is more than justified, given this high opportunity cost.

Finally, the spread in the risk characteristics for retirees is smaller yet noticeable. These relatively modest increases in risk need to be weighed against the risk of running out of money analyzed earlier in this section. To us, the choice is obvious: Longevity risk is massively more significant than short-term market risk to new retirees.

Nonetheless, short-term losses are a necessary consideration, regardless of which plan a participant chooses. That's because the participant might *feel* as if his or her portfolio has a problem and act on that feeling counterproductively—perhaps fleeing to the perceived safety of conservative asset classes or chasing after whatever asset class has had the strongest recent performance. We return to this issue later in this paper.

Display 39
Midlife Saver Results:
Monte Carlo Simulation of Risk Characteristics (Age 45–64)

	Frequency of Loss (%)	Median Worst Year	5th Percentile Worst Year
Plan A	32.6	(18.8)	(29.7)
Plan B	30.6	(15.1)	(24.6)
Plan C	28.2	(12.0)	(20.3)
Diversified Plan A	30.4	(16.8)	(27.4)
Diversified Plan B	28.4	(13.4)	(22.3)
Diversified Plan C	25.8	(10.6)	(18.5)

Reflects Bernstein Capital Markets Engine assumptions as of March 31, 2005
Source: AllianceBernstein

Display 40
New Retiree Results:
Monte Carlo Simulation of Risk Characteristics (Age 65–84)

	Frequency of Loss (%)	Median Worst Year	5th Percentile Worst Year
Plan A	27.5	(11.2)	(19.6)
Plan B	24.5	(8.3)	(14.9)
Plan C	21.6	(6.3)	(11.4)
Diversified Plan A	24.2	(9.1)	(16.9)
Diversified Plan B	21.2	(6.6)	(12.5)
Diversified Plan C	18.2	(4.8)	(9.2)

Reflects Bernstein Capital Markets Engine assumptions as of March 31, 2005
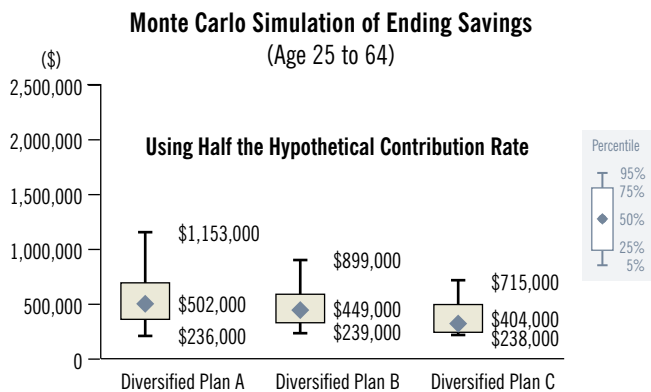Source: AllianceBernstein

Sensitivity to Participant Contributions

In the introduction to this paper, we asserted that our approach and conclusions held under a number of variations. In this section, we present the results of the two alternative scenarios that we think will interest many readers: What if a participant doesn't save as much each year, and what if a participant doesn't start saving until a later age?

Display 41 shows results for a participant investing in either Diversified Plan A, B or C, with the three box-and-whisker plots representing the expected ending retirement savings for a 25-year-old invested in each plan, if the employee had contributed only *half as much* each year as in Display 2. The expected ending savings in each case under this contribution scenario is exactly half of that of the original contribution scenario (rounded to the nearest $1,000), shown on Display 33.
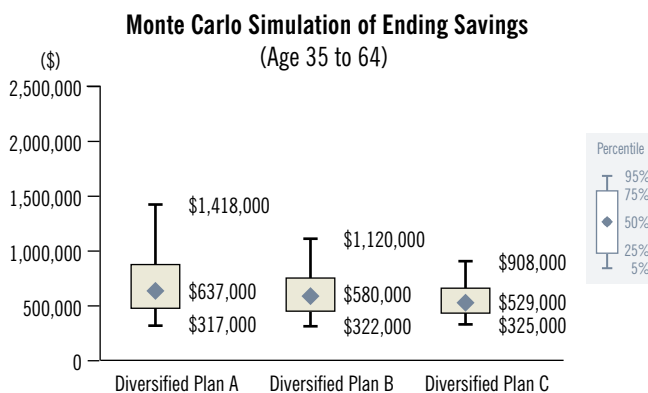
It is easy to see why: Mathematically, the expected ending savings is just the sum of a series of compounded yearly cash flows. If each cash flow were cut exactly in half, the end result of each cash flow would be exactly half and therefore the final sum of cash flows would be exactly half. So, the *pattern* of results we've presented is exactly the same with lower contribution percentages: The final dollar figures differ in proportion to the fractional contribution rate. Thus, 20% lower contributions would result in 20% lower expected savings.

Display 41

Impact of Contribution Rate on Range of Expected Performance in Savings Phase

Monte Carlo Simulation of Ending Savings
(Age 25 to 64)

Using Half the Hypothetical Contribution Rate

Percentile	
95%	
75%	
50%	
25%	
5%	

- Diversified Plan A: $1,153,000 / $502,000 / $236,000
- Diversified Plan B: $899,000 / $449,000 / $239,000
- Diversified Plan C: $715,000 / $404,000 / $238,000

Starting with $0; assuming half of the hypothetical contribution rate in Display 2; all amounts are in present-day dollars; reflects Bernstein Capital Markets Engine assumptions as of March 31, 2005.
Source: AllianceBernstein

Display 42

Impact on Range of Expected Performance in Savings Phase When Saving Is Delayed 10 Years

Monte Carlo Simulation of Ending Savings
(Age 35 to 64)

Percentile	
95%	
75%	
50%	
25%	
5%	

- Diversified Plan A: $1,418,000 / $637,000 / $317,000
- Diversified Plan B: $1,120,000 / $580,000 / $322,000
- Diversified Plan C: $908,000 / $529,000 / $325,000

Starting with $0; all amounts are in present-day dollars; reflects Bernstein Capital Markets Engine assumptions as of March 31, 2005.
Source: AllianceBernstein

But what if someone starts saving later? *Display 42* shows the expected ending savings for a participant who didn't make *any* contributions until age 35. Again Diversified Plan A does best. Displays 41 and 42 are valuable reminders of the importance of participating in a plan and making the largest contributions that are affordable. But they don't change the glide path preference: Diversified Plan A remains the clear winner.

