



AGENDA

RETIREMENT BOARD MEETING

INVESTMENT STRATEGY DEVELOPMENT
 WORKSHOP – DAY 1
 September 29, 2015
 9:00 a.m.

McHale Room
 Pleasant Hill Community Center
 320 Civic Drive
 Pleasant Hill, California

THE RETIREMENT BOARD MAY DISCUSS AND TAKE ACTION ON THE FOLLOWING:

1. Pledge of Allegiance.
2. Accept comments from the public.
3. Presentations regarding Investment Strategy Development.

TIME	TOPIC	PRESENTER
9:00 – 9:15	Workshop Overview: Agenda / Objectives / Ground Rules	S. Whalen
9:15 – 10:00	The Board's Role: Understanding Fiduciary Boundaries	H. Leiderman
10:00 – 10:30	The Importance of Guiding Principles: Developing a Statement of Investment Philosophy – Session I	S. Whalen
10:30 – 10:45	Break	
10:45 – 11:45	What Can We Do Better?: Identifying Institutional Investment Best Practices	A. Monk
11:45 – 12:30	Lunch	
12:30 – 1:30	Historical Attribution: Investigating the Sources of CCCERA's Investment Performance	S. Whalen
1:30 – 2:15	Know Thyself: Behavioral Biases and Their Impact on the Investment Decision-Making Process	S. Whalen
2:15 – 2:30	Break	
2:30 – 3:30	It All Starts Here: Clearly Articulating Plan Goals and Constraints	E. Hoffman
3:30 – 4:30	The Importance of Guiding Principles: Developing a Statement of Investment Philosophy – Session II	S. Whalen
4:30 – 4:45	Re-cap of Day 1 / Preview of Day 2	S. Whalen

The Retirement Board will provide reasonable accommodations for persons with disabilities planning to attend Board meetings who contact the Retirement Office at least 24 hours before a meeting.

4. Miscellaneous
 - a. Staff Report
 - b. Outside Professionals' Report
 - c. Trustees' comments

The Retirement Board will provide reasonable accommodations for persons with disabilities planning to attend Board meetings who contact the Retirement Office at least 24 hours before a meeting.



AGENDA

RETIREMENT BOARD MEETING

INVESTMENT STRATEGY DEVELOPMENT
 WORKSHOP – DAY 2
 September 30, 2015
 9:00 a.m.

McHale Room
 Pleasant Hill Community Center
 320 Civic Drive
 Pleasant Hill, California

THE RETIREMENT BOARD MAY DISCUSS AND TAKE ACTION ON THE FOLLOWING:

1. Pledge of Allegiance.
2. Accept comments from the public.
3. Presentations regarding Investment Strategy Development.

TIME	TOPIC	PRESENTER
9:00 – 9:15	Introduction to Day 2	E. Hoffman
9:15 – 10:15	Understanding the Role of Asset Classes in an Institutional Investment Portfolio	E. Hoffman
10:15 – 10:30	Break	
10:30 – 12:00	Investment Strategy Selection Stage 1: Asset/Liability Study	S. Whalen
12:00 – 12:45	Lunch	
12:45 – 1:45	Investment Strategy Selection Stage 2: Enterprise Risk Tolerance Assessment	S. Whalen
1:45 – 2:00	Break	
2:00 – 3:30	Investment Strategy Selection Stage 3: Model Evaluation	E. Hoffman
3:30 – 4:00	Conclusion and Next Steps	S. Whalen

4. Consider and take possible action to accept new target asset allocation.
5. Miscellaneous
 - a. Staff Report
 - b. Outside Professionals' Report
 - c. Trustees' comments

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PERSPECTIVES

Murder on the Orient Express: The Mystery of Underperformance

Charles D. Ellis, CFA

Evidence increasingly shows that a “crime” of extensive underperformance has been committed in mutual funds, pension funds, and endowments. In a pattern reminiscent of Agatha Christie’s famous novel Murder on the Orient Express, an investigation leads to a surprising, if inevitable, conclusion: The usual suspects—investment managers, fund executives, investment consultants, and investment committees—are all guilty.

Agatha Christie—for many years, the world’s favorite mystery writer¹—perfected her guessing game for readers by creating a “can you solve it?” puzzle in *Murder on the Orient Express*: Clues pointed in many directions but gave no certainty. As the plot thickened, Hercule Poirot, the wily Belgian investigator, deftly guided readers to an eventually obvious conclusion: No *one* suspect was guilty—all the suspects were guilty.

The same reality may explain the persistent failure of institutional investors to achieve their ubiquitous but evanescent investment goal of superior results, or “beating the market.” The results are consistently disappointing, clues to the causes and leads to suspects abound, suspicions and evidence implicate a full array of possible culprits, any one of whom could be the perpetrator. However unintentionally, the “failure to perform” problem is made even worse by many funds² that aim very high, set inherently unrealistic expectations, and then take on higher-volatility managers because their recent performance looks “better.”³ Despite the statistical impossibility of more than one in four achieving top quartile results, a majority of funds—more than twice the top quartile objective capacity—solemnly declare this goal as their objective.⁴ (Lake Wobegon fans would not be surprised. Nor would behavioral economists whose research shows the famous 80/20 Rule at work in many self-evaluations. About 80% of people in group after group rate themselves “above average” as friends,

conversationalists, drivers, or dancers *and* in having a good sense of humor and good judgment and being trustworthy.)

Maybe it is just human nature to be qualitatively optimistic about ourselves. But investment results can always be quantified for objective analysis. Extensive and readily available data show that in a random 12-month period, about 60% of mutual fund managers underperform; lengthen the period to 10 years and the proportion of managers who underperform rises to about 70%. Although the data are not robust for 20-year periods, the proportion of managers who fall behind the market for this longer period is about 80%. At least as concerning, equity managers who underperform do so by roughly twice as much as the “outperforming” funds beat their chosen benchmarks, and so the underperformers’ “slugging average” is doubly daunting.⁵ New research on the performance of institutional portfolios shows that after risk adjustment, 24% of funds fall significantly short of their chosen market benchmark and have negative alpha, 75% of funds roughly match the market and have zero alpha, and well under 1% achieve superior results after costs—a number not statistically significantly different from zero.⁶

If our profession fails to deliver on its promises, negative consequences could be in the offing for us as well as for our patient, long-suffering clients. So, let’s look at the evidence to see why institutional funds have been underperforming.

The Evidence

Institutional funds underperform because their managers underperform—certainly not always

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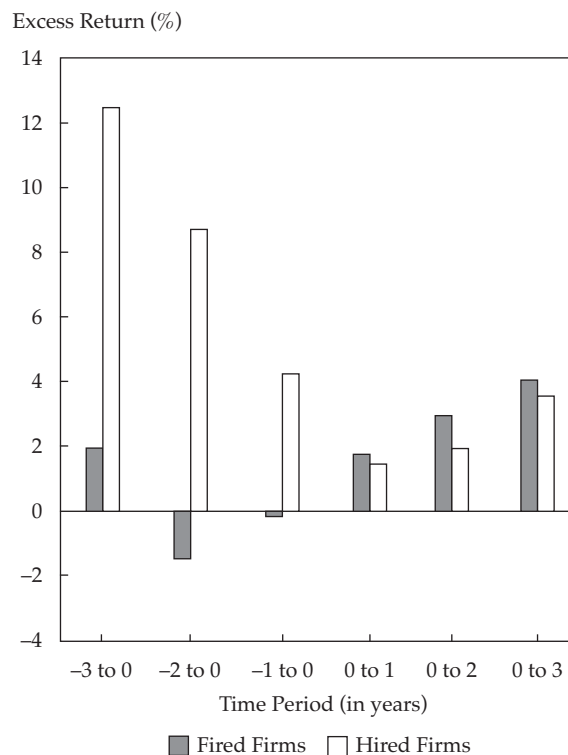
and certainly not all managers, but enough managers enough of the time to make the aggregate evidence undeniable.

Data from over 35 years of behavioral research on individual managers at institutional funds show that large numbers of new accounts go to managers who have produced superior recent results—mostly after their best-performance years—and away from underperforming managers after their worst-performance years.⁷ Another oft-repeated negative factor is moving into asset classes or subclasses after prices have risen and out of asset classes or subclasses after prices have fallen—moving assets in the wrong direction at the wrong time. This “buy high, sell low” pattern of behavior, so familiar to students of mutual fund ownership, also burdens institutional investors with billions of dollars in costs.⁸

Forensic evidence in **Figure 1** shows that institutional investors (pension funds, endowments, etc.)—despite their many “competitive advantages,” including full-time staff, consultants, and the ability to change managers and select those they consider the very best managers—typically underperform their chosen benchmarks. In a recent study of more than 1,000 institutional funds, the managers who were hired had achieved—over the three years before their hiring—significantly higher returns than the managers who were fired. (The to-be-hired managers produced substantial excess returns on domestic equities of 12.5%, 8.7%, and 4.3% annually over the three years.) However, for the three years after the new managers were hired, the fired managers achieved slightly higher returns than the new managers. This difference—repeated over and over—incurs two kinds of costs that accumulate through repetition. Significantly, what matters is not the cost of the trivial underperformance of the new managers versus the fired managers *after* the change but, rather, the substantial underperformance of the soon-to-be-fired managers over the years *before* the change.⁹

Ironically, once the hiring is done, almost nobody involved studies the process of hiring managers who later disappoint. Managers tell themselves that their poor runs were just “anomalies” and look forward, often with remarkable optimism, to better times ahead—and better results. Meanwhile, clients tell themselves that they got rid of the bad managers. As Socrates so wisely observed, “The unexamined life is not worth living.” Social scientists have observed that people with motivations to believe in their efficacy repeatedly “see what they believe in”—the illusion of validity—and so do not recognize even persistent shortfalls or failures. Although everybody knows that patrons of gam-

Figure 1. Excess Returns for Fired and Hired Investment Managers



Notes: All the differences between fired and hired managers before the firing are significant. The differences between fired and hired managers after the change are clearly indicative but not statistically significant. All data are for U.S. funds.

Source: Amit Goyal and Sunil Wahal, “The Selection and Termination of Investment Management Firms by Plan Sponsors,” *Journal of Finance*, vol. 63, no. 4 (August 2008):1805–1847.

bling casinos are, as a group, significant losers, the tables and slots stay busy. So, if neither clients nor managers examine or learn from their actual experience, the problem will continue.

If participants did examine their experience, they would see that one serious cost is the negative performance incurred by funds before they are finally provoked into taking action. This cost comes from the risks taken when trying to identify managers who *might* produce superior performance. But reaching for “star” managers and using past performance to identify which managers are likely to achieve superior future performance increase the odds of future disappointment because past performance—however compelling it may appear—cannot predict future performance.

Costs also matter, far more than most investors realize. Investment management fees are not “low.” Viewed correctly, such fees are actually very high. Over the past several decades, fees for institutional investors have risen from less than 1/10 of

1% to nearly 1/2 of 1% of assets for equity investments (less for fixed income and more for such “alternatives” as private equity and hedge funds). Because the client already has the assets and is thus looking only for returns, those same fees are actually more than 5% of *likely* returns—a more accurate recognition of reality.

But a new reality is a specter stalking active managers. The very small commodity fees charged for index funds that consistently provide market-matching returns at market-matching risk mean that active managers can only hope to deliver real value when they actually beat the market—which, we now know, most do not do, particularly over the long term. As a consequence, for active management, true fees—incremental fees as a percentage of incremental added value—are more than 50% of the value delivered by the more successful active managers and are far higher, even infinitely higher, for the many less successful active managers. Here’s why: The real marginal cost of active management is the incremental fee that active managers charge versus the incremental returns they deliver.¹⁰

Seen correctly, active management may be the only service ever offered that costs more than the value delivered. (Students of real versus apparent cost will remind us that the true cost of a puppy is *not* the cost of a dog nor is the payment to the boat broker the true cost of a yacht. On the latter, J.P. Morgan famously observed, “If you have to ask what it costs, you cannot afford it.”) Increasingly, clients are realizing that costs are at least a major part of the problem of underperformance—particularly in today’s intensely professionalized market. The cruel irony is that so many active managers are so skillful, hardworking, and capable that they collectively dominate the market and thus few, if any, can beat the crowd. Judging by overall investment performance, the record is *not* comforting.

So, institutional underperformance—in addition to the high fees and the costs of manager switching—involves three “weapons”: hiring managers late, firing managers late, and investing with managers and in asset classes that underperform. But we are still left with the question that Agatha Christie fans must try to figure out: who dunnit?

The Suspects

The investment profession is not lacking in possible suspects for the crime of systemic underperformance.

Investment Managers. After almost three decades of working on business strategy with major investment management firms in Europe, Asia, Australia, New Zealand, and North America,

it became clear that the main culprit *had* to be investment managers. Managers—knowing they are talented, hardworking, well trained, and dedicated—believe deeply in the value of their work (behavioral economists call this *familiarity bias*). The circumstantial evidence was substantial. During new-business presentations and in quarterly review meetings, virtually all managers gave in to the understandable temptation to present their performance records in the most favorable light. Their records were almost always “enhanced.”¹¹ For example, the years included in historical “performance” charts were often chosen mainly to make the best impression. In addition, the benchmarks against which the managers’ results were compared were often selected for similar reasons. Looking back, both the inconsistency of “relevant time periods” and the variety of benchmarks used were impressive. Even more disturbing is how many institutional managers still present their results *before* deducting fees.

Another “clue”: Investment philosophies and decision-making processes—no matter how complex they might be to implement—were all too often oversimplified, documented with “selected” data, and then crisply articulated as convincing “universal truths.” Both prospects and clients were led to believe that each manager had developed a compelling conceptual competitive advantage in the “battle for performance.” One aspect of client-manager meetings had an intriguing reality: Virtually every such meeting was a *sales* meeting. Of course, new-business presentations were also sales meetings. But then so were the quarterly review meetings. The managers’ unstated objective at every meeting was less about building a shared understanding of the uncertainties and difficulties of investing and more about “winning”—winning the account in a new-business competition or winning additional business when performance had been strong or winning a reprieve and retaining the account for a few more quarters when performance had been disappointing. No manager talked candidly with clients about how difficult investment management had become as company information and rigorous analyses had proliferated, competitors had multiplied, and information that had once been seen as a competitive advantage had become increasingly commoditized.

Realists would suspect that as much as investment managers might want to build their firms on the basis of superior performance, the more compelling motivation had become economic: to win new accounts and to keep old accounts while worrying about tomorrow. Client-manager relationships might have been much stronger if the skill

and resourcefulness devoted to getting clients to defer termination during periods of poor performance had been devoted instead to developing a realistic shared understanding of how difficult achieving superior investment results had become as markets became dominated by well-trained professionals, information proliferated, and computers, quantitative models, and research from experienced CFA charterholders became more widely available. After nearly three decades of “behind the scenes” experience with over 100 investment organizations of various sizes in several nations, I was increasingly drawn toward the suspicions of the realists.

A close examination of the competitive rankings of investment managers makes a compelling case: Over and over again—even when they had to know that continuing to produce such superior results would be terribly hard—managers made special efforts to go out and sell their services and win new accounts when their recent annual performance numbers were particularly favorable. Well, they *would*, wouldn't they? Realists recognized that those managers who worked hard to get new accounts when their results looked best *won* more business, and those who temporized skillfully during patches of underperformance *kept* more business. So, if investors were asked “who dunnit?” the evidence would point to the investment managers as being guilty of causing institutional underperformance.

Investment Consultants. On reflection, however, another group of suspects had to be considered: investment consultants. They are paid fees, usually on retainer, to monitor an institution's current managers and to help select new managers—after, of course, first helping clients decide to terminate underperforming managers. In the view of most institutions' busy investment committees, it has made sense to use an outside consultant whose profession specializes in evaluating hundreds of potential investment managers, systematically evaluating their “performance” numbers, regularly interviewing their key people, and rigorously comparing actual behavior with projections and promises. The outside expert—ostensibly dedicated solely to the client's best interest—is independent and is able to do a more extensive and intensive evaluation. Moreover, the stated cost of retaining a consultant is low compared with having internal staff do the work.