We forgo presenting a sensitivity analysis for the retirement phase, since the results are identical to what we've already presented if spending is expressed in percentage terms of beginning capital. For example, in the results we presented earlier in this section, we assumed an initial 5% spending rate ($50,000 spending rate on $1,000,000). If a retiree instead had $500,000 in savings and decided to spend $25,000 a year, the spending rate is the same, at 5%, and therefore the probability that the savings will last over a given period is identical. The ending dollar amounts in each period would simply be fractionally reduced (halved in our example). Different amounts of savings at retirement do not affect our conclusions if we assume the same percentage spending rate.

But what about a higher spending rate? We've already presented results of a 6.4% spending rate and found that Diversified Plan A was the clear winner in both cases. We don't show higher spending rates here (since most financial planners wouldn't even recommend 6%), but in our analysis, Diversified Plan A continued to have the best chance of prolonging spending. As spending rates go significantly higher than 7%, of course, all plans quickly become overwhelmed by the rapid spending rate.

And what about a lower spending rate—less than 5%, say? We also don't present the results here, because lower spending rates simply favor plans with higher equity allocations (since there tends to be more savings remaining to help weather short-term market declines and a higher equity exposure is expected to compound savings more over longer horizons). In our analysis, the lower we set the spending rate, the more attractive Diversified Plan A looked. In fact, with spending much below 4%, it is unlikely that dissavings would occur at all with Diversified Plan A. Instead, plan assets continue to *increase*.

In the end, we can't know how much a participant will contribute or how much a retiree will spend. We've inspected our candidate glide paths in detail using the most common saving and spending heuristics as well as alternative scenarios. Regardless of whether participants save or spend more or less, our conclusions hold.

Stress Testing: Conclusions and Observations

Our Monte Carlo analysis of the performance characteristics of six equity glide paths shows that effective diversification can indeed reduce risk without unnecessarily sacrificing return.

- With only minor exceptions, increasing diversification performed as expected. Regardless of the equity glide path, increasing diversification reduced the chance of both very good and very bad outcomes and shifted the entire distribution in favor of higher returns. Diversified Plan C showed some indication of being too diversified, however: It sometimes underperformed its nondiversified counterpart.

- Although Diversified Plan A contains a higher equity exposure than nondiversified Plan C at all life stages—and would thus appear to be riskier—Diversified Plan A made more money for participants across the board, *even in the worst 5% of capital-market scenarios*. This clearly indicates that a simple comparison between plans in terms of overall equity exposure at a given point in time can be very misleading when determining which is "riskier."

- For young and midlife savers as well as retirees, Diversified Plan A provided the best median performance. In most cases it also performed the best at the 25th and 75th percentiles.

- The asymmetry of ending money for participants over the entire savings phase at the 5th and 95th percentiles was astonishing: While Diversified Plan A underperformed Diversified Plan C by just $3,000 at the 5th percentile, it outperformed by $877,000 at the 95th percentile.

- The lower equity plans provided a modest reduction in short-term risk for savers, but at a very high opportunity cost: They reduced a participant's savings at retirement by hundreds of thousands of dollars in the median case.

- The lower equity plans also provided a modest reduction in short-term risk to retirees, but the cost of this extra insurance was a massive *increase* in longevity risk: The probability that a retiree would run out of money is much higher in the lower equity plans for longer-lived retirees.

- Results are robust under a wide variety of alternative saving and spending scenarios.

- While the addition of short-term bonds and other asset classes was quite useful in reducing the magnitude and frequency of short-term losses, all plans exhibited enough short-term downside risk to prompt a participant to flee the plan out of fear. Thus, good communications are a necessary adjunct to a well-designed target-date retirement fund.

ENHANCING RETURNS THROUGH ACTIVE MANAGEMENT AND EFFICIENT OPERATIONS

In the previous section, we demonstrated what an enormous difference asset allocation can make to the success of a retirement investment plan, as shown by the range of probable final savings at retirement and years of spending in retirement for six candidate plans.

Our analysis, however, assumed only index returns for all asset classes and yearly rebalancing with no management fees or transaction costs. It also did not consider the fact that the participant would be invested in a commingled fund with cash flows not attributable to the participant's own contributions and withdrawals.

In real life, however, plan sponsors can choose to use active, rather than passive, management and they certainly pay fees (even for index funds); meanwhile, participants unwittingly pay rebalancing transaction costs and subsidize the cost of the cash flows of other participants. While none of these factors is likely to make a huge difference over short periods, when compounded over 40 years—or more—they could have a substantial impact on a plan participant's final savings and spending power in retirement.

To demonstrate the impact of a 1% increase in return, we return to the simple saving and spending model presented in Display 3 on page 11. *Display 43* shows the same saving and spending model, but assumes a 1% higher return each year. Contributions are made according to the hypothetical participant contributions pre-

Display 43
Adding 1% to Annual Returns Could Fund More Than 10 Extra Years of Spending

Assumes 1% greater return each year than in Display 3; all amounts are in present-day dollars.
Source: AllianceBernstein

sented in Display 2 on page 11, with inflation running at a constant 3%, and with the portfolio achieving nominal returns ranging from 10% at age 25 and linearly declining each year to 7% at age 80 and thereafter. In the retirement phase, we again assume a real withdrawal rate of $63,750 (75% of our hypothetical participant's final salary) and show how long the savings would last.

The tan area shows how the saving and spending profile improves using our 1% higher return assumption vs. the blue area originally shown in Display 3. The result: The extra one percentage point of annual return translated into *nearly a quarter of a million dollars* more in savings by retirement and helped prolong spending for *more than 10 years*.
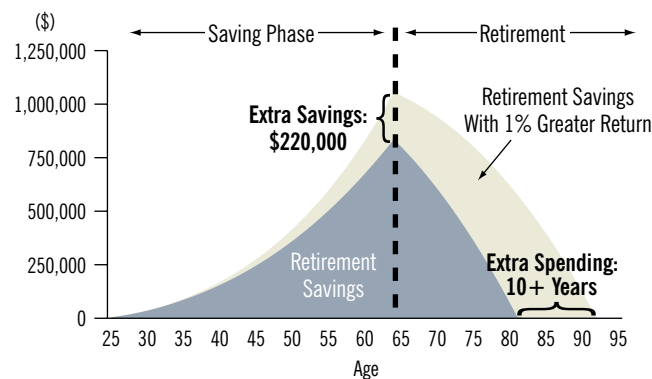
Since retirement saving and spending occur over a very long time horizon, seemingly small incremental returns can compound to create big differences in total assets.