A realist would note that investment consulting is a business. Although consultants would like to achieve great results for their clients, business economics almost inevitably dominate aspirations

toward professionalism. Once the research costs of evaluating managers and compiling the database at an investment consulting firm are covered, the annual profitability of an incremental account is over 90%. And because well-managed relationships continue for many years into the future, their economic value is not this year's fee but, rather, the net present value of many years' future fees. Equally, over 90% of the net present value of any *lost* account's fees is lost to the firm's profits. So, the owners of consulting firms pay close attention to their firms' business relationships, and the main priority of relationship managers is clear: never lose an account. Eventually, as consulting firms get larger, this business priority naturally dominates compensation and promotion for every on-the-line consultant.

Given the great difficulty of the task, it would be naive to assume that any investment consulting firm could somehow consistently identify managers with superior *future* capabilities and skillfully terminate those about to disappoint. It would be far better for the consulting firm to build a strong defensive position by encouraging each institutional client to diversify its fund across various asset classes and to have multiple managers in each category. On both dimensions, “the more, the merrier” diversification protects the consultant's business by diversifying against the risk of any particular manager's performance difficulties doing harm to the consultant's relationship with his client (and future fees).

Of course, this hyperdiversification portfolio strategy led to client institutions paying higher fees and having a large number of different managers, which increased the chances of one or more managers' producing disappointing results. It also made the institution's fund executive and its investment committee all the more dependent on the consultant monitoring those numerous managers—plus the alternative managers who might be brought in when some of the current managers faltered or failed. Monitoring all those managers not only made the institution dependent on the consultant for information, but it also meant that no one manager was all that important to the total fund. The traditionally limited time of investment committee meetings—typically three hours once a quarter—was fully booked with reviewing the overall performance of the portfolio and reporting on a long list of specific managers, particularly those who were seriously underperforming. Keeping to the agenda left too little time for thorough evaluation of both the committee's own management of the manager process and the consultant's true added value.

Many consultants learned long ago the wisdom of following two practices with each client's investment committee. First, develop a particularly close, personal service relationship with the chair of the committee, which is easily done by increasing the frequency of research reports, report updates, e-mails, and phone calls to render impressively caring service. (A supplemental objective might be to develop nearly as close a relationship with the most likely *next* committee chair.) Second, investment consultants learned to present at selection finals only those managers who had compelling recent annual performance records and not to lose points by defending a "disappointing" investment manager. (Has *any* consultant ever presented a manager by saying, "While this manager's recent performance record certainly does not *look* favorable, our professional opinion is that this manager has weathered storms in a market that was not hospitable to her style and has a particularly strong team that we believe will achieve superior results in the future"?)

Consultants' *agency* interests—compensation for both consulting firm owners and individual consultants—are economically focused on keeping the largest number of accounts for as many years as possible. These agency interests are not well aligned with the long-term *principal* interests of the client institution. Although neither consultant nor committee really wants it to be that way, a separation of agency versus principal (or actual versus expected) behavior should have been anticipated.

Finally, after tracking which managers win accounts and which lose accounts each year—and then subdividing the records by consulting firm—the behavioral record indicates that consulting firms' clients have been hiring managers after their best years and firing managers after their worst years. So, the evidence points to this conclusion: The consultants did it! They are guilty of—or at least complicit in—the crime of causing institutional investors to underperform.

Fund Executives. Suspicion points in yet another direction—the institutions' own fund executives. One cause for suspicion is a curiosity: Fund executives frequently insist on having a separate account rather than investing in a pooled fund at a significantly lower fee—even though managed by the same firm using the same research and usually the same or similar portfolio managers. Separate accounts often make sense when investing in illiquid "alternatives," but the preference for separate accounts for "long-only" stock investing is a mystery. Although there are much-admired exceptions—in particular, several endowment CIOs with

extensive experience and strong professional staffs—many fund executives are disadvantaged. Often not deeply experienced in the complexities of investing, they are not highly paid, especially when compared with the front-line "socially dominating" representatives of investment managers.

Investment managers learned long ago to be represented always by socially dominant people—hunters—who are highly skilled at closing transactions and are paid many multiples of what fund executives are paid. Disparagingly called "gatekeepers," fund executives are almost always staff-minded processing people who must often feel "caught in the middle" between investment committees with too little time and investment managers with too much skill and experience at selling—and an absolute determination to win. Through no fault of their own, fund executives and their staffs are set up to be overwhelmed. Rather than carefully *buying* investment services, they are *sold* those services. And the easiest time to "buy" investment managers is at the peak of their firms' investment performance. So, a realist would be drawn, however reluctantly, to the grim conclusion that it is the fund executives who dunnit.

Investment Committees. During the past decade, a new kind of experience has provided me with another, better perspective on why institutional funds underperform. Having served on a dozen investment committees—in Asia, North America, and the Middle East—with funds ranging in size from \$10 million to \$300 billion, I can confidently state that the evidence points with remarkable consistency to yet another surprising culprit. With all their best intentions—both individually and collectively—the perpetrators of the crime of underperformance must be the funds' own investment committees.

Consider the evidence. First, many investment committees are operating in ways that do not reflect the substantial changes in investment markets that have made obsolete many of the traditional beliefs about investing—particularly those outdated beliefs still often held by senior people who serve on investment committees. However unintentionally, many investment committees have misdefined their objectives and are organized in ways that are counterproductive. As Shakespeare put it, "The fault, dear Brutus, lies not in our stars, but in ourselves."

Certain internal factors that inhibit fund committees "come with the territory." Many are not helpful. Most investment committees devote up to 10% of their limited time to administrative matters: reviewing minutes of past meetings, setting dates for

future meetings, and so on. Some 15–20% of their time is devoted to discussing the economic outlook and covering regulatory issues. Another 15–20% is spent reviewing managers' "performance" and comparing their fund's results with those of a peer group of funds. Usually, another 20% of the meeting time is devoted to presentations by two or three current managers who discuss the economy, the markets' outlook, their organizations' various perspectives on performance, their more interesting recent investments, and their look-ahead portfolio strategies. Always interesting and thoroughly documented, in combination, a series of these presentations by different managers can blend together in the memories of most committee members into one large "disassembled jigsaw puzzle" of data, concepts, opinions, and projections. What had seemed quite persuasive when first articulated can, in retrospect, seem confusingly jumbled together.

The committee then turns to the "real" work, often with the guidance of an investment consultant: considering the firing of one or two poorly performing managers among the dozens employed and hiring one or more among the three or four "finalist" managers evaluated and selected by the consulting firm from the dozens of managers monitored. Usually, the selected managers have had the most apparently compelling recent performance and have made the most persuasive presentations. Each finalist manager's team enters the room; its members thank everyone, often individually, for "this important opportunity." They pass out binders of 40–60 pages loaded with "gee whiz" charts of past performance, extensive statistics on the economy and the major investment markets, several sheets of "bullets" outlining the managers' core beliefs and investment concepts, a few compelling examples of their recent investment triumphs, and short "credential" biographies of several key professionals. Although sardonic humorists might point out that it is like trying to select a spouse via speed dating, committee members dutifully strive to do their best to keep up with the main themes of the presentations, remember specific points made, and make a judicious appraisal of the capabilities of the complex organizations being presented, all before the meeting time has run out.

Committees tend to differ somewhat from one type of institution to another. For example, most endowment investment committees comprise experienced seniors who devote their time without compensation to impart their wisdom and experience because they care deeply about their institutions. Often, although they are important patriots of the institution and feel honored to serve, they are not always experts in contemporary investing. As distinguished seniors, participants are reserved in

demeanor, strive to avoid disagreement or confrontation, and, to ensure harmony, usually place their spoken views near the center of an emerging consensus. In addition to these challenging *qualitative* characteristics, endowment committees are often similar in such *quantitative* factors as meeting four times a year for three or four hours per meeting with little contact between meetings. Committee members are aware of the reality that the meeting time is fixed, the agenda is at least "full," and the chair is determined to complete all items by a pre-agreed time for adjournment.

Corporate pension committees tend to differ in several ways: Most are staffed entirely by internal executives representing such important parts of the sponsoring corporation as human resources, benefits administration, finance, and treasury. One or two investment staffers—typically young and serving on rotation for a few years for training purposes but not extensively experienced in the complexities of investing—often hope to rotate to a divisional controller's or assistant treasurer's position. Usually chaired by the vice president for finance, meetings are disciplined and the protocols of corporate deference to hierarchy are well understood. Committee meetings are shorter and more frequent than those for endowments. Open discussions on such theoretical subjects as how to evaluate investment managers or the reasons for skepticism about performance data are rare. Each agenda item has an explicit time limit, and the pace of meetings is expeditiously business-like.

Public pension fund committees have their own set of characteristics. They are large—often very large—to accommodate union representatives of such disparate employee groups as teachers, firefighters, police, and sanitation workers, as well as representatives of the government's budget office and treasury and of the mayor or governor. Many committees are new to investing and its many complexities and to the importance of managing risk as well as returns. Some also have two or three "public" representatives or are required by law to be open to the public, and some even broadcast their meetings on radio or television.

Almost all investment committees often labor under an array of handicaps, including the following:

- Believing performance data can provide useful information for evaluating active investment managers even though studies of past performance show that past results have no predictive power—except for the *bottom* decile. (High fees and limited capabilities tend to persist, and so seriously disappointing results tend to repeat.)
- Believing a primary mission of their investment committee is to select top quartile managers

who will significantly outperform even though the evidence shows that a majority of managers fall short of the market and almost none have outperformed by very much for very long.

- Staying with historically valid policies when circumstances have changed fundamentally.¹²
- Being prone to the constraints of both “group-think” and such aspects of behavioral economics as overreacting to recent events, being confirmation biased, and tending to ignore long-term norms.
- Being guided by an investment consultant whose advice may suffer from the very real agency problems discussed earlier.
- Making the double error of attempting to do too much of what they shouldn’t do (making investment *management* decisions) and thus having too little time for the important work they should do (providing good *governance*).

Governance should include the following: evaluating the supervisory capabilities of the fund’s internal management, understanding the real costs of actively managing investments, clarifying long-term objectives and short-term risk tolerance, developing realistic investment policies, determining the consistency with which actions fulfill agreed policies, and asking searching questions about the process followed by the fund’s operating management and its investment committee. The best committees help bring stabilizing, rational consistency to the emotionally draining work of managing long-term

investments in volatile markets and staying with chosen policies through periods of turbulence.

Conclusion

No matter how tempted investment committees may be—after objectively examining the accumulated evidence—to confess to causing underperformance, they are not entirely responsible. Investment committees *are* guilty, but they are not alone. They have accomplices. Investment managers, investment consultants, and fund executives are also guilty. No *one* suspect is guilty; they are *all* guilty.

But, in the “end-of-story” ironic twist so often enjoyed by Agatha Christie’s many readers, none of the four guilty parties is ready to recognize its own role in the crime. Each participant knows that it is working conscientiously, knows it is working hard, and believes sincerely in its own innocence. Indeed, nobody seems to even recognize that a crime has been committed—nor to realize that until they examine the evidence and recognize their own active roles, however unintentionally performed, the crime of underperformance will continue to be committed.

I thank Jim Vertin, Marty Leibowitz, David Swensen, Mark Lapman, Phil Bullen, John McStay, Lea Hansen, and Pat Woolf for their helpful insights.

This article qualifies for 0.5 CE credit.

Notes

1. Collectively, Christie’s 66 detective novels and 14 volumes of short stories have outsold all but the Bible and Shakespeare.
2. Funds include pension funds, endowments, and mutual funds.
3. Sociologists have documented that compared with the women men marry, the women they like to date wear shorter skirts and brighter lipstick and are less interested in cooking and knitting.
4. Yes, Virginia, there are investors with clearly superior long-term investment records—including Warren Buffett of Berkshire Hathaway, Jim Rothenberg of Capital Research, and David Swensen of Yale—but they are rare, invest very differently from the rest of us, and are seldom identifiable in advance.
5. Because Babe Ruth set a record for home runs, his simultaneous record for strikeouts is easily forgotten.
6. See Laurent Barras, Olivier Scaillet, and Russ Wermers, “False Discoveries in Mutual Fund Performance: Measuring Luck in Estimated Alphas,” *Journal of Finance*, vol. 65, no. 1 (February 2010):179–216.
7. Data collected by Greenwich Associates.
8. See Scott D. Stewart, John J. Neumann, Christopher R. Knittel, and Jeffrey Heisler, “Absence of Value: An Analysis of Investment Allocation Decisions by Institutional Plan Sponsors,” *Financial Analysts Journal*, vol. 65, no. 6 (November/December 2009):34–51. They estimated the annual costs to be in excess of \$300 billion.
9. Social scientists recognize a phenomenon called Ettore’s Law, which argues against changing lines when queuing for service. Most of us recognize the “teller’s line irony”: You change lines at the bank only to see your prior line somehow speed up just as your current line seems to slow down.
10. Another factor is the 1–3% cost to transfer the assets from the old manager to the new manager. These costs can never be recovered because they are permanent.
11. As Bing Crosby once crooned, they would “accent-tchu-ate the positive, e-lim-my-nate the negative,” and not “mess with Mister In-between.”
12. Pension funds continue to use high-rate-of-return assumptions in an economic environment with lower long-term prospects. Or, institutions continue to hold large bond positions even though interest rates are being driven to unusually low levels by the Fed in its determination to save the economy. Before the 1952 Accord, the Fed had also driven rates down; after the 1952 Accord, bondholders suffered major losses.

INVESTMENT POLICY AND THE COMPETENT STRANGER

Charles D. Ellis, Managing Partner, Greenwich Associates

Speech to the Empire Club of Canada
April 7, 1988

Investment policy does not enjoy much popularity. Almost everyone agrees that it is a "good" thing, but almost no one does anything about it.

An extraordinary paradox prevails in the field of investment, particularly professional investment. The paradox is that 99 per cent of all the efforts and energy and skill of investment professionals is devoted to a difficult, even disagreeable task in which they're very unlikely to be successful. And if successful, the success will be small and not long-lasting. Meanwhile, they spend less than 1 per cent of their time and effort on a task that takes very little time, is not very difficult, yet is nearly sure of success and brings good rewards.

The very hard, seldom-rewarded task is to "beat the market" by outsmarting and outworking the competition. The relatively easy and rewarding task is to determine each client's real needs and then set reasonable goals and structure portfolios that can and will meet them.

I plead with those who are not in the investment management field to have a greater degree of respectful distrust for those who are. They are wonderful people. They are brilliant. They are articulate and they have charm. They work very, very hard. And they have the best intentions. They truly want to win.

However, they have misplaced their bets and you-as their client-own the bets. I urge you to be cautious and skeptical. Moreover, I advocate that you do something about it.

First, let me tell you a little bit about investment management. There are three ways in which you might try to achieve superior results: one is physically difficult; one is intellectually difficult; and one is emotionally difficult.

Warren Buffet, John Templeton, Dean LeBaron and Warren Goldring and a very few others have staked out the intellectually difficult way of beating the market.

Intellectually difficult investing is pursued by those who have a deep and profound understanding of the true nature of investing, see the future more clearly and take long-term positions that turn out to be remarkably successful. We admire them, but only in retrospect. At the time of their doing their best work, we see them as misguided. We do not want to do what they are doing because it looks so unpromising.

Most of the crowd is deeply involved in the physically difficult way of beating the market. See if you don't recognize the physically difficult right away. They come to the office earlier; they stay later. They read a larger number of reports more rapidly. They go to more breakfast meetings and more luncheon meetings and more dinner meetings. They are on the telephone, making more calls and receiving more calls than all the rest. They carry huge briefcases home at night, determined to get ahead by reading more reports before the morrow. In every way they possibly can, they put enormous physical energy into trying to beat the market by outworking the competition. What they don't seem to recognize is that so is almost everyone else.

Being incapable of doing the intellectually difficult, and reluctant about the physically difficult, I have set about the emotionally difficult approach to investing. This straightforward, untiring approach is simply to work out the long-term investment policy that's truly right for you and your particular circumstances and is realistic given the history of the capital markets, commit to it and—here is the emotionally difficult part—hold on.

When your friends turn to you and say, "Wow! have I got an opportunity for you! This is a great time to buy!" be absolutely uninterested. And when they turn to you and say, "Oh, Lord, this is it. It's going to be one hell of a crash. Get out now while you can!" you must simply be not interested, absolutely sound asleep. No intellectual effort; no physical effort; but for most, emotionally far too difficult. It suits me just fine. It requires no great genius and no great brawn, but it works.

Now, what is investment policy and whose responsibility is it? First of all, just as war is too important to leave to generals, investment policy is too important to leave to investment professionals. And the reason is simple. Investment managers know a great deal about a great many things in investing—the economic outlook for every major nation, the earnings expected for dozens and dozens of companies, the prices of hundreds of stocks, etc. But their expert knowledge has nothing to do with the specific client. Yet setting sound investment policy depends primarily on knowing the

whole story of the specific client's financial situation, expectations and needs and the client's fears, constraints and goals.

Managers will be preoccupied by the demanding daily details of investing while clients' goals and needs are long-term. There's only one way to establish the right investment policy: it must be done by the client.

How can you be a superior client? First, know your own financial situation. Know your long-term goals. Know what your limits are. But be careful. Most people approach investments as if the right "solution" were mathematical, and their investment objectives rational. The objective factors are usually not the most important parts of the "best" investment policy. Experience teaches that the subjective and emotional factors are usually more important because the emotional errors-buying too high because of excessive confidence or selling too low because of excessive anxiety-do more harm than rational errors. So you need to know as well what is your emotional situation and what are your emotional constraints. What riskiness can you live with and live through? Can you hang on when the pressure is most intense and the data most compelling that you are clearly wrong? If not, recognize your own emotional realities-and learn to live well within them.

To become a superior client, you will want to study and understand the capital markets, how they behave over the short and long run, so you will never be surprised or shaken by their future behaviour. Benign neglect is vital to superior clienting.

Select the managers you admire, respect and trust as human beings. Here's the test: if their investment performance is poor for two or three straight years, would you gladly give them more money to manage? If your answer is not clearly in the affirmative, you should not choose that manager-you don't trust him enough. Encourage the managers when their recent results look poor, for they will desperately need it. And then be "reserved" when the current results look great-they don't need praise and applause when they've been lucky and the market's been with them.

Be sure that each manager understands your specific goals and your specific limits. To do this you really must put it in writing. Insist on regular and formal meetings. At these meetings, which need only take 15 minutes' time, restate your goals and constraints and ask, "is there any reason to change our specified goals or our defined constraints?"

Also insist on a careful restatement of the investment philosophy and decision-making process of the investment manager and ask, "Have you made any changes in your philosophy or your process?" If there are no changes, you then review the operation of the portfolio since the last meeting to be sure it matches agreed-upon policy. After this, the real meeting is completed. It shouldn't take more than 15 minutes to do all of the serious work because there really should be nothing "new" and nothing that's "interesting."

Commit yourself absolutely to the discipline of setting and adhering to sound policy. Avoid the many fascinating, enticing distractions that are so prevalent in investing and you will avoid a lot of trouble. In this way, you can assure the achievement of truly good performance: performance that really does meet the real goals of your specific fund.

Now, I'd like to offer you a short test: You are called by Mr. Mulroney to the Hill. He takes you aside and says, "if you will accept the mandate, your nation is going to send you on a secret mission. Your name will go down in history as one of Canada's great national heroes. You will be very safe while on your mission. But you will be gone for 10 long years, and for the entire 10 years you will be incommunicado.

"I have some good news for you," he goes on. "First, your family is being brought here in an hour to say goodbye and to wish you well. They will have been briefed about this mission and will be thrilled that you have been chosen.

"Second, I have retained the services of a highly competent investment professional. You do not know this professional. I regret to say she cannot come to Ottawa today, but we do have about an hour before your family will arrive and I have put pencil and paper in the next room. If you would just go into that room and take the available hour to write down for the Competent Stranger your complete investment policy, the Competent Stranger will implement your policy exactly as you state it. And when you return, the portfolio for which you have been responsible will be returned to you-having been managed faithfully by the Competent Stranger in accordance with your instructions."

Some test! Could you pass it to your own satisfaction? Of course, it's only a story. It's just to catch your attention. But if you are not able to sit down and write out in an hour's time what you are trying to do with your portfolio and how you intend to do it-in such a way that a competent and able professional could take those instructions and fulfil them-you should at least

consider making a serious study of your objectives, your risk aversion, the nature of the capital markets, your cash inflow and outflows, and the design of an investment policy that is truly right for the long term, for you. Being a superior client is not easy. It means taking an important responsibility and doing the work. But this is one investment that is guaranteed to pay off. I urge you to make the investment.



**PERSPECTIVES
THAT DRIVE
ENTERPRISE
SUCCESS**



SEPTEMBER 2015

Asset / Liability Study

Contra Costa County Employees' Retirement Association

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I. Introduction

Session objectives

- Develop intuitive sense of how different investment strategies impact the Plan's key metrics, including:
 - Funded ratio
 - \$ Contributions
 - Contributions as % of pay
- Understand impact of range of possible market outcomes
- Provide information to assist Board in developing its Enterprise Risk Tolerance
- Provide meaningful insight into the investment strategy selection decision

Asset / liability analysis is best used to evaluate the impact of broad strategic shifts, rather than small asset allocation adjustments

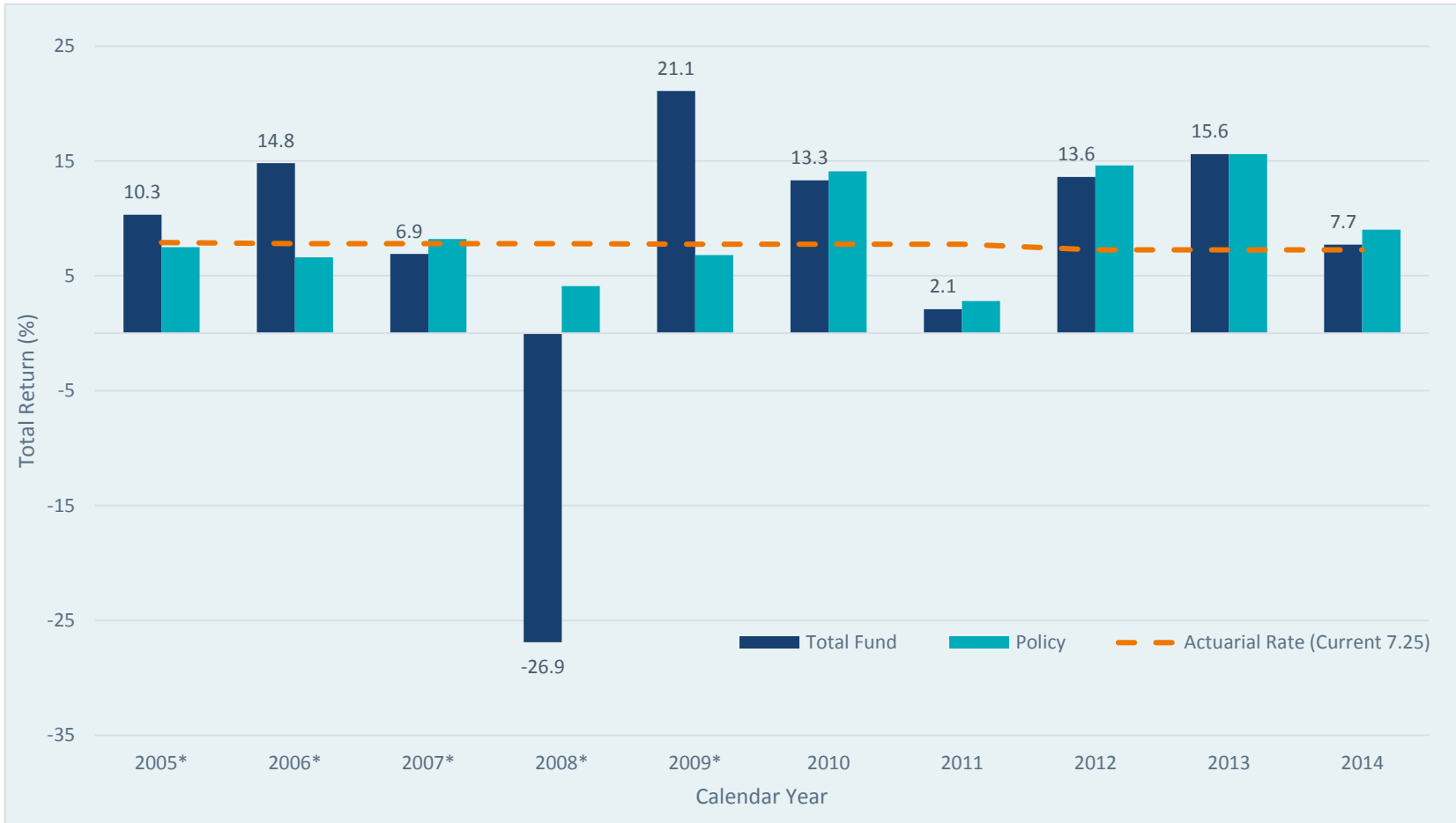
Summary Findings

- If actuarial assumptions hold, the Plan will become fully funded in 2024
- Over the 20-year projection period, net cash flow is expected to become increasingly negative
- Based on Verus' capital market assumptions, and nine alternative investment strategies:
 - Expected returns range from approximately 6% - 7% with expected volatility ranging from 10% - 13%
 - Equity risk exposure ranges from a high of 89% to a low of 63% for the most diversified portfolio
 - All investment strategies will do best to a high growth / low inflation economic environment with some, more diversified portfolios, having more sensitivity to other regimes
 - The investment strategies demonstrate a broad range of outcomes during times of historical volatility
 - The median forecasted funded ratios range from 94% to 100% (low outcome dispersion largely due to long UAAL amortization period)
 - The median forecasted employer contributions in year 10 range from \$193MM to \$230MM across the nine investment strategies
 - The median forecasted employer contributions as a percent of pay in year 10 range from 15% to 29% across the nine investment strategies

II. Historical experience

Total fund performance

	Trailing Returns for period ending 6/30/15				Calendar Years				
	1-Year	3-Year	5-Year	10-Year	2014	2013	2012	2011	2010
Total Fund	5.3%	11.3%	11.7%	7.1%	7.7%	15.6%	13.6%	2.1%	13.3%
Policy Index	4.0%	11.1%	11.8%	6.1%*	9.0%	15.6%	14.6%	2.8%	14.1%



CCCERA has outperformed the actuarial assumed rate in 7 of the last 10 years.

All returns are net of fees. Returns prior to 1Q 2015 were provided by the prior consultant.

*Policy Index for trailing 10-year and calendar years 2005 to 2009: CPI+4%

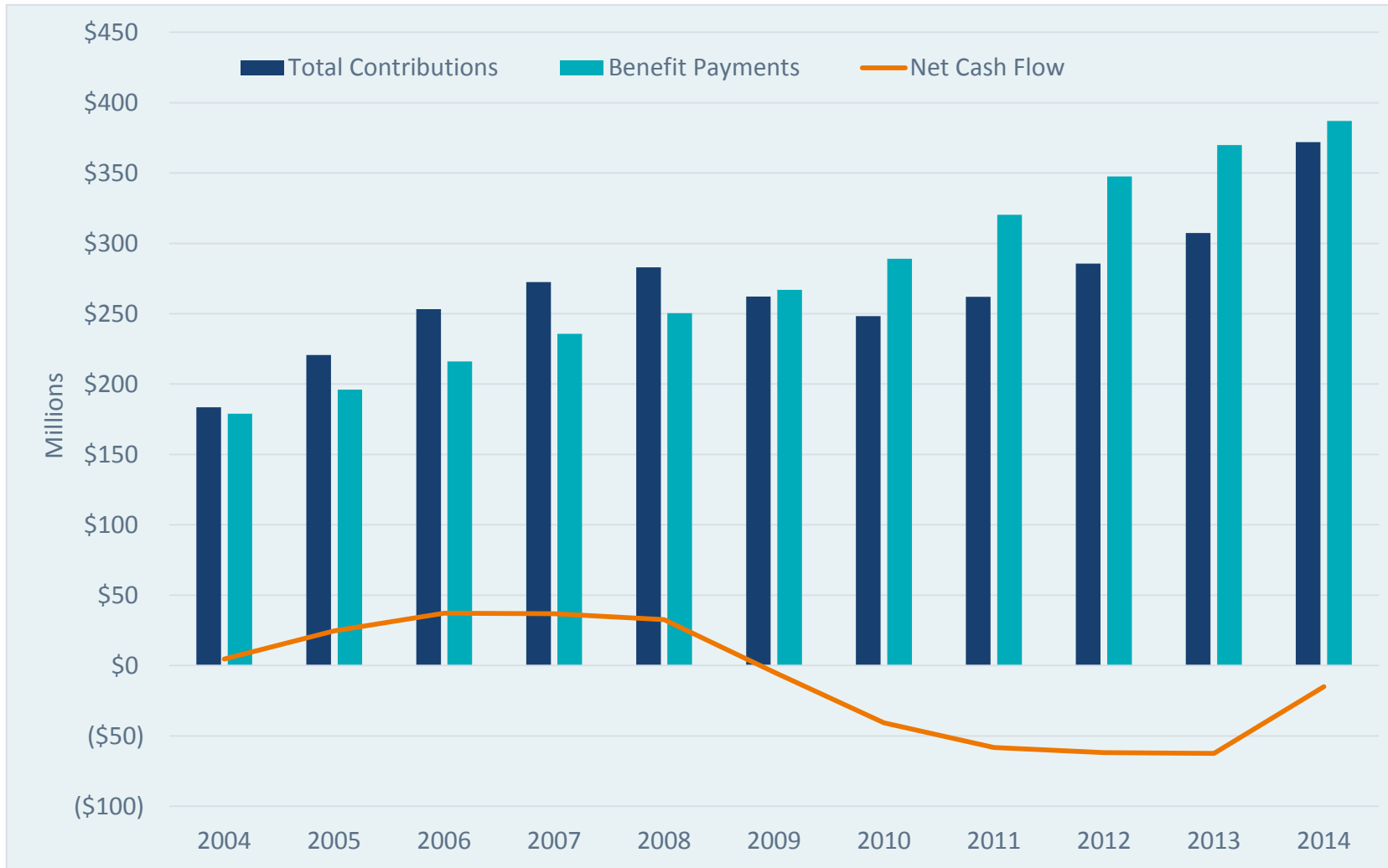
Actuarial valuations & market value funded status