Active vs. Passive Management
First, we would like to correct a common misconception: There is no such thing as a passively managed target-date retirement fund. Substantial active decisions are made during the construction of all such funds: which asset classes to use, how much to allocate to each asset class and how to manage each underlying asset class. As amply presented in this paper, the asset-allocation policy—and in particular the overall equity allocation—plays a primary role in the long-term investment results of a fund. Indeed, the performance of a target-date retirement fund can be hobbled by poor initial asset-allocation decisions, unless they are corrected later. For the purposes of discussion in the remainder of this section, however, we focus the analysis on the management approach of each asset class, rather than the asset-allocation decisions.

By itself, skilled active management could generate the additional percentage point of annualized return vs. a passive approach—which, we've just shown, might add $220,000 to our hypothetical participant's final savings, funding more than 10 extra years of retirement spending. A common performance objective of an active equity manager is to generate 2% to 3% return above the benchmark before fees; active bond managers commonly seek an

alpha of 0.5% to 1.0%. If the underlying asset-class components of a target-date retirement fund were managed by skilled active managers, it's not unlikely that the overall fund could achieve 1% or more annual outperformance versus a passively managed approach, even net of fees.

Of course, the passively managed fund would have a lower fee structure and more certainty of performance relative to the benchmark. Indeed, if each underlying fund in each asset class performs as advertised and consistently replicates its benchmark's performance, net of fees, the overall fund will consistently underperform the fund's policy benchmark by an amount equal to the fees. Actively managed target-date retirement funds can perform considerably *worse*, of course, if the active managers of its various asset classes are unskilled.

The classic argument in support of passive management is that active managers, in aggregate, are destined to underperform the benchmark by an amount equal to the cost of the transactions they incur in excess of the benchmark turnover (and higher management fees reduce their performance even more). Since it's a zero-sum game, when one active manager is winning, another must be losing, the argument goes.

We agree that active management does have considerable similarities to a zero-sum game.[46] But even if it were a perfect zero-sum game, if there is any validity in the idea that one investor could have above-average skill, then there is an opportunity for that investor to generate premium returns at the expense of the less skilled investors.

Identifying skilled managers is difficult and time consuming, however, so plan sponsors should rightfully ask whether it is worth the effort. We emphatically believe it is, given the enormous impact the incremental positive return afforded by active management can have on plan participant savings. In the remainder of this section, we more fully explore why the multi-asset-class nature of target-date retirement funds provides an ideal framework to produce consistent alpha. We then turn to two additional methods to enhance returns for participants: efficient rebalancing and smart cash-flow allocation.

Producing Consistent Alpha

A previous AllianceBernstein research study[47] examined why alpha can exist and how it can be generated with more consistency. Here are some of the key findings.

First, identifying skilled managers is difficult. Unskilled managers may get lucky and outperform, creating the illusion of skill. Skilled managers may get unlucky and underperform, creating the illusion of lack of skill. One qualitative way to help distinguish luck from skill is to understand the market anomaly that the manager claims to be exploiting and gauge whether that anomaly can be expected to persist and whether the manager can demonstrate that it is able to benefit from the anomaly with consistency. In the equity arena, the growth and value styles are examples of such approaches.

A quantitative metric for gauging a manager's past ability to produce consistent alpha is the so-called information ratio, calculated by dividing a manager's realized annual premium to the benchmark by the tracking error (standard deviation of premiums to the benchmark). Higher information ratios represent more consistency; they reflect more excess return per unit of risk.

Investors, of course, would prefer to get high premiums, but high premiums are typically accompanied by high tracking errors, making it more difficult to distinguish whether the manager is skilled or was just lucky. Indeed, in our study we found that active US large-cap managers who generated high premiums tended to have higher tracking errors, while lower-risk managers produced less premium with higher information ratios.[48] In fact, the median active US large-cap manager had a tracking error of more than 6% and a 0.1 information ratio. Statistically speaking, it would take 271 years to obtain 95% confidence that a manager with an information ratio of 0.1 had skill; for a first-quartile manager with an information ratio of 0.3, it would take 31 years (*Display 44*). Both time periods are too long to be of much practical use when judging managers. Even the 11 years required to have 95% confidence in a manager with a 0.5 information ratio is long in the context of most investors'— and managers'—careers.

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[46] *It's not really a zero-sum game since the universe of investors, investment opportunities, total amount of investment capital and many other variables are constantly in flux.*

[47] Finding Consistent Alpha *by S. Masters and D. Demakis, 2003 AllianceBernstein.*

[48] *This finding is likely due to the impact of the long-only constraint, discussed in* "The Surprisingly Large Impact of the Long-Only Constraint," *by R. Grinold and R. Kahn, in* BGI Investment Insights *(2000).*

Fortunately, it's possible to gain confidence in obtaining high alpha with consistency for a multi-asset-class portfolio by combining high alpha managers with return premiums that are negatively correlated to each other. Although combining many managers with a 0.5 correlation of premiums is not very helpful, combining just two or three managers with negative 0.3 correlation helps a lot (*Display 45*).

A simple illustration helps to explain why. Let's say you combine an aggressive growth manager with a deep-value manager and both have 50-stock portfolios benchmarked to the S&P 500 (*Display 46*). Each 50-stock portfolio has an average weight of 2% in each stock versus the 0.2% average weights of each stock in the S&P 500, and average overweights that are nine times the size of its average underweights. Assuming no portfolio overlap, the two portfolios together have 100 stocks, which lowers the ratio of overweights to underweights to four times. This direct risk reduction is very significant, greatly reducing the expected tracking error to the benchmark and leading to an increase in information ratio.

Furthermore, the 50 value stocks are likely to be precisely the kind of ideas that the growth manager underweights, and the 50 growth stocks are likely to be the kind of ideas that the value manager underweights. As a result, the two portfolios neatly offset each other's risks. In practice, when you combine two portfolios with complementary styles or two portfolios that for some other reason have complementary risk factors, the correlation of their alphas is likely to be negative and possibly even less than negative 0.3.

Thus, there is, after all, a practical way to have confidence that a fund can generate high alpha without waiting 271 years: Enlist managers who appear to have reasonably high alpha-generating capacity and sources of alpha with low correlation, and combine them into a multi-asset-class portfolio. Under these conditions, you can have much greater confidence they will generate consistent alpha.
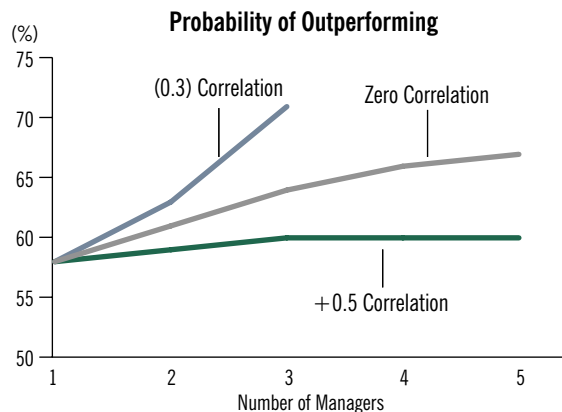
Opponents of active management often argue that it is hard to find skillful managers and that even if you do, when you put several together, you could end up with a

Display 44
It Takes Many Years to Distinguish Skill from Luck
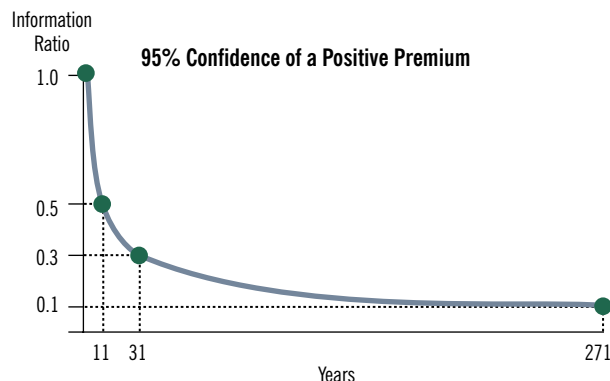
Source: AllianceBernstein

Display 45
Combining Portfolios with Uncorrelated Premiums Generates More Consistent Alpha

Assumes each manager has a 0.2 information ratio
Source: AllianceBernstein

Display 46
Two Concentrated Portfolios Can Offset Risks

Portfolio	Average Security Weighting	Average Over-weight	Average Under-weight	Ratio of Over- to Under-weights
50 Value Stocks	2.0%	+1.8%	(0.2)%	9
50 Growth Stocks	2.0	+1.8	(0.2)	9
100 Stocks	1.0	+0.8	(0.2)	4

Source: AllianceBernstein

high-cost index fund. While we certainly agree that skill-ful managers are hard to identify, our research and experience leads us to a different conclusion: By combining skilled style-pure managers, you significantly enhance the chance of harvesting alpha. The multi-asset-class structure of target-date retirement funds provides the perfect framework for skilled active managers to jointly produce consistent alpha.

Efficient Rebalancing

An inevitable result of combining multiple strategies with low return correlations is that some of them will outperform over certain periods while others lag. As a result, the asset allocation will stray from the target asset allocation, possibly quite far and in very little time. The problem is further complicated in target-date retirement funds, since the target allocations change over time. We'll return to that in a moment; first, let's assume that the target allocation is fixed.

Clearly, any systematic rebalancing rule is preferable to not rebalancing at all. The question, then, is when should the portfolio be rebalanced? Quarterly? Yearly? Our firm's extensive research in this area[49] has found that while periodic rebalancing tends to keep the portfolio near its strategic targets, it often incurs unnecessary transaction costs, particularly when the portfolio is not far from target. However, reducing the frequency of periodic rebalancing in order to reduce transaction costs invites more deviation from target between rebalancings.

Our solution is to rebalance only when the portfolio is far enough from target that the risk-reduction benefit would exceed the transaction costs. This so-called trigger-point rebalancing method is easily illustrated by considering a simple portfolio consisting of just a 50/50 allocation between a US large-cap value and a US large-cap growth portfolio, shown in *Display 47*. At inception, the portfolio is equally allocated, but over time the underperforming asset class will account for less and less of the overall total strategy. If value stocks happen to be in favor, as they have been over the past several years, it is likely that the growth portion of the portfolio will account for less than 50%, then less than 49%, less than 48% and so forth. The trigger-point rebalancing rule

states that once the growth portfolio falls to 45% of the portfolio, the increased risk arising from the tilt to value finally justifies rebalancing. At that point, the value portion of the portfolio is trimmed and the weight in the growth portfolio is increased.

But how much of the outperforming asset class should be trimmed? Our analysis shows that rebalancing all the way back to the strategic target is suboptimal, since the balancing point between the benefit of the risk reduction and the costs of the transactions is exactly halfway back to target. Thus, in our example, the value portion of the portfolio would be reduced from 55.0% to 52.5% and the growth portion would be increased from 45.0% to 47.5%. The same rebalancing action is taken whenever either component reaches 45% (or 55%) of the total assets.

This method is superior to periodic rebalancing since transaction costs are incurred only when justified. Furthermore, the technique enforces a buy-low, sell-high discipline, systematically reducing risk while taking advantage of market mean reversion.

So far we have considered only a simple two-asset class rebalancing problem, but the trigger-point approach can be used to derive rebalancing rules for multiple asset-class portfolios as well. In AllianceBernstein Retirement Strategies portfolios, for example, we employ systematic rebalancing trigger points to the overall stock/bond allocation, value and growth allocation, US and non-US

Display 47
How Trigger-Point Rebalancing Works
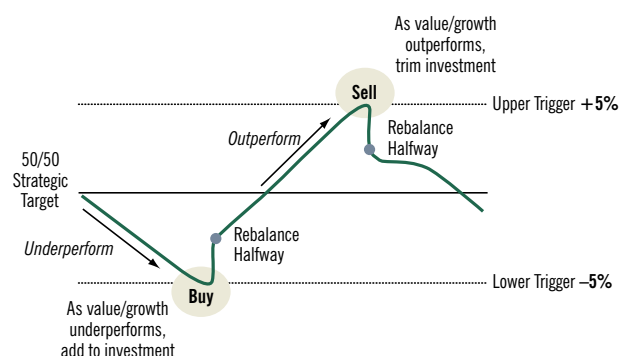
Source: AllianceBernstein

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[49] *See* Is There a Better Way to Rebalance? *by S. Masters, 2002, AllianceBernstein.*

equity allocation and so forth. Considering the enormous amount of research and care in developing a well-designed asset allocation, we believe it is critical to ensure that the portfolio remains near those targets at minimal cost.

Another design challenge for target-date retirement funds is the fact that the strategic allocation changes as a participant ages. Most target-date funds are offered in five- or 10-year retirement increments, but target allocations change quite a lot in just five years. In the allocation for Diversified Plan A on page 36, for example, 14% of the assets are reallocated between age 60 and 65. If a target-date retirement fund shifts to a new target allocation only every five years, the large rebalancing cliff effect can be quite expensive for participants. Indeed, rebalancing 14% of a portfolio can significantly detract from shareholder value.