HISTORICAL FUNDED STATUS



Source: CCCERA Performance Reports, Segal Actuarial Valuation Reports

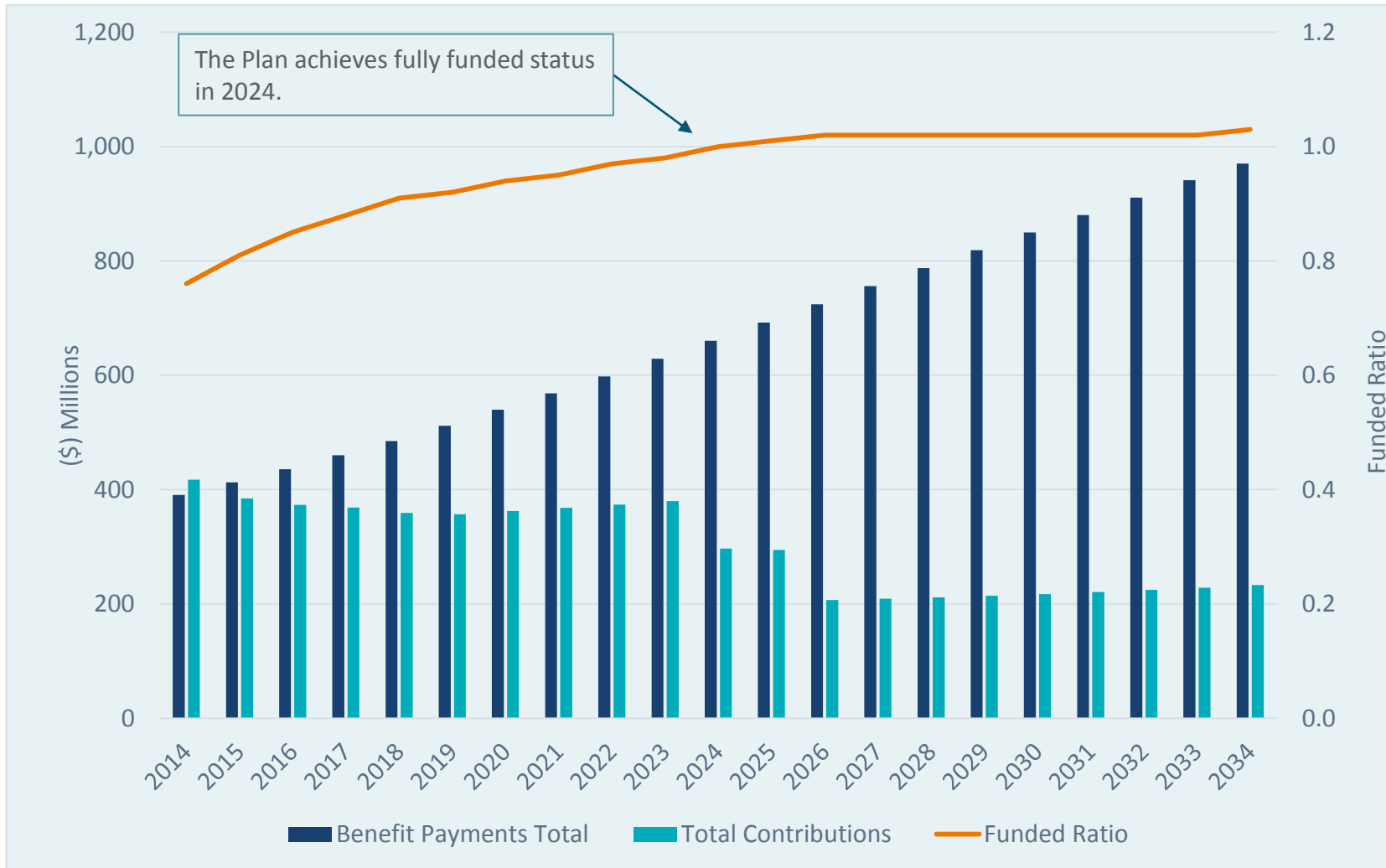
Contributions & benefit payments



The plan transitioned to net negative cash flow in 2009. But recently, the trajectory has turned up.

III. Deterministic Projections

Base case: the plan earns 7.25% every year for next 20 years



The Plan achieves fully funded status during 2024 if the base case were to hold true.

Notes: Contributions consist of employer and employee contributions. Funded status for all deterministic projections is based on the actuarial value of assets.

Funded status outcomes

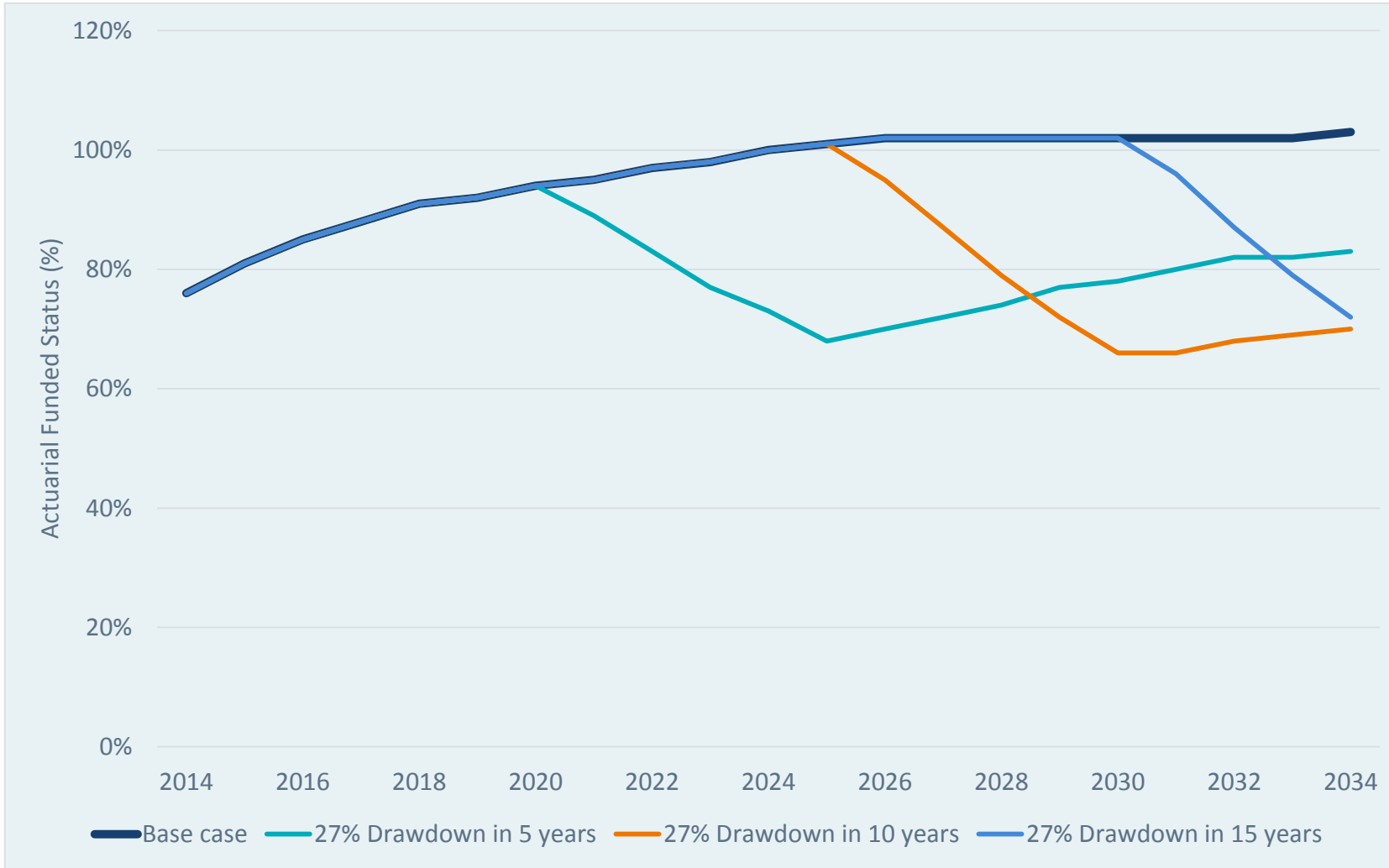
← Annual Returns →

	0%	2%	4%	5%	6%	6.25%	6.50%	6.75%	7%	7.25%	7.50%	7.75%
2014	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
2015	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
2016	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
2017	0.87	0.87	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
2018	0.87	0.88	0.89	0.9	0.9	0.9	0.91	0.91	0.91	0.91	0.91	0.91
2019	0.85	0.87	0.89	0.9	0.91	0.91	0.92	0.92	0.92	0.92	0.93	0.93
2020	0.81	0.84	0.88	0.9	0.92	0.92	0.92	0.93	0.93	0.94	0.94	0.95
2021	0.77	0.82	0.87	0.89	0.92	0.93	0.93	0.94	0.95	0.95	0.96	0.97
2022	0.73	0.79	0.85	0.89	0.92	0.93	0.94	0.95	0.96	0.97	0.98	0.99
2023	0.70	0.77	0.85	0.89	0.93	0.94	0.95	0.96	0.97	0.98	0.99	1.01
2024	0.67	0.75	0.84	0.88	0.93	0.95	0.96	0.97	0.99	1.00	1.01	1.03

These deterministic forecasts assume a 7.25% discount rate.

Funded status & drawdowns

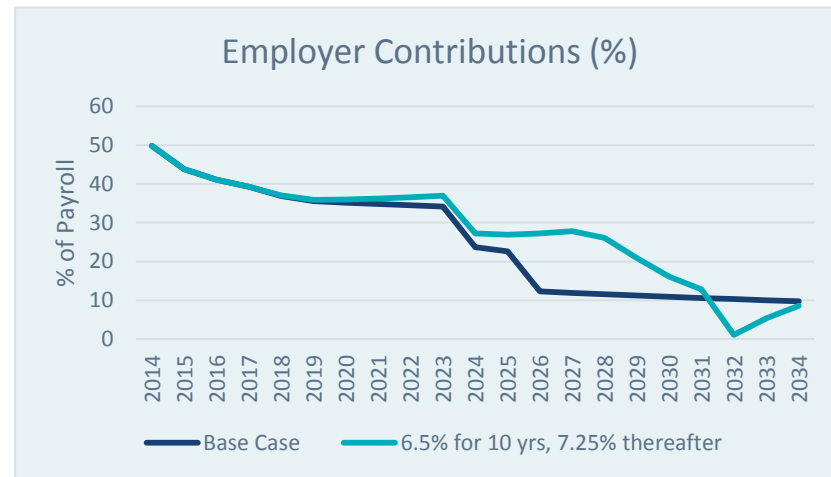
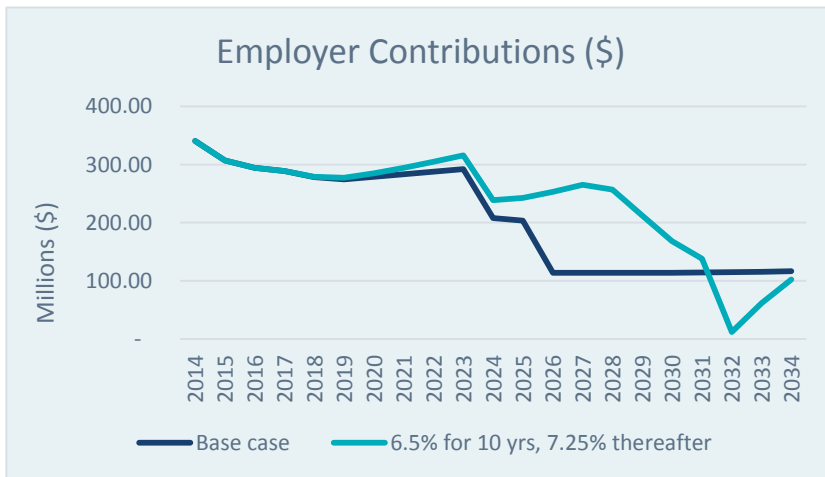
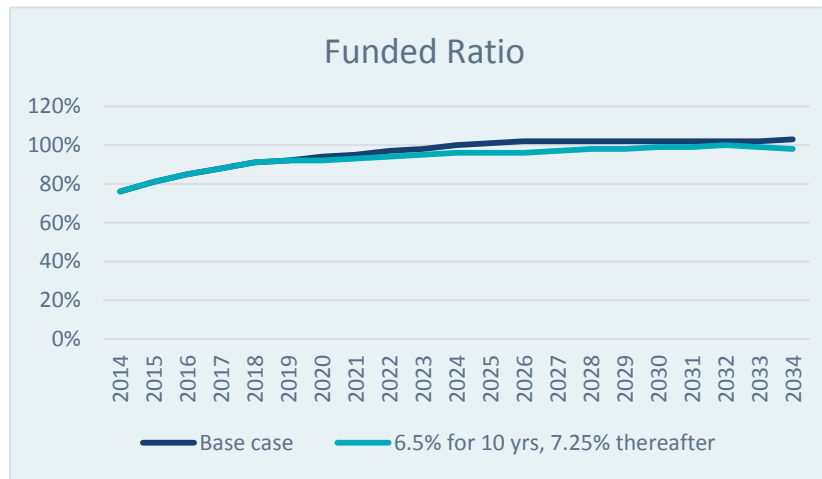
ACTUARIAL FUNDED RATIO



Experiencing “2008 type” drawdown event would set the plan back on its path to recovery

Assumes 7.25% in all non-drawdown years. Assumes no increases in contributions or benefit changes beyond what has been assumed. Also assumes all other actuarial assumptions are met.

Impact of 10-Year Performance Below Assumed Rate



Note: 6.5% is the expected rate of return for the current policy investment strategy over the next 10 years.

IV. Stochastic Projections

CMA Process

- Verus independently develops and publishes our Capital Market Assumptions each January for every major asset class.
- These assumptions are rooted in extensive research* and vetted by the firm’s Investment Committee following a comprehensive review process.
- The approach is predicated on a widely accepted “building block” method. (Low interest rates lead to below average assumptions, which is consistent with historical experience.)
- While we employ a very robust process, they represent “educated guesses” on what the future holds.

*The primary source of academia driving our CMA process is Antti Illman’s book, [Expected Returns](#).