Using a yearly glide path to adjust the strategic target weights more frequently would be better. For funds with five-year vintages, each year the target asset allocation would move one-fifth of the way toward the new asset allocation. This can greatly reduce the cliff effect of adjusting target allocations only every five years.

An even better solution is to adjust the target asset allocations *quarterly*, moving one-twentieth of the way toward the new targets at the end of each quarter. This method results in only very modest changes to the target allocations and, when combined with the trigger-point rebalancing method, ensures that rebalancing transaction costs are minimized. This is the method we use in the AllianceBernstein Retirement Strategies.

Smart Cash-Flow Allocation

Another frequently overlooked opportunity to enhance the returns of multi-asset-class portfolios comes from using cash flows to rebalance toward the asset-class targets. Not only can smart cash-flow allocation help reduce risk versus the policy allocation, but it can also result in more return for participants by helping to avoid rebalancing transaction costs that might otherwise occur if cash flows were naively allocated.

Suppose, for example, that a hypothetical fund were composed of four asset classes with the target allocations shown in *Display 48*. The fund happens to be currently underweight US large-cap equities by (3)% and US SMID equities by (2)%. On the other hand, the fund is overweight international equities by 4% and overweight REITs by 1%.

When the fund receives a cash inflow, how should that flow be allocated? A naive, but commonly used,[50] method is to allocate the cash flows to each asset class in proportion to its target allocation. While this approach may seem sensible, it is suboptimal and misses an important opportunity to rebalance the portfolio at no incremental cost. A superior method is to direct the cash flow to the asset class that is farthest from its target until either the cash flow is completely allocated or until two or more asset classes are equally underweight, at which point the remaining cash is split evenly among all equally underweight asset classes and the process continues.

The benefit of smart allocation can be seen in *Display 49*. To illustrate the effect, we assume that the hypothetical fund receives a cash flow of 10%. (Although it is unlikely for a fund to receive such a large cash flow in a single period, a fund is likely to receive such a cash flow in aggregate over a longer period, such as in a year.) Allocating the cash flow in proportion to the target allocation weight, the naive allocation method hardly moves the asset classes back toward their strategic targets, while the smart allocation method dramatically reduces distance of each asset class from its target allocation.

Display 48
Target and Current Allocations (Hypothetical)

Asset Class	Target (%)	Current (%)	Difference (%)
US Large-Cap Equities	48	45	(3)
US SMID-Cap Equities	15	13	(2)
International Equities	27	31	+4
REITs	10	11	+1

Source: AllianceBernstein

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[50] *The naive technique is not merely used in existing target-date funds; it is used by virtually every participant in a defined-contribution plan, since contributions are typically directed according to the participant's target allocation.*

Display 49
Allocating a 10% Cash Inflow

Distance from Target (%)

Source: AllianceBernstein

Display 50
Allocating a 10% Cash Outflow

Distance from Target (%)
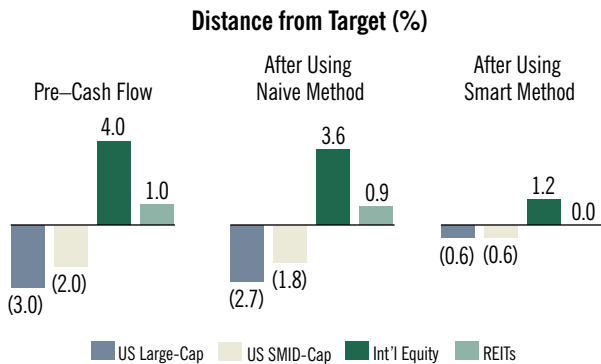
Source: AllianceBernstein

Moreover, using the naive method to direct cash outflows can actually move the asset-class allocations *farther* from their targets! For example, suppose the fund experiences a 10% cash outflow and each asset class must provide cash in proportion to its representation in the overall portfolio in order to fund the outflow. *Display 50* shows that each asset class actually moves farther from target: With fewer assets in the fund overall, existing variances from the strategic targets are magnified. Using the smart allocation method, cash outflows would be provided by the asset classes that are most overweight, again moving each asset class closer to its strategic target without incurring any incremental transaction costs.

Smart cash-flow allocation, when combined with disciplined rebalancing and a quarterly adjustment of the asset-allocation glide path, virtually eliminates unnecessary transaction costs that are incurred by less thoughtful methods. And as we've mentioned throughout this paper, even a few basis points of return compounded over many years can have a large impact on participants' retirement savings.

Enhancing Returns: Conclusions and Observations

We have shown that active management and unconventional but important operational techniques can help increase returns and, therefore, spending power in retirement.

- When the investment horizon is very long, small differences in return can make a huge difference: Adding one percentage point to annual returns could provide over 10 more years of spending. Thus, target-date retirement funds should seek extra return wherever possible.
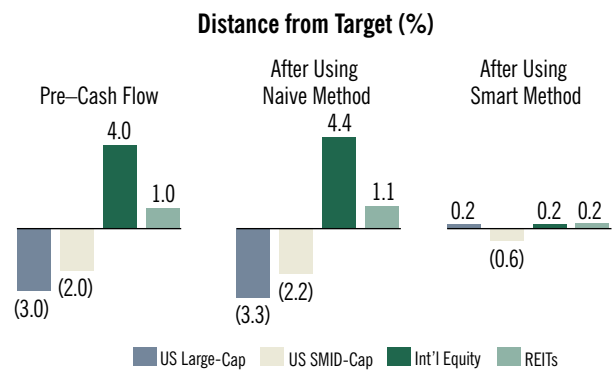
- There is no such thing as passively managed target-date retirement funds: Asset-allocation decisions during fund design are permanent active decisions.

- Skillful active management of the underlying portfolios in a target-date retirement fund—on its own—could generate the additional percentage point of annualized return needed to provide more than 10 extra years of spending; passive management of the underlying portfolios guarantees underperforming an index after fees. Thus, plan sponsors should devote the extra time and effort to identifying skilled active managers.

- Combining skilled active managers with distinctive styles significantly enhances the likelihood of consistent outperformance. Target-date retirement funds provide the ideal framework for such combinations.

- Efficient rebalancing can ensure that the portfolio remains near its policy asset allocation while minimizing transaction costs, by making trades only when the expected risk-reduction benefit exceeds the costs. Adjusting the strategic target weight each quarter helps avoid being forced to make larger rebalancing trades.

- Smart cash-flow allocation—directing cash flows to the asset classes farthest from their target weights—can reduce the need for rebalancing trades even more.

- Skilled active management and thoughtful efficient operations can provide extra return to participants that, compounded over long periods, can dramatically increase a participant's retirement savings.

MEASURING SUCCESS: PERFORMANCE BENCHMARKS

A perplexing problem for plan sponsors and consultants is how to assess the performance of target-date retirement funds. The traditional approach to performance measurement is to compare a fund's past returns to its stated benchmark or to a peer universe. Unfortunately, since target-date retirement funds are a relatively recent innovation, these traditional yardsticks of performance measurement, commonly used in the manager selection process in defined-benefit plans, are not well developed.

But the real challenge is that performance in a target-date retirement fund is heavily influenced by the asset-allocation decisions. The fund manager's decisions in constructing the asset-allocation glide path have an enormous impact, as we have demonstrated. For this reason, so-called target-date benchmarks from index providers are of limited use: Unless a target-date retirement fund has *exactly* the same policy allocation as the benchmark, it is unclear what the relative performance means. If a fund outperforms the benchmark, is it an indication that the fund manager had good security selection or good asset allocation? Or is it an indication that the benchmark asset allocation didn't perform well in that period? The creation of these benchmarks entails *active* asset-allocation decisions. There's no reason to believe that those allocations should be held up as the standard.

We believe that the most useful measurement of performance, which will ultimately be adopted as a standard, is net-of-fee peer universe performance comparisons for different fund vintages. That is, the most useful and fair comparison of a "2045" retirement fund is against all other "2045" funds since it takes into consideration all levels of investment performance, from initial fund design decisions to stock selection to competitive fees. Indeed, this performance is what plan participants will actually experience and, therefore, is the most appropriate. In time, we expect plan sponsors and their consultants to develop methods of determining whether the recent performance of a given "2045" fund reflects enduring features of plan design and investment management, or whether the fund "got lucky," perhaps because recent market conditions played to its strengths.

Unfortunately, that observation doesn't help solve the question today. Until better metrics are available to help plan sponsors and their consultants compare and contrast various offerings, much of the decision will ultimately rely on quantitative measures of the performance of the underlying portfolios and qualitative analysis of additional aspects of the design, from the thoughtfulness of the asset allocation to the ability to deliver high-quality targeted communications and competitive fees. Manager assessment today is also likely to involve the fund company's experience with managing defined-contribution assets. We hope that the content of this paper will help plan sponsors and their consultants gain further insight into the design issues of target-date retirement funds and the relevant distinguishing characteristics that may not always conform to conventional wisdom. ∎

• In the near term, there is no easy way to compare the performance of competing target-date retirement funds. Assessments will need to look at several factors, including the asset allocation, performance of the underlying funds and the firm's experience in managing DC plan assets. In the longer term, plan sponsors should compare the performance of each fund vintage to its peer group, because that comparison most fairly factors in all investment decisions and fees.

BEYOND FUND DESIGN AND PORTFOLIO MANAGEMENT

Most of this paper has discussed the many considerations involved in designing and managing a target-date retirement fund to help the participant succeed in building enough savings for a comfortable retirement. This section will look at a few other elements we feel are needed to improve the success of defined-contribution plans: automation, choice of default option and communications.

Automated Enrollment and Default Options

Perhaps the single greatest step a plan sponsor can make in advancing its employees toward financial security in retirement is to adopt automated methods for enrollment, contribution and investments, accompanied by communications materials that help them understand the benefits (and the choices). Automatic enrollment and contribution systems can greatly boost participation and contribution levels.[51]

Another important decision the plan sponsor makes is to choose a default investment option. Here, the correct decision is less clear cut. It is certainly clear, however, that the most common default investment options by far—stable-value or money-market funds—are probably not the correct strategy for *anyone*, even retirees. It would certainly be hard to find a prudent financial advisor who would steer a 25- or 30-year-old (or even 60-year-old) employee to put all of his retirement money into a money-market fund. Target-date retirement funds, however, are explicitly designed to suit people of all ages. Offering a target-date retirement fund as the default investment option thus gives employees a far better opportunity to create the savings they need—and may thus go a long way to reducing plan sponsors' exposure to legal claims from employees that the fund failed to provide prudent investments, as defined by the Employee Retirement Income Security Act.[52]

Finally, excellent communications—from introductory materials to quarterly reports—are the employees' right and critical to the plan's overall success. They can influence whether employees participate, how much they contribute, the investment options they choose and whether they stick with a reasonable investment plan or let emotional reactions drive bad decisions.

The Communications Challenge

Crafting such communications is difficult, as shown by the large share of participants who don't use target-date retirement funds, or use them incorrectly. Only 6% of DC plan assets are invested in such strategies, compared to about 29% in money-market or stable-value funds.[53] And more than 60% of plan participants who do invest in target-date retirement funds have less than 40% of their DC plan assets in them, evidence that they don't understand that these broad asset-allocation funds are designed to be their central, if not their sole, investment (*Display 51*). Either communications about using these funds was not attempted, or it was insufficient.

The misuse of such funds probably arises because the investment manager and plan sponsor are essentially addressing two audiences with very different needs. The accidental investors in the plans must be addressed in very simple, brief and clear terms that won't overwhelm them or scare them off: They have a low tolerance for

Display 51

Proof of Poor Communications:
Few Investors Make Target-Date Funds Their Main Investment
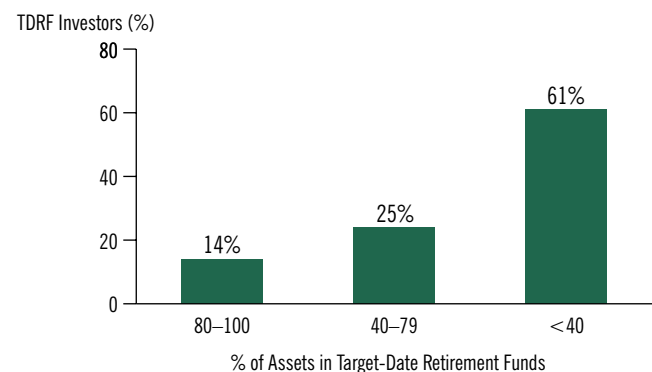
Results of an AllianceBernstein survey conducted in February 2005 of employees eligible to participate in their companies' defined-contribution plan; results are based on respondents who invest in target-date retirement funds.