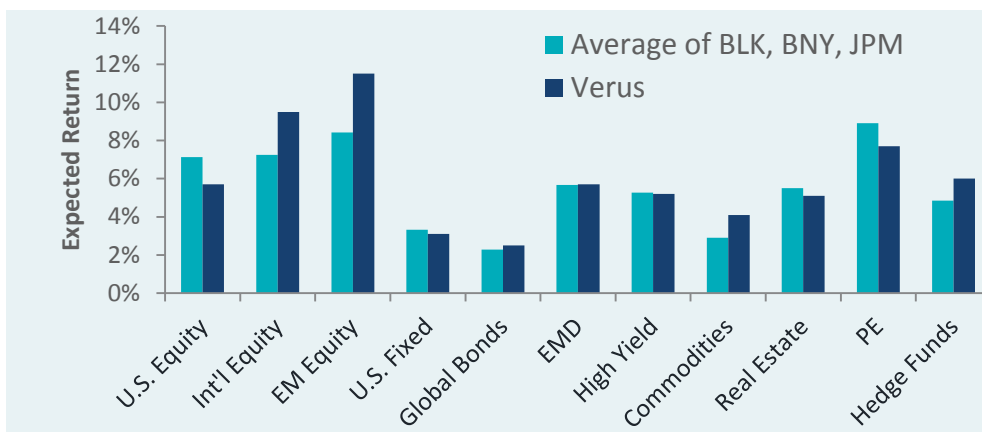
10 year return & risk assumptions

Asset Class	Index Proxy	Ten Year Return Forecast		Standard Deviation Forecast	Sharpe Ratio Forecast	Ten Year Historical Sharpe Ratio
		Geometric	Arithmetic			
Equities						
US Large	S&P 500	5.7%	6.7%	14.7%	0.25	0.47
US Small	Russell 2000	4.7%	6.5%	19.8%	0.13	0.4
International Developed	MSCI EAFE	9.5%	11.0%	18.2%	0.41	0.25
International Small	MSCI EAFE Small Cap	9.2%	11.0%	19.7%	0.36	0.32
Emerging Markets	MSCI EM	11.5%	13.9%	23.7%	0.4	0.4
Global Equity	MSCI ACWI	7.4%	8.7%	16.5%	0.32	0.35
Private Equity	Cambridge Private Equity	7.7%	10.2%	23.7%	0.24	1.07
Fixed Income						
Cash	30 Day T-Bills	2.1%	2.1%	0.6%	-	-
US TIPS	Barclays US TIPS 5 - 10	2.6%	2.8%	6.3%	0.07	0.47
US Treasury	Barclays Treasury 7 - 10 year	2.2%	2.4%	6.4%	0.01	0.65
Global Sovereign ex US	Barclays Global Treasury ex US	2.5%	2.8%	7.9%	0.05	0.18
Core Fixed Income	Barclays US Aggregate Bond	3.1%	3.2%	3.2%	0.31	0.96
Core Plus Fixed Income	Barclays US Corporate IG	3.8%	4.0%	5.9%	0.29	0.67
Short-Term Gov't/Credit	Barclays US Gov't/Credit 1 - 3 year	2.3%	2.3%	1.3%	0.17	1.09
Short-Term Credit	Barclays Credit 1 - 3 year	2.6%	2.6%	2.3%	0.22	0.88
Long-Term Credit	Barclays Long US Corporate	3.7%	4.3%	11.0%	0.15	0.55
High Yield Corp. Credit	Barclays High Yield	5.2%	5.8%	10.5%	0.3	0.61
Bank Loans	S&P/LSTA	3.7%	4.1%	8.7%	0.19	0.44
Global Credit	Barclays Global Credit	1.9%	2.2%	7.4%	-0.02	0.49
Emerging Markets Debt (Hard)	JPM EMBI Global Diversified	5.7%	6.1%	8.9%	0.41	0.72
Emerging Markets Debt (Local)	JPM GBI EM Global Diversified	6.2%	7.0%	12.9%	0.32	0.46
Private Credit	High Yield + 200 bps	7.8%	8.4%	10.5%	0.55	-
Other						
Commodities	Bloomberg Commodity	4.1%	5.7%	18.2%	0.11	-0.1
Hedge Funds	HFRI Fund of Funds	6.0%	6.4%	9.1%	0.43	0.29
Core Real Estate	NCREIF Property	5.1%	5.9%	13.2%	0.23	0.93
REITs	Wilshire REIT	5.1%	8.1%	26.4%	0.11	0.38
Risk Parity		7.1%	7.6%	10.0%	0.50	-
Inflation		2.1%	-	-	-	-

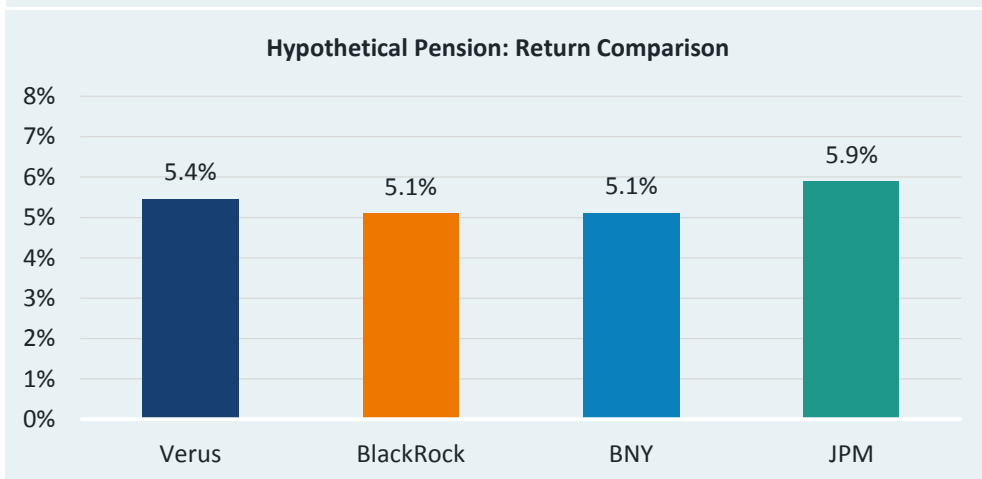
Investors wishing to produce expected geometric return forecasts for their portfolios should use the arithmetic return forecasts provided here as inputs into that calculation, rather than the single-asset-class geometric return forecasts. This is the industry standard approach, but requires a complex explanation only a heavy quant could love, so we have chosen not to provide further details in this document – we will happily provide those details to any readers of this who are interested.

Comparing return assumptions

We compared our 2015 ten year assumptions for major asset classes to those of some of the largest financial institutions in the world.



- We compared our 2015 assumptions to those produced by BlackRock, Bank of New York Mellon, & JP Morgan.
- 64% of the time, our forecast was more optimistic than the other firms.
- When comparing the average of all three firms, our assumptions were more optimistic in 6 of 11 asset classes.
- Comparing a hypothetical portfolio of 22.5% US equity, 22.5% int'l equity, 35% US fixed income and 5% real estate, Verus' expected return was higher than BlackRock and BNY by 30 basis points and below JPM by 50 basis points.



Data compiled by Verus. See appendix for details regarding Verus' 2015 capital market assumptions.

Investment models

	Policy	Current	Typical Peer	80/20	70/30	60/40	Risk Diversified 50/25/25	Risk Diversified 40/30/30	FFP
Equities	55	53.6	50	80	70	60	50	40	40
US Large							20	17.5	10
International Developed							15	13.5	10
Emerging Markets							5	4	5
Global Equity	42.6	45.7	45	80	70	60			
Private Equity	12.4	7.9	5				10	5	15
Fixed Income	31.2	31.1	35	20	30	40	25	30	35
Cash	0.5	0.6							5
US TIPS	1.3	2.3							
US Treasury							10	15	10
Short-Term Gov't/Credit									10
Global Sovereign ex US	1.25	1.4							
Core Fixed Income	19.5	19.1	35	20	30	40			
High Yield Corp. Credit	7.4	6.5					5	5	
Global Credit	1.25	1.2							
Emerging Markets Debt (Local)							5	5	
Private Credit							5	5	10
Other	13.8	15.3	15	0	0	0	25	30	25
Commodities	1.3	2.3	5					5	
Hedge Funds			5				5	5	10
Core Real Estate	8	9.4	5				20	20	15
REITs	4.5	3.6							
Total	100	100	100	100	100	100	100	100	100

Typical peer is based on BNY Mellon universe data of DB Plans > \$2 Billion

Investment model forecasts

	Policy	Current	Typical Peer	80/20	70/30	60/40	Risk Diversified 50/25/25	Risk Diversified 40/30/30	FFP
Mean Variance Analysis									
Forecast 10 Year Return	6.5	6.4	6.0	6.9	6.5	6.0	7.1	6.6	6.6
Standard Deviation	11.6	11.1	9.6	13.2	11.5	9.9	11.0	9.7	9.5
Return/Std. Deviation	0.56	0.57	0.63	0.53	0.56	0.61	0.64	0.68	0.70
Sharpe Ratio	0.38	0.39	0.41	0.37	0.38	0.40	0.45	0.46	0.48

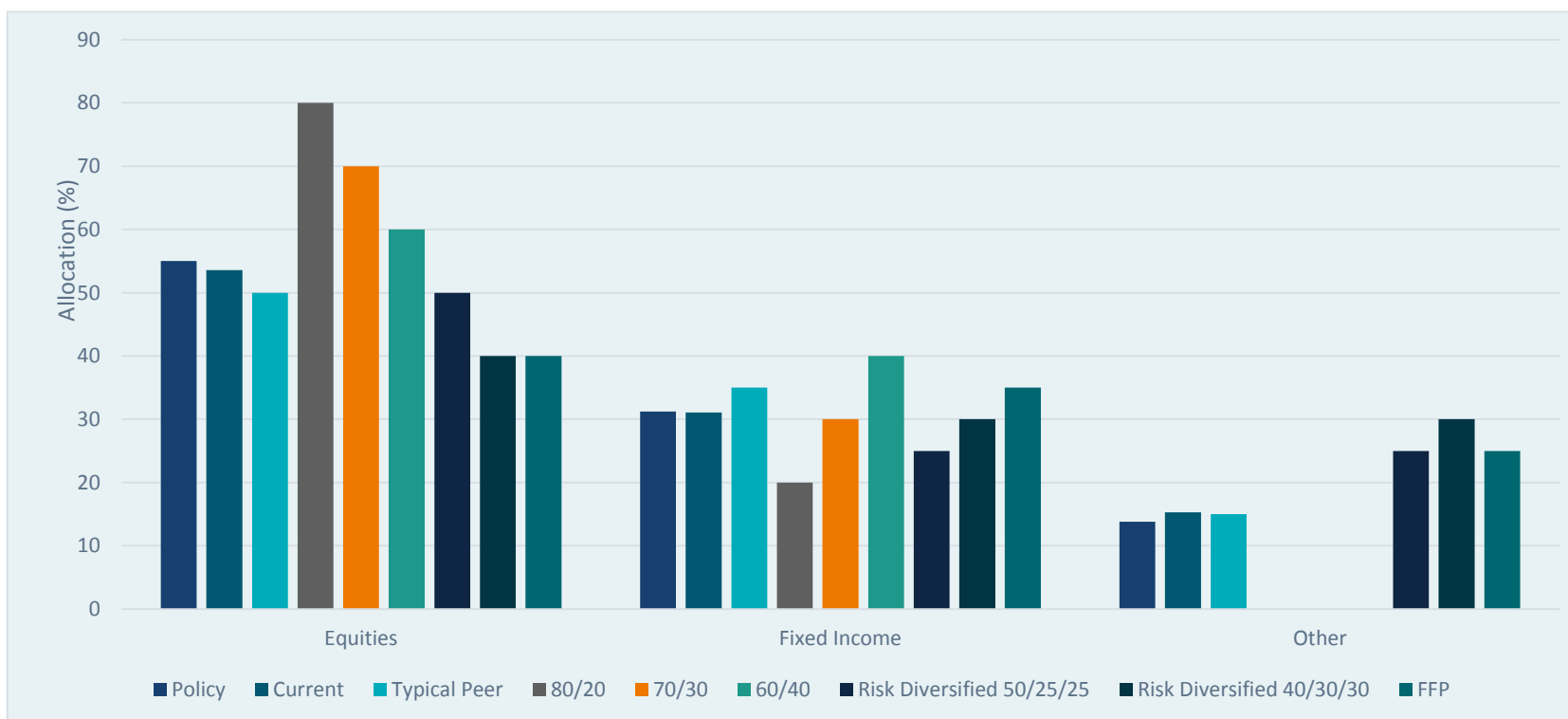
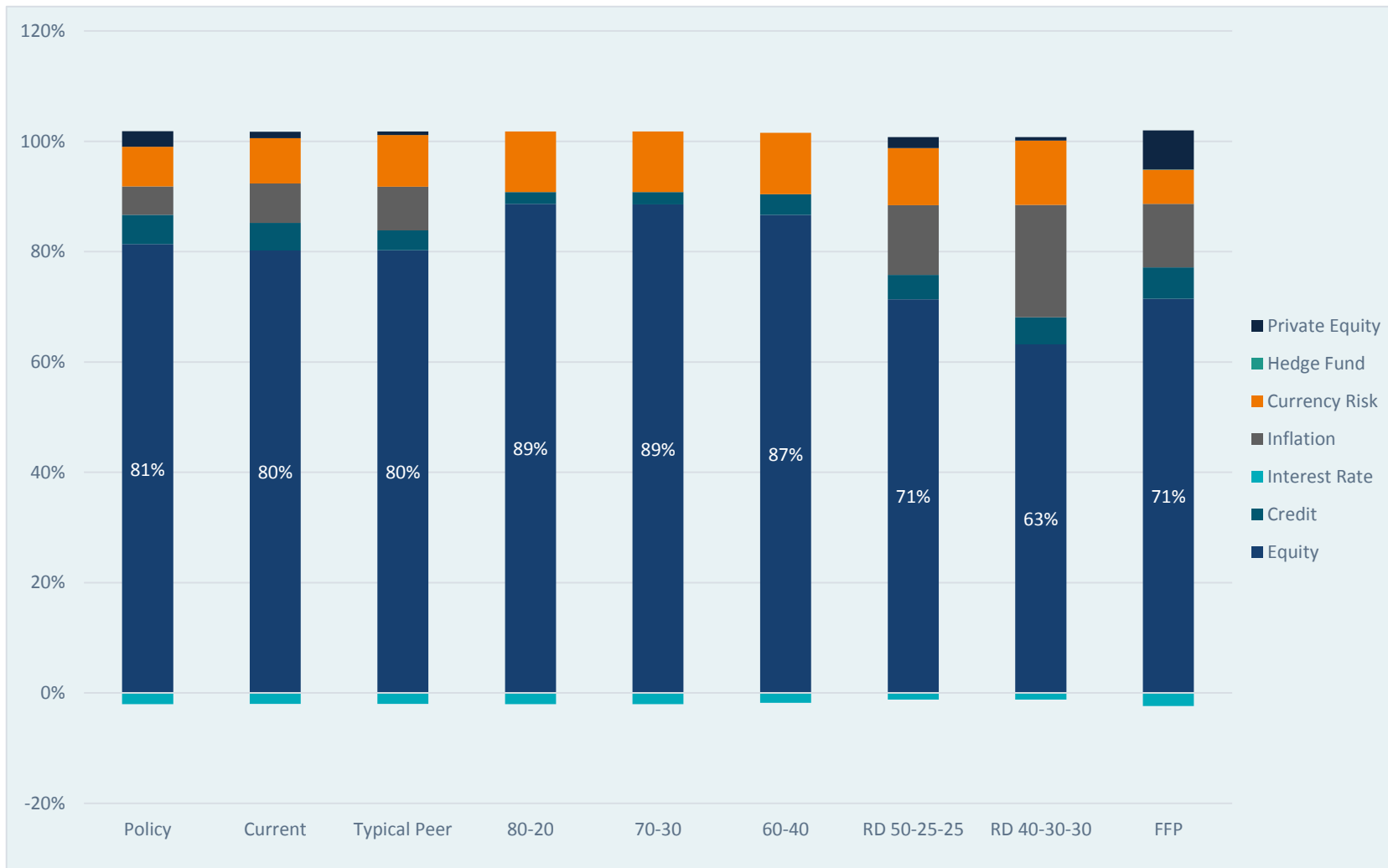


Chart note: Broad allocation buckets consistent with investment model table For example: equities includes private equity; fixed income includes private credit; other includes HFs, commodities, and RE. Mean Variance Analysis done in ProVal