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[51] *Information on the likely success of automatic enrollment is available in* "The Automatic 401(k): A Simple Way to Strengthen Retirement Savings" *by W. Gale, J. Iwry and P. Orszag in the* Retirement Security Project Report 2005-1. *Adopting automated methods to increase contributions can further enhance saving by helping individuals overcome their behavioral biases. See* "Save More Tomorrow™: Using behavioral economics to increase employee saving" *by R. H. Thaler and S. Benartzi,* Journal of Political Economy, *2004, Vol. 112, No. S1.*

[52] *See* Target-Date Retirement Funds and the Defined-Contribution Plan Sponsor's Fiduciary Responsibility *by D. Notto, 2005, AllianceBernstein.*

[53] *At year-end 2005, approximately 6% of 401(k) assets were in "premixed/lifestyle" funds according to* Trends and Experiences in 401(k) Plans 2005 *by Hewitt Associates.*

complexity and investment jargon. These participants need to know, above all, that these investments are simple for them to use.

The confident investors in the plan, by contrast, are willing to invest time and energy but will gain confidence in the fund only if they receive more detailed materials: They need to be shown that the funds are employing a thoughtful approach and to be convinced that the funds can produce better results than they themselves would produce on their own.

A Two-Pronged Approach

In our view, the solution is to take a two-pronged approach, always providing a simple, brief and clear overview with all of the crucial messages up front, followed by a more detailed, longer explanation of why the strategy is effective. The accidental investors will read the overview, and then probably stop. The active investors will read on.

In the plan offering documents, for example, the key points to make up front are that it's simple to sign up, it's yours (managed professionally to your retirement date) and it's designed to work over time to build savings and prolong savings through retirement. Additional materials targeted at the active investors would explain the overall strategy of the fund in somewhat more detail and include a detailed discussion of the asset allocation at different points in time.

Ongoing communications, such as quarterly reports, must be prepared with participants' likely reactions to market movements in mind. Decisions about personal investments are all too often influenced by emotions and subconscious biases that cause people to make poor choices. Dramatic headlines about events in a particular market, or poor performance in an asset class in which the portfolio invests, all too often lead investors to flee sound investments—perhaps to chase the latest fad.

When markets (or some portion of them) are roaring, the message must emphasize that all bull markets come to an end; thus, the fund is sticking by its asset allocation, rather than increasing risk by chasing the latest fad in hopes of an even higher return. When markets (or some portion of them) are dismal, the message must include a reminder that bear markets, too, don't last; thus, the fund isn't abandoning its asset allocation—selling low—to flee into the perceived safety of cash.

BASIC INVESTMENT PRINCIPLES THAT DC PLAN FIDUCIARIES MUST COMMUNICATE

- Regular contributions are necessary to build retirement savings.

- Choosing a good investment plan is critical to helping you build savings.

- Retirement savings are built by investing for the long term, not betting on near-term market movements: Chasing the performance of hot funds or stocks is a losing strategy.

- If you're primarily invested in cash, you're probably invested far too conservatively.

- If you're primarily invested in company stock, you're probably taking far too much risk.

- To reduce risk, you need to diversify by investing in a number of complementary asset classes.

- It is the performance of the whole portfolio that matters, not the pieces.

- In a well-diversified portfolio investing in several asset classes, something will always be out of favor. The performance of the individual parts should get back to, or close to, historical norms.

- Systematically bringing your portfolio back to its target asset allocation can add to return and reduce risk, by requiring you to sell high and buy low.

- Your risk and return objectives change over time as you age and approach retirement—and thereafter. You should reassess your asset allocation as you age, but not in response to short-term market movements. ■

Both groups need to be continually reminded that a target-date retirement fund puts them on a planned investment path for the long term. They should expect periods—sometimes lasting several years—in which their portfolio will decline in value. They should also expect periods, some equally lengthy, in which their portfolios will realize very large gains.

The message should reinforce the idea that the portfolio is being managed for the long term, with the participants' stage of life in mind. Implicitly or explicitly, it should counsel participants to stick with the fund.

Many of these points are among the *Basic Investment Principles that DC Plan Fiduciaries Must Communicate* on page 60. Communicating investment concepts such as diversification by combining low-correlation asset classes is quite challenging. But communicating these concepts is greatly simplified in the context of a target-date retirement fund, since the fund itself serves as an example. For example, the concept "You need to diversify by investing in a number of complementary asset classes" can be stated as "The target-date retirement fund offered in our plan was designed by investment professionals to invest in many different segments of the capital markets simultaneously in a sensible mix. This greatly reduces the chances of your portfolio incurring the sharp losses that often result from investing in too few market segments." Examples using the actual underlying strategies in the target-date retirement fund would show that while one component experienced a loss in the recent period, other components experienced gains, providing a much smoother pattern of overall returns.

Addressing Performance

Regardless of their level of investment knowledge, employees need to know how their retirement funds are doing. Plan sponsors should be wary of showing inappropriate or misleading benchmarks that send the wrong message. Comparing a target-date retirement fund's performance only to the S&P 500, for example, would doom most funds to appear unsuccessful in periods when bonds underperform stocks—or when foreign equities lag US equities (since part of the portfolio will be invested in bonds and foreign equities). Similarly, comparing the fund to just the Lehman Aggregate might cause the fund to appear unsuccessful in years when equities underperformed bonds.

Furthermore, since the asset mix changes over time in a target-date fund, choosing a single benchmark isn't meaningful. A simple alternative is to show the performance for two benchmarks, one equity and one bond, to help participants understand that their portfolio is performing more like stocks (for younger savers) or more like bonds (for retirees). Showing recent market performance in historical context also helps give employees a broader view of the market; it also reinforces the idea that what is hot today very likely won't be hot tomorrow and that their portfolio is designed to work over the long term.

A more detailed analysis might follow this simple performance overview, including comparisons of the fund's performance to other benchmarks, and perhaps including a customized benchmark for each target-date fund that uses the identical asset allocation as the fund, and the appropriate index returns for each of the underlying asset classes. This would help the more confident investors in the fund assess how much value the investment manager is adding or detracting.

Beyond Fund Design:
Conclusions and Observations

We have shown there are several other crucial steps a plan sponsor can take to help employees build retirement security. Most notably:

- Adopt automated methods for enrollment, contributions and investments;

- Make a target-date retirement fund the default investment option;

- Establish a two-pronged approach to employee communications, with distinct messages for confident and accidental investors, since each segment has distinct needs;

- Emphasize basic investment principles; a target-date retirement fund can serve as an example to illustrate many of them; and

- Provide recent performance of both stock and bond benchmarks, as well as their performance in different periods, to help participants understand how well their fund is performing and to reinforce that no single asset class always outperforms.