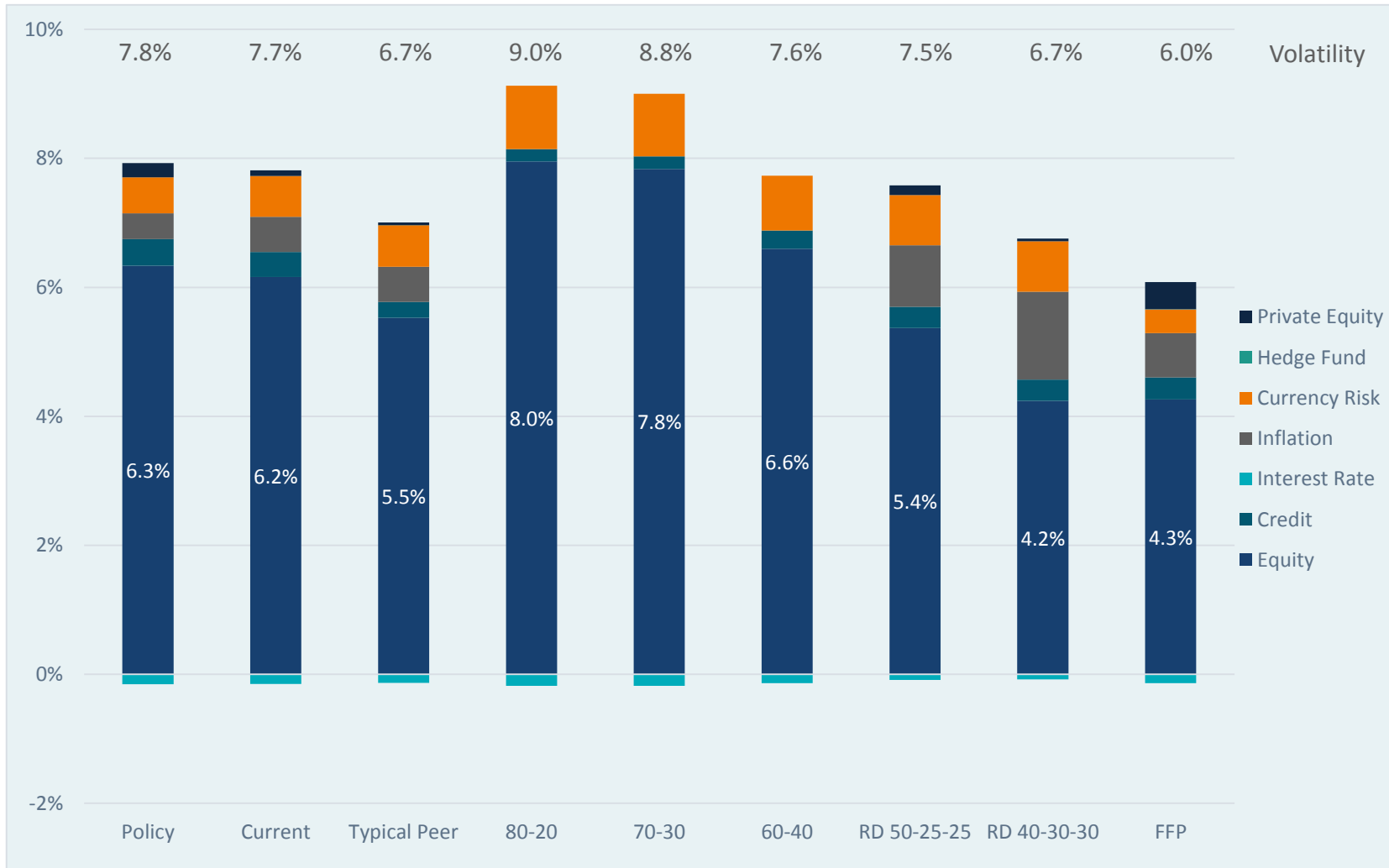
Risk decomposition



Source: MSCI BARRA

Note: Selection Risk is the risk attributable to unassigned factors

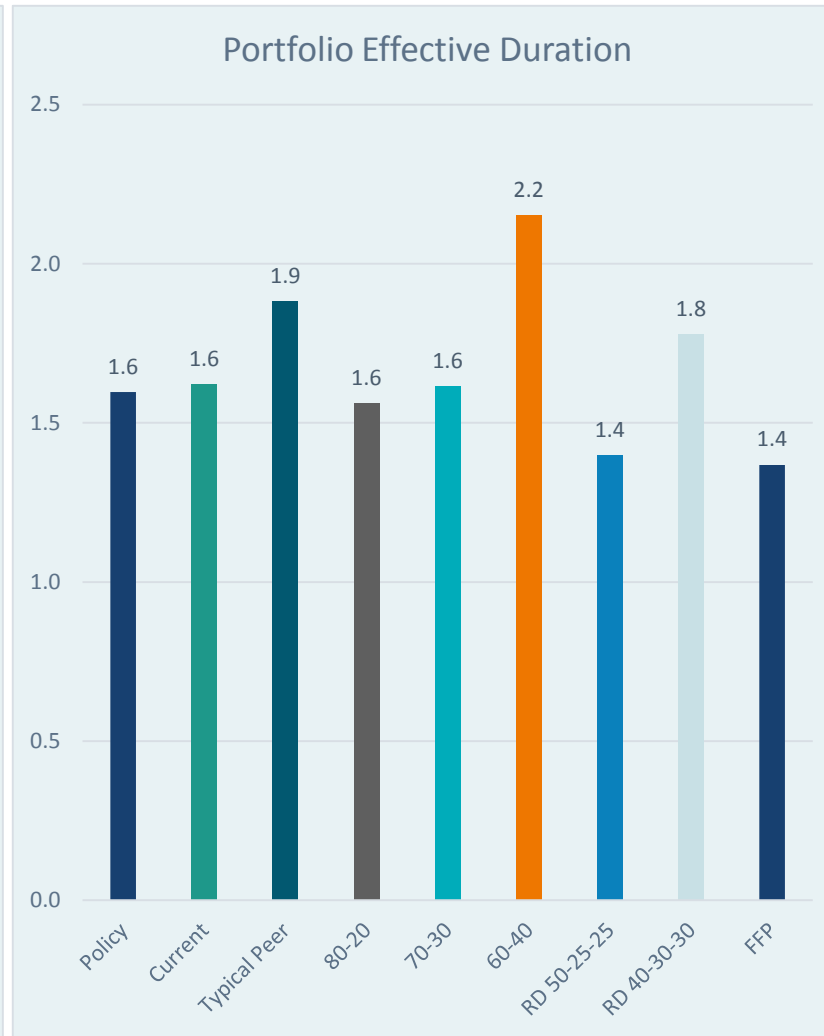
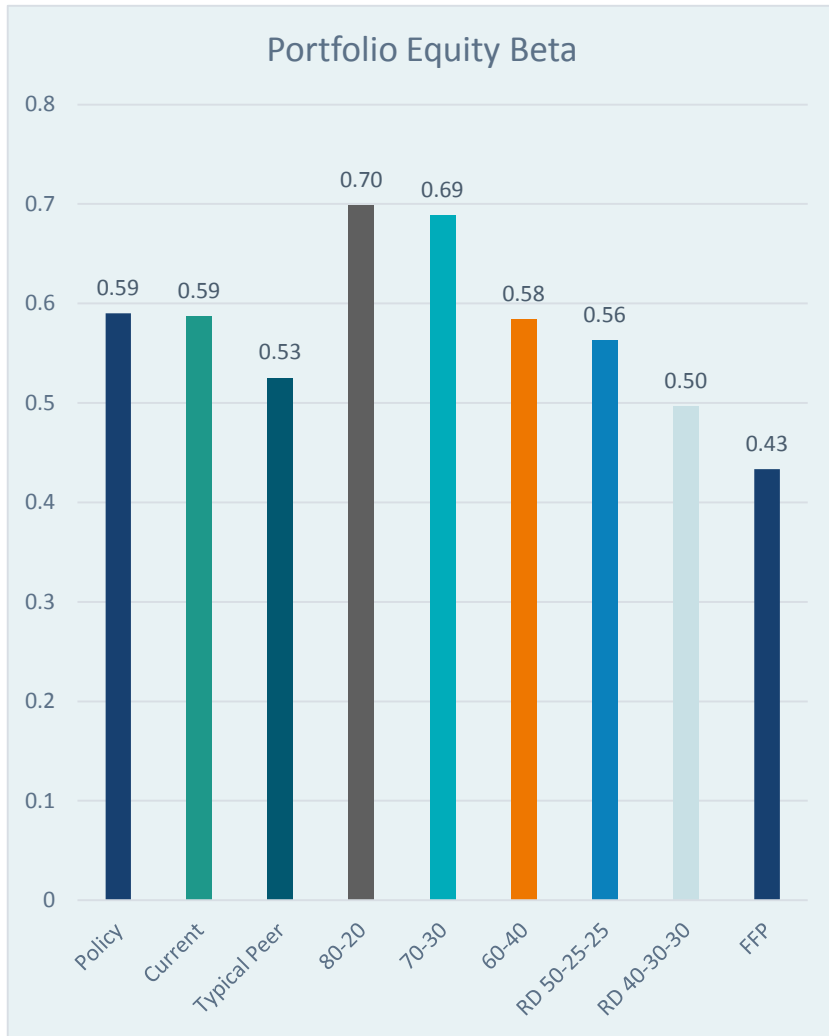
Ex-Ante Volatility



Source: MSCI BARRA

Note: Selection Risk is the risk attributable to unassigned factors

Sources of risk



Equity beta measures the sensitivity to the risks of the broad equity market.

Duration measures the sensitivity of the portfolio to a change in interest rates.

Source: MSCI BARRA

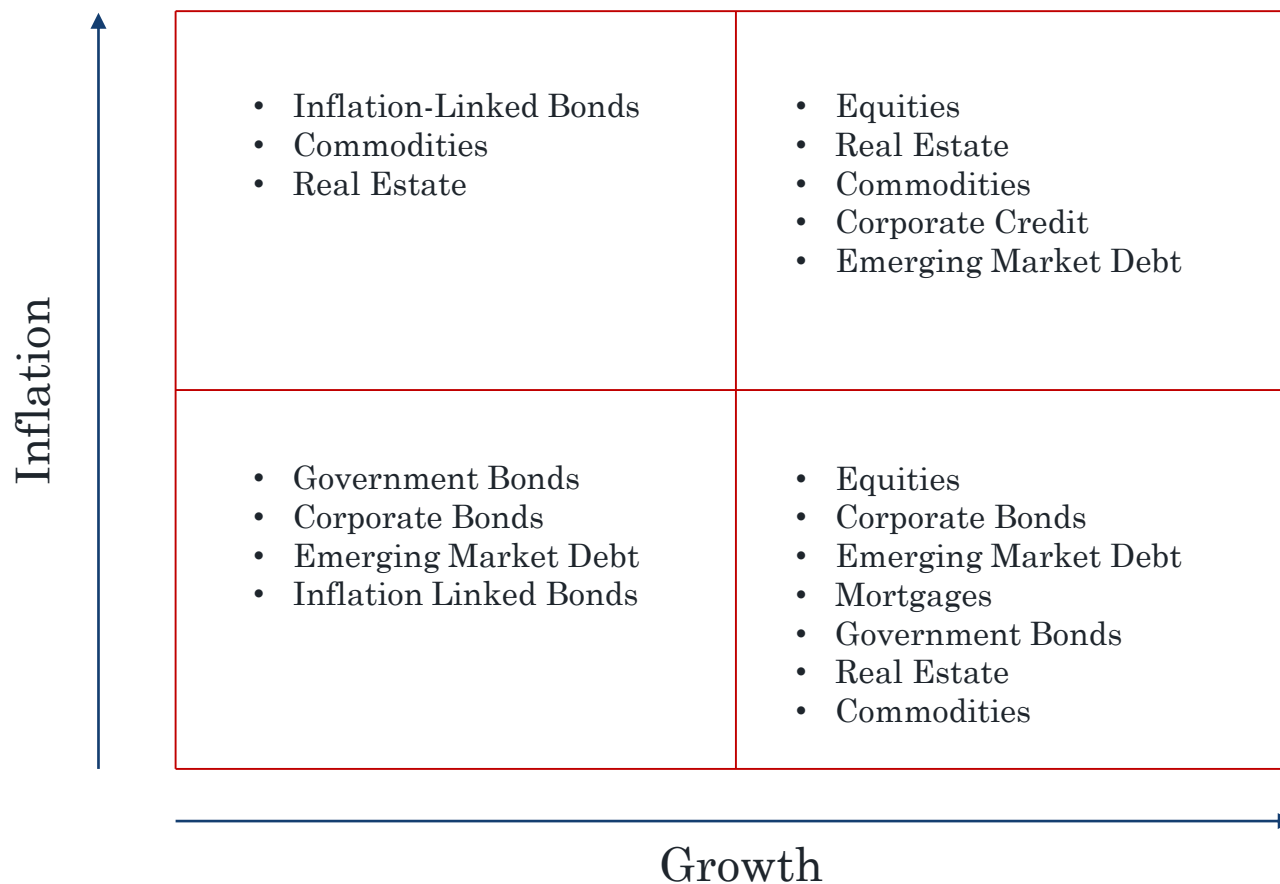
Active risk relative to typical peer



Active risk relative to the typical peer is measured as the tracking error of returns of each strategy to the returns of the typical peer

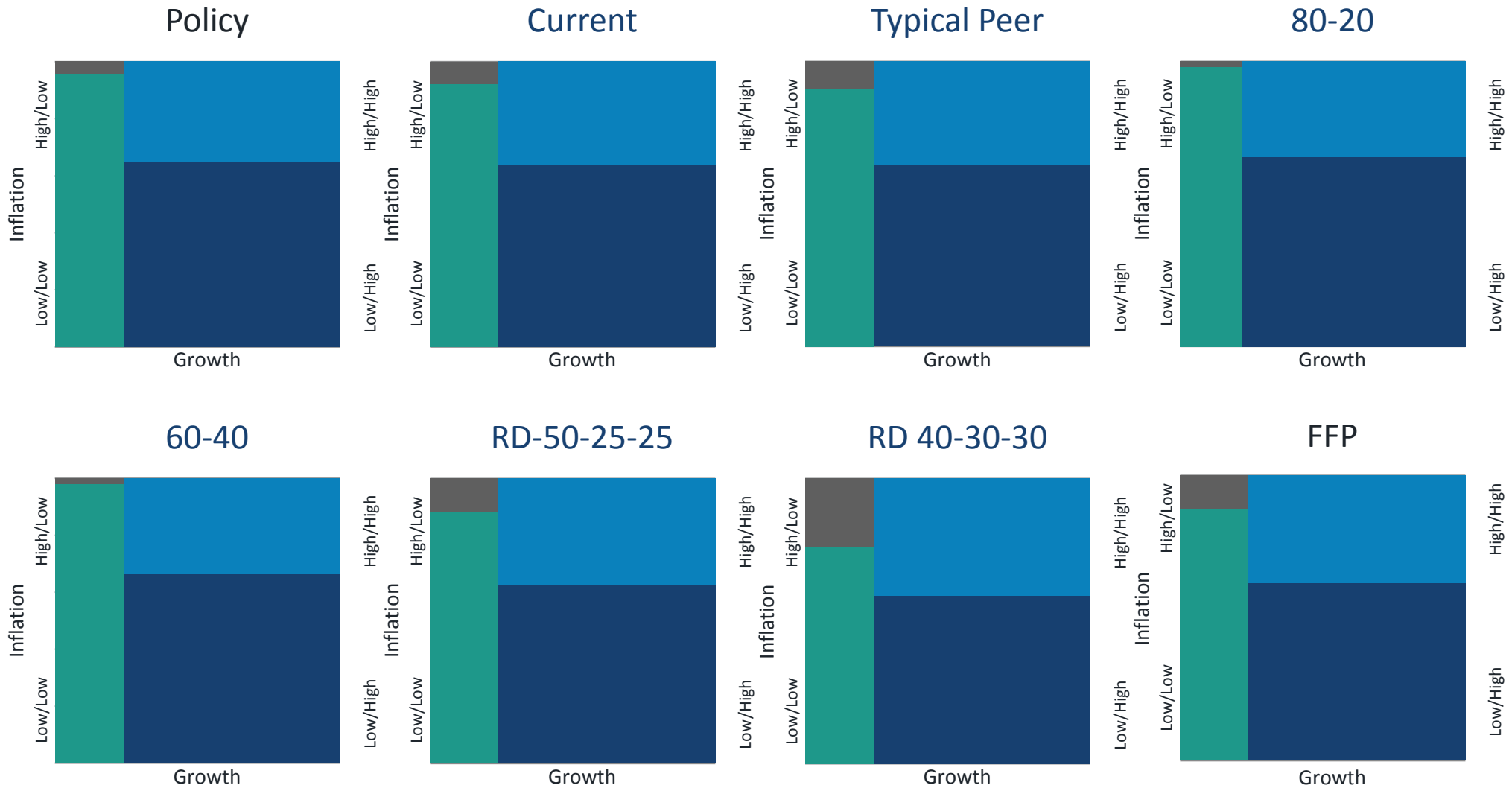
Typical Peer Allocation: 45% Global Equity, 5% Private Equity, 35% Core Fixed Income, 5% Commodities, 5% Hedge Funds, 5% Core Real Estate