SUMMARY AND CONCLUSIONS

Janet Smith and the millions of Americans who have paid insufficient attention to their retirement savings need not despair: It is possible for individuals to build enough savings to fund even a lengthy retirement.

Increased participation and contribution rates are crucial. We applaud plan sponsors' recent efforts to encourage both—and we hope even more plan sponsors adopt automated-enrollment and contribution systems and require participants to opt out, rather than opt in.

Helping employees to make good investment choices is also crucial. Recent widespread interest in target-date retirement funds is a good sign; we recommend that sponsors make them the default investment choice.

But not all target-date retirement funds are created equal. These funds should be more than simple to use—they should be well-designed investment portfolios. As fiduciaries, plan sponsors should require nothing less. Our research based on historical data and our forecasts of future capital-market scenarios indicates that the low equity glide paths of most existing offerings create unacceptable amounts of shortfall risk in the saving phase and longevity risk in retirement.

The unique investment problem posed by retirement funds for individuals suggests that:

- The most important risk consideration for these funds is failure to amass enough savings prior to retirement and failure to provide sufficient growth to prolong spending throughout retirement.

- The particular kind of risk that matters most will vary over the participant's lifetime. Since asset classes may be risky in terms of one kind of risk, but safe in terms of another, these trade-offs must be deftly balanced.

- The likely pattern of cash inflows prior to retirement and cash outflows during retirement means that strong returns matter more in midlife (when there are more savings to compound) than in youth, and more in early retirement than later.

- Substantial equity allocations are needed throughout the saving years and into early retirement to generate sufficient growth, although they are likely to increase short-term market risk. Diversifying beyond US equities and US bonds can reduce the risk of capital losses due to adverse markets without sacrificing return unnecessarily. Thus, we advocate adding US SMID and international equities and REITs, and making equal allocations to growth and value within equity categories.

- Cash is a very expensive form of insurance, inappropriate even in target-date retirement funds for retirees. A core bond portfolio can mute equity volatility while providing significant return potential. In the late saving years and in retirement, inflation-protected securities are effective safeguards against inflation. In the retirement years, short-duration bonds are effective stabilizers.

- While asset allocation is the most important driver of return, active management of the asset classes within a fund could readily provide an extra 1% of annualized return; the multi-asset-class framework of target-date retirement funds is ideal for combining skilled active managers to produce consistent excess return. Efficient rebalancing and smart cash-flow allocation can enhance return even more. Together, all these techniques could provide 10 to 15 extra years of spending in retirement.

Finally, thoughtful targeted communications are crucial to increase enrollment and to help participants invest wisely. A dual approach with simple upfront messages targeted at the accidental investors, followed by more detailed materials to satisfy the confident investors, can greatly enhance plan success by making participants feel more secure and helping them stay the course.

Janet Smith had the foresight to seek the advice of a financial advisor to better understand her financial circumstances. But tens of millions of Americans who are less financially secure than Janet are making poor investment choices and not receiving adequate advice or alternatives.

We hope our insights into the retirement-savings problem can help plan sponsors and their consultants identify good investment solutions for participants, and thereby increase participants' likelihood of enjoying financial security in retirement. But neither plan sponsors nor their participants can expect to be successful without fund managers providing high-quality investment products; we also hope this paper helps raise the quality of our industry's offerings. ∎

ABOUT ALLIANCEBERNSTEIN

Knowing More. Using Knowledge Better.

AllianceBernstein is one of the world's leading institutional investment managers. Our worldwide presence, breadth of services and depth of research allow us to offer a full array of investment products, both global and local, in every major market. AllianceBernstein Institutional encompasses four preeminent investment brands: Bernstein value equities, Alliance Capital growth equities, AllianceBernstein core and style-blend services, and Alliance Capital Fixed Income.

Our Client-Centered Mission

• To have more knowledge and to use knowledge better than any investment firm in the world;

• To use and share knowledge to help our clients achieve investment success and peace of mind; and

• To place our clients' interests first and foremost.

Research Excellence

We believe that superior research is the ultimate source of superior investment returns.

In our view, superior research requires both knowing more and using knowledge better. Knowing more—having an information advantage over other market participants—requires doing deep fundamental and economic research with a truly global scope and being both accurate and innovative. Using knowledge better means identifying and exploiting pricing anomalies that can provide incremental return, employing portfolio-construction techniques to manage risk and return efficiently at various points along the efficient frontier, and customizing solutions to meet client-specific needs.

Our commitment to knowing more has led us to build one of the largest and broadest research footprints in our business. With more than 200 buy-side analysts operating in 12 countries, we cover thousands of securities in every meaningful capital market around the world. Our research effort is organized into separate groups dedicated to growth equities, value equities and fixed income, reflecting the unique needs of each investment approach. Our commitment to using knowledge better has led us to build a team of 38 quantitative buy-side analysts.

Disciplined Investment Processes

Our investment-management teams pay close attention to fundamentals and valuations and follow clearly defined rules for security selection and portfolio construction. This helps ensure that clients get portfolios with the characteristics and long-term performance patterns we said they should expect. Our robust risk-management and compliance systems provide a second layer of control.

Broad Array of Services

AllianceBernstein's services are designed to meet a broad range of client requirements. We offer value, growth and core/style-blend equity portfolios, with various risk/return goals and market-capitalization ranges, in developed and emerging markets. Similarly, we offer actively managed taxable, tax-exempt and max-after-tax fixed-income portfolios across the risk/return spectrum. We also offer balanced services. Our global platforms support single-country portfolios in the US, Canada, the UK, Japan, Hong Kong, Australia and New Zealand; European and Asian regional portfolios; and global portfolios including or excluding the home country.

Client Service and Communications

We recognize that client needs are varied. Our client-service and investment professionals seek to provide clients with the investment service that is best for them, sometimes modifying existing services to their specific requirements.

To give clients peace of mind, our client-service professionals provide personalized and timely service and access to our investment professionals in one-on-one meetings and via conference calls, conferences and an array of print and Web-based publications. Our content-rich communications explain the research basis for our portfolio decisions, our analysis of recent market developments, our market outlook and our other research findings.

A Global Leader

As of June 30, 2005, our firm had US$516 billion in assets under management, including approximately US$325 billion for institutional clients around the world. These clients include private, public and Taft-Hartley pension plans; foundations and endowments; insurance companies; central banks; and governments in more than 35 countries. We believe our range of services, global research coverage and ability to serve clients in virtually all parts of the world make AllianceBernstein a preeminent resource for institutional investors worldwide.

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