Economic diversification and the role of asset classes

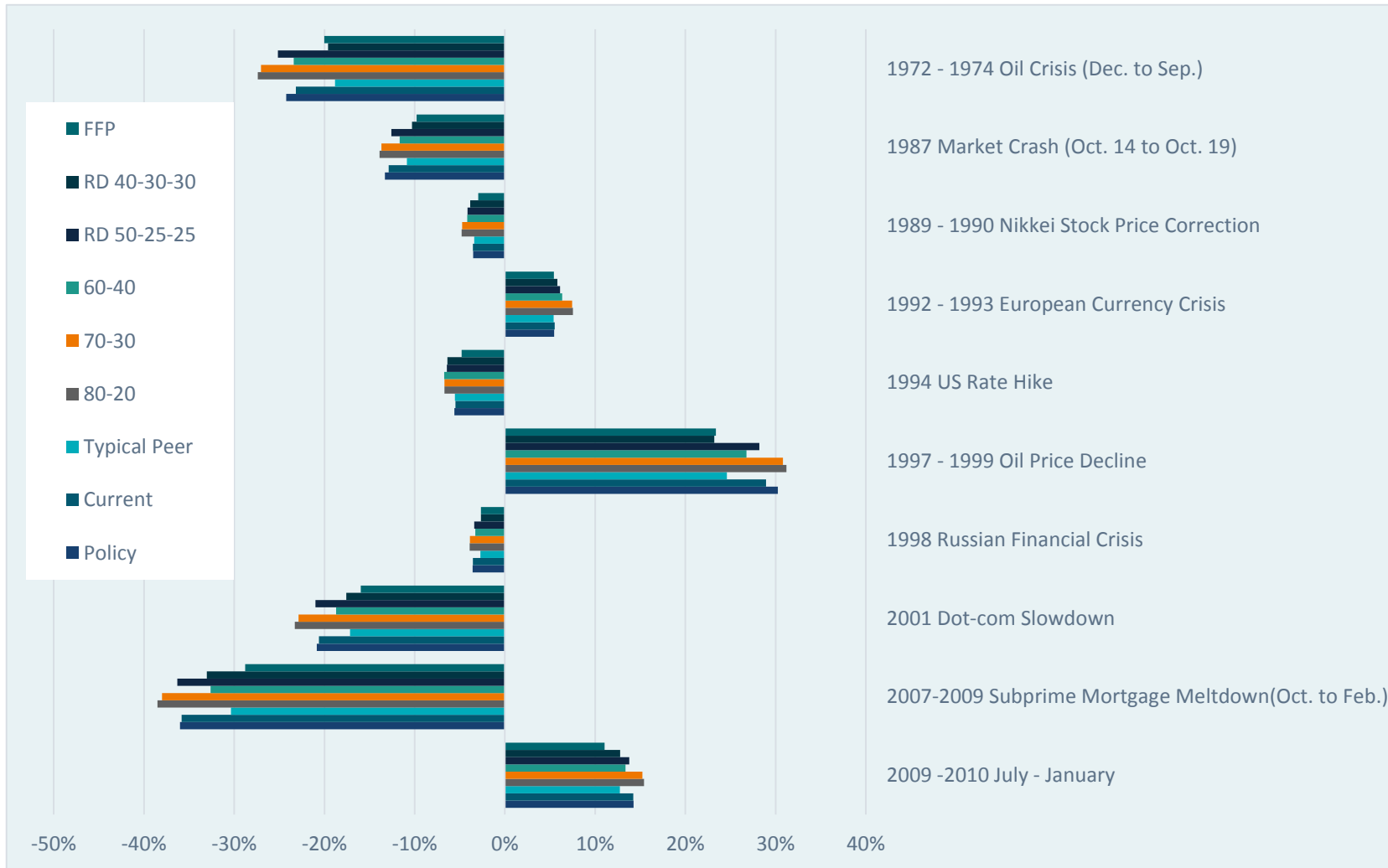


Economic diversification

Most portfolios have a bias towards high a growth / low inflation regime.



Scenario Analysis



Source: MSCI BARRA

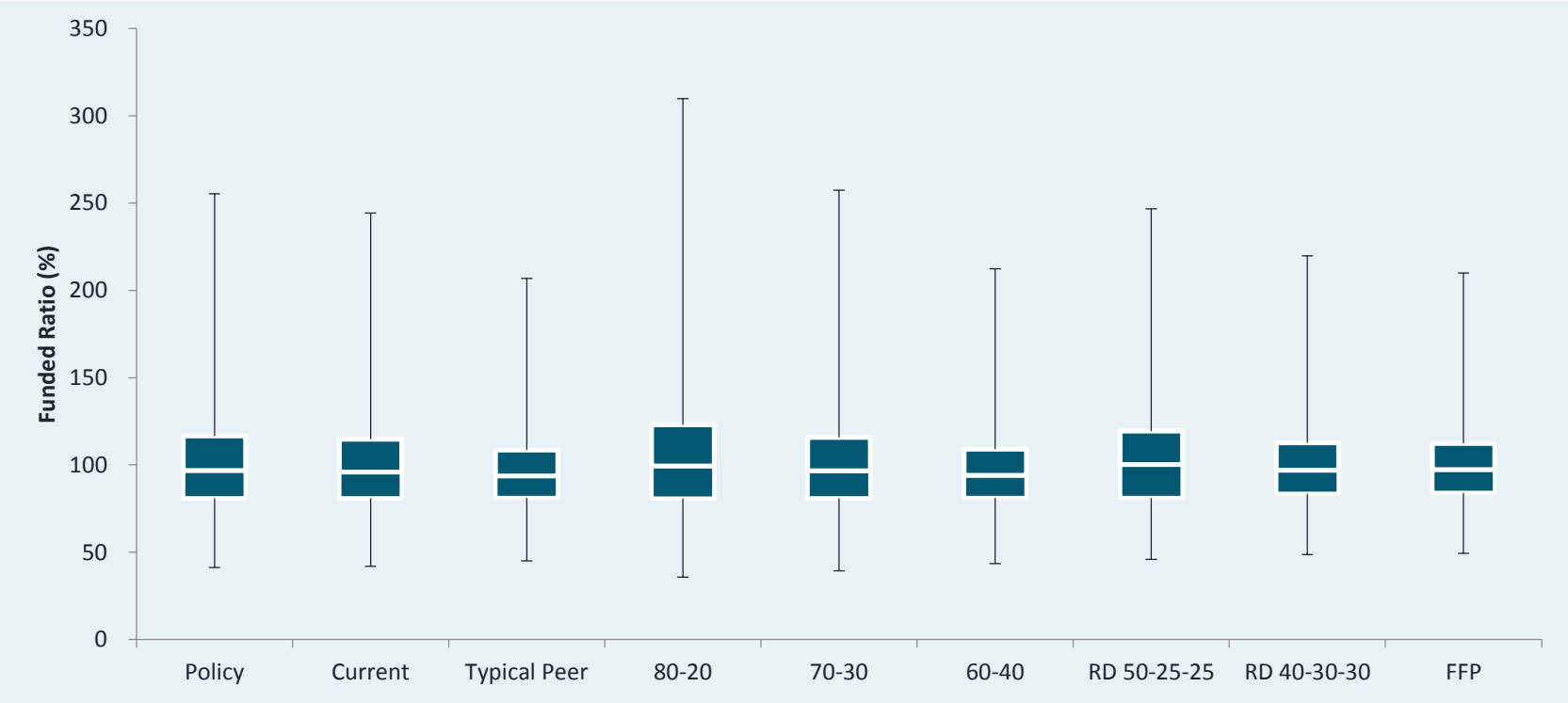
Stress tests



Source: MSCI BARRA

Expected funded ratio

FUNDED RATIO SIMULATION FOR PLAN YEAR ENDING 2024

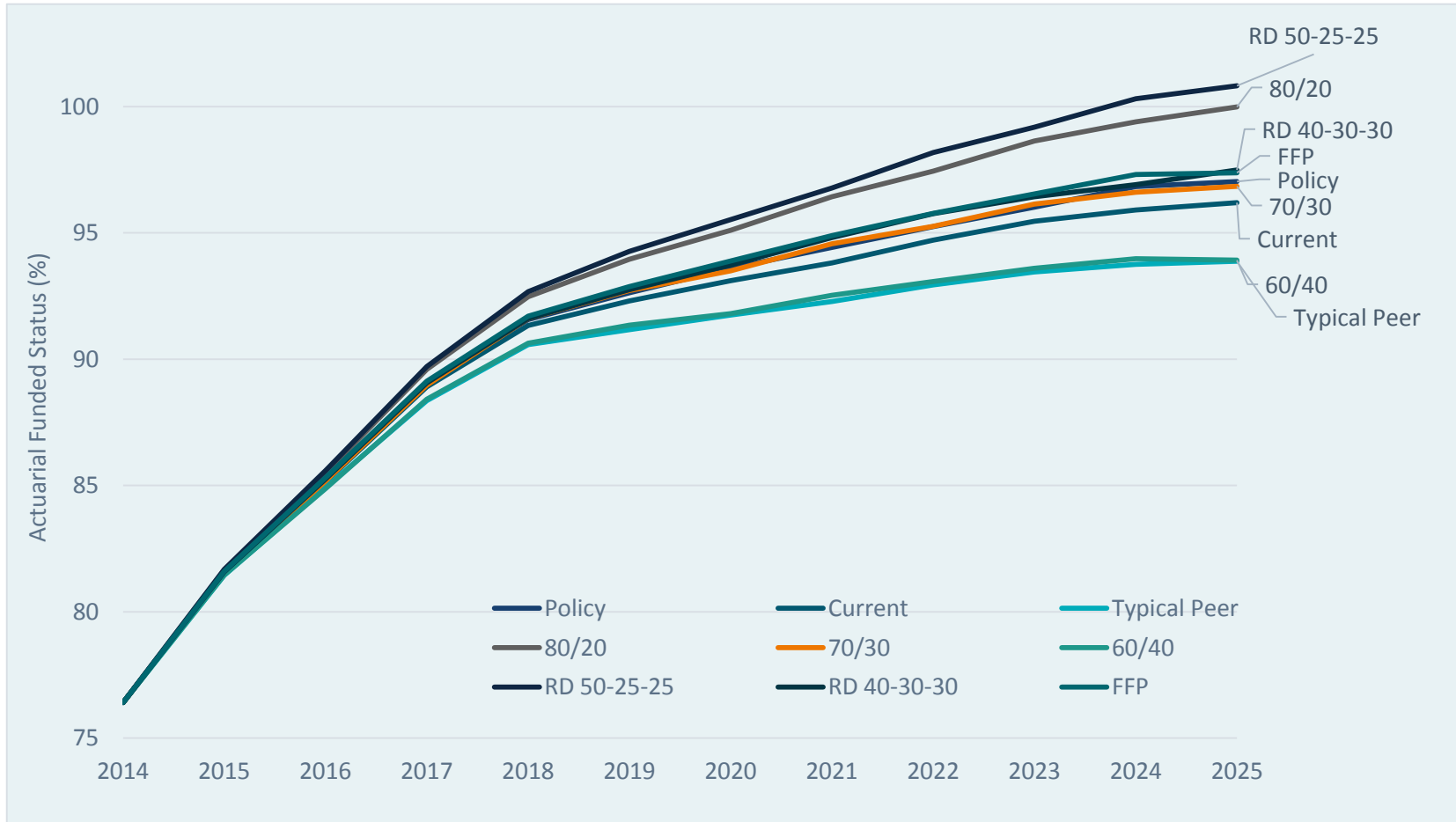


	Policy	Current	Typical Peer	80-20	70-30	60-40	RD 50-25-25	RD 40-30-30	FFP
Best Case	255	244	207	310	257	212	247	220	210
Median	97	96	94	99	97	94	100	97	97
Worst Case	41	42	45	36	39	44	46	49	49

Based on 5,000 independent simulations. Best case defined as 100th percentile. Worst case defined as 0th percentile. Median outcome is the 50th percentile.

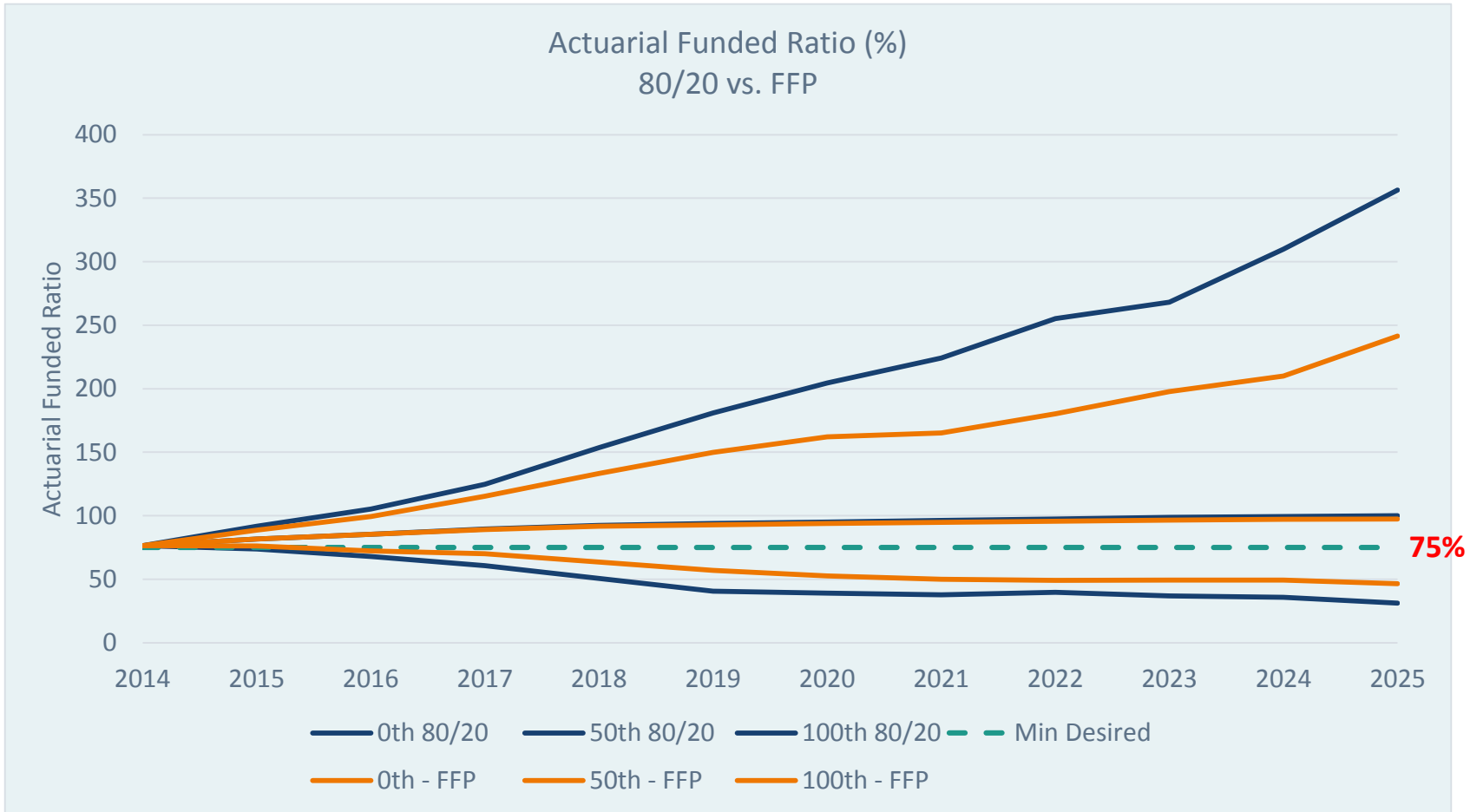
Actuarial funded status

Median projections



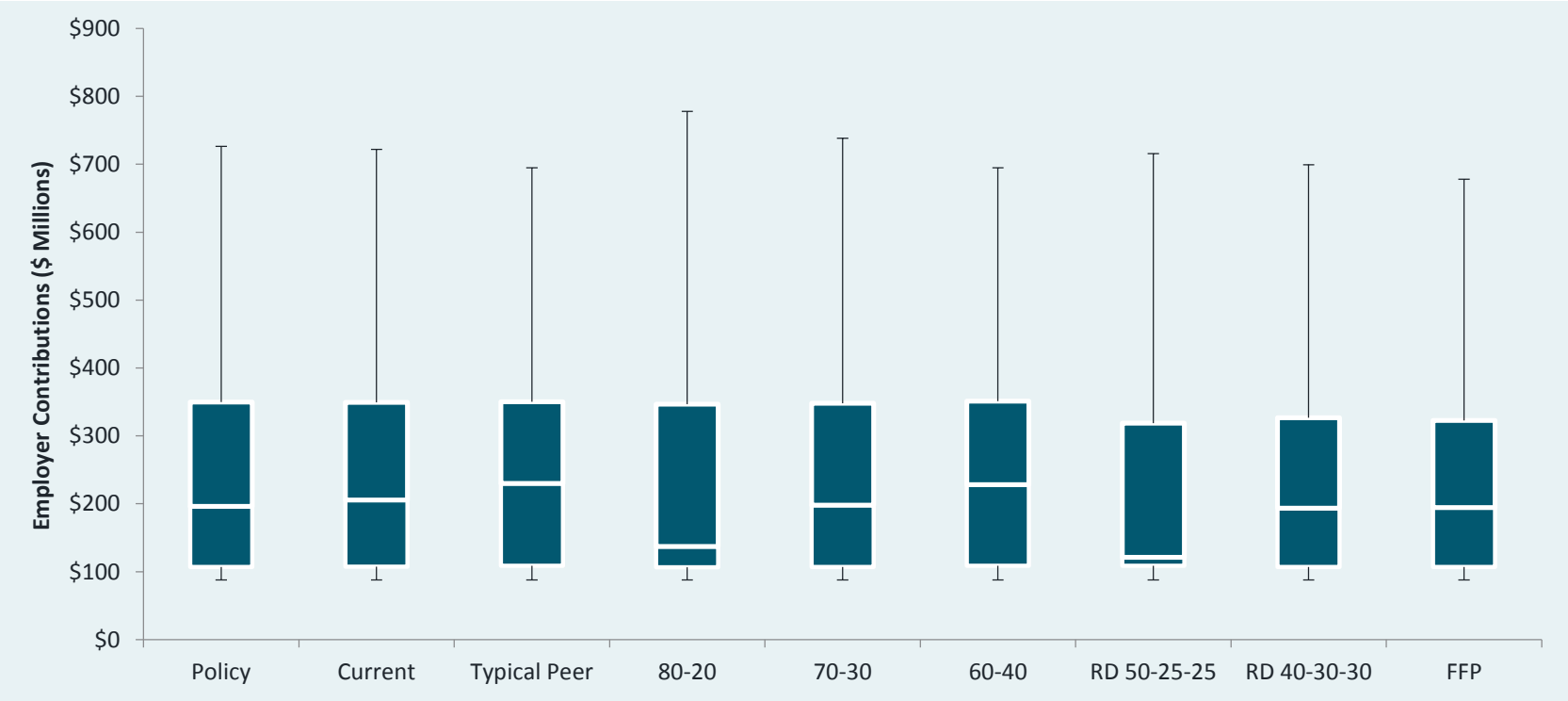
Funded ratio forecast

Comparison between 80/20 and FFP models



Expected employer contributions

EMPLOYER CONTRIBUTION SIMULATION FOR PLAN YEAR ENDING 2024

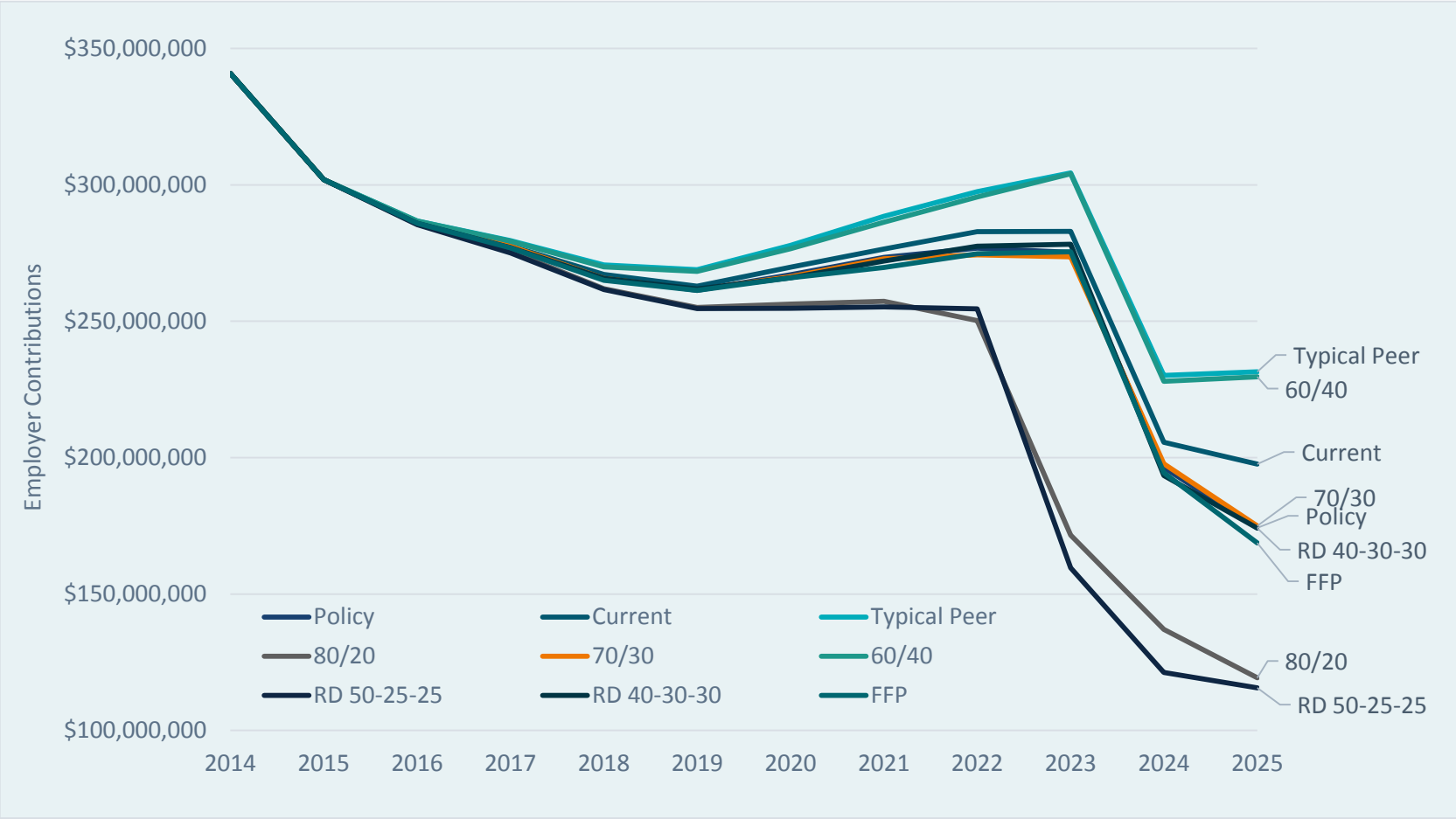


	Policy	Current	Typical Peer	80-20	70-30	60-40	RD 50-25-25	RD 40-30-30	FFP
Best Case	\$87,758,512	\$87,758,512	\$87,758,512	\$87,758,512	\$87,758,512	\$87,758,512	\$87,758,512	\$87,758,512	\$87,758,512
Median	\$196,357,602	\$205,649,002	\$230,112,850	\$137,022,538	\$197,775,295	\$228,006,004	\$121,242,908	\$193,466,693	\$194,485,433
Worst Case	\$726,435,544	\$722,102,977	\$694,718,351	\$777,710,850	\$738,449,838	\$695,026,017	\$715,765,152	\$699,153,834	\$678,144,637

Based on 5,000 independent simulations. Best case defined as 0th percentile. Worst case defined as 100th percentile. Median outcome is the 50th percentile.

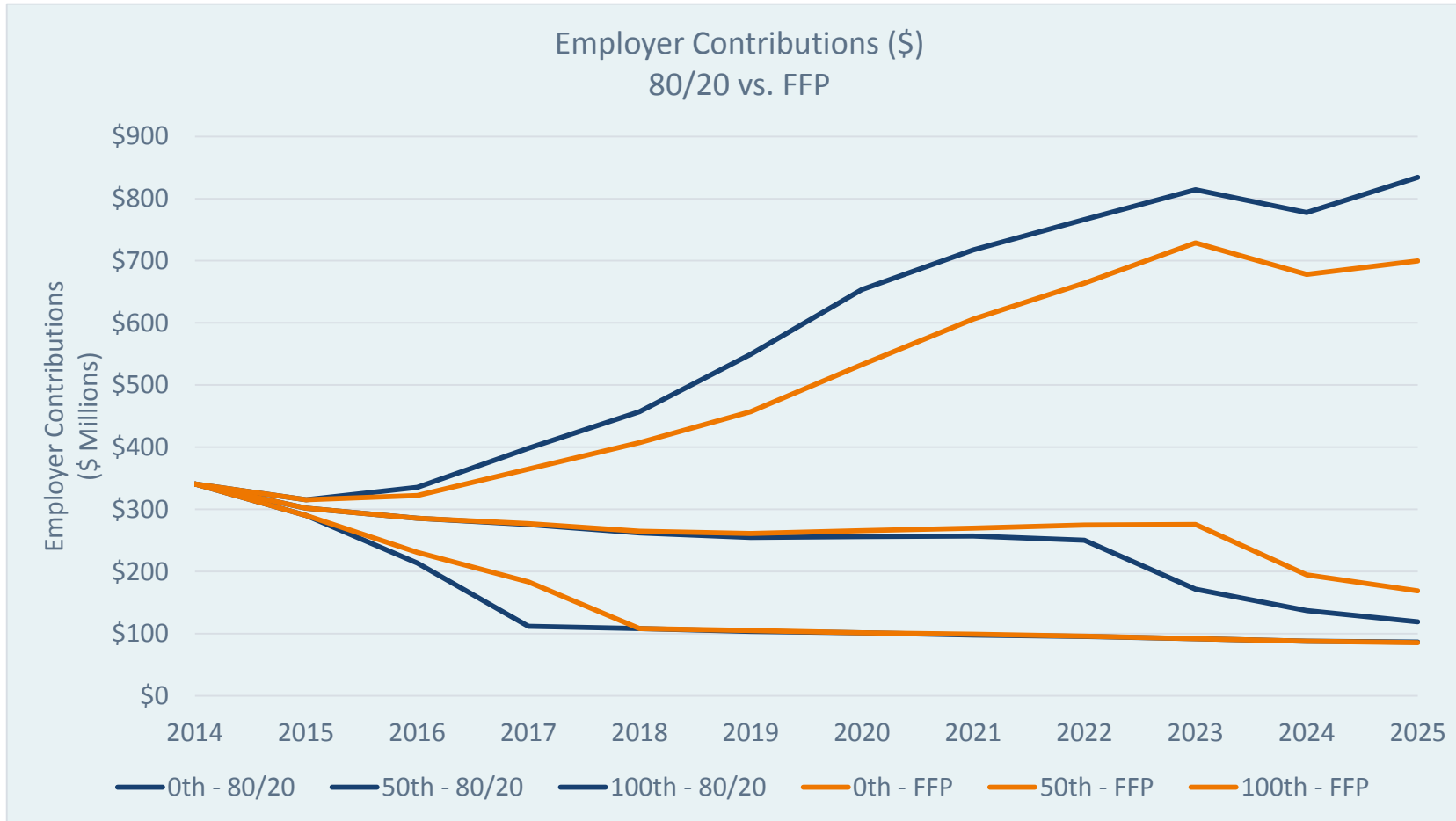
Employer contributions

Median projections



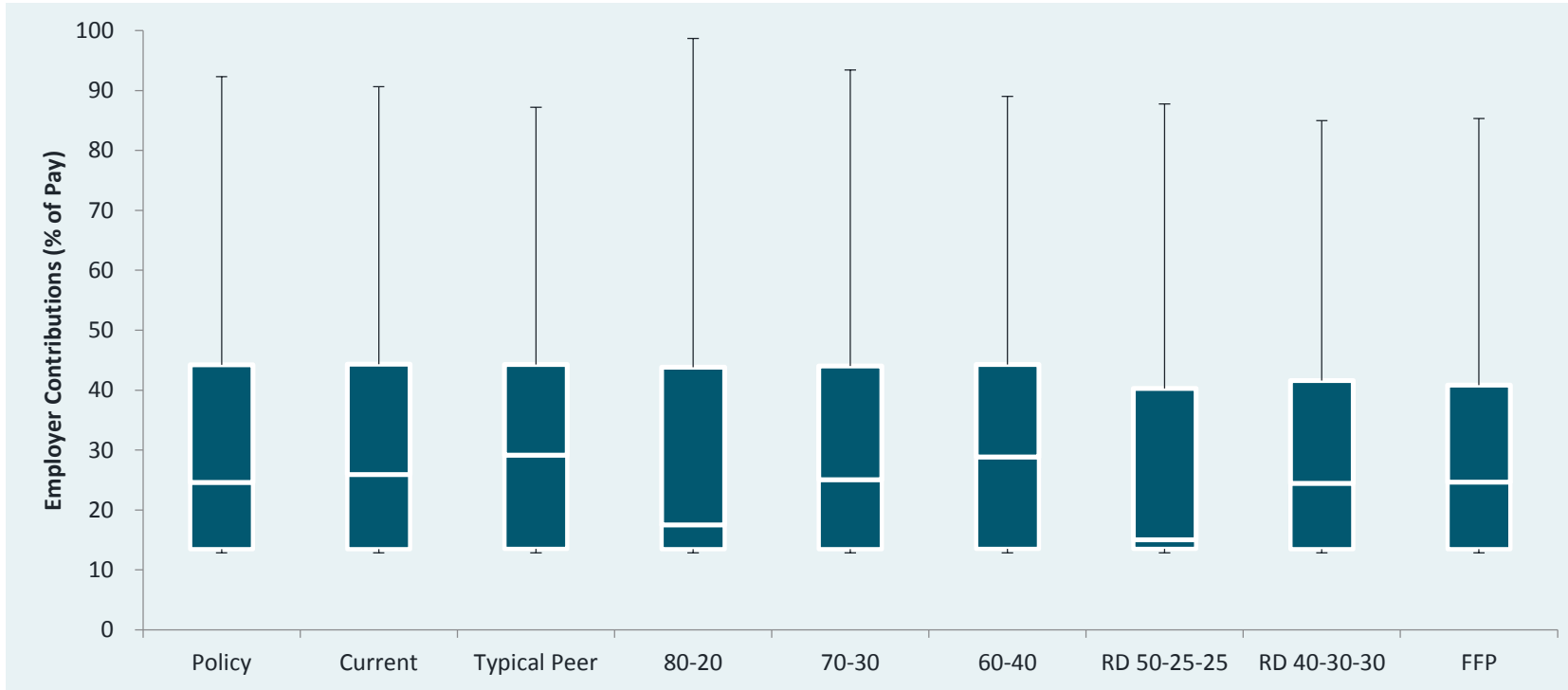
Employer contributions forecast

Comparison between 80/20 and FFP models



Expected employer contributions as % of pay

EMPLOYER CONTRIBUTION SIMULATION FOR PLAN YEAR ENDING 2024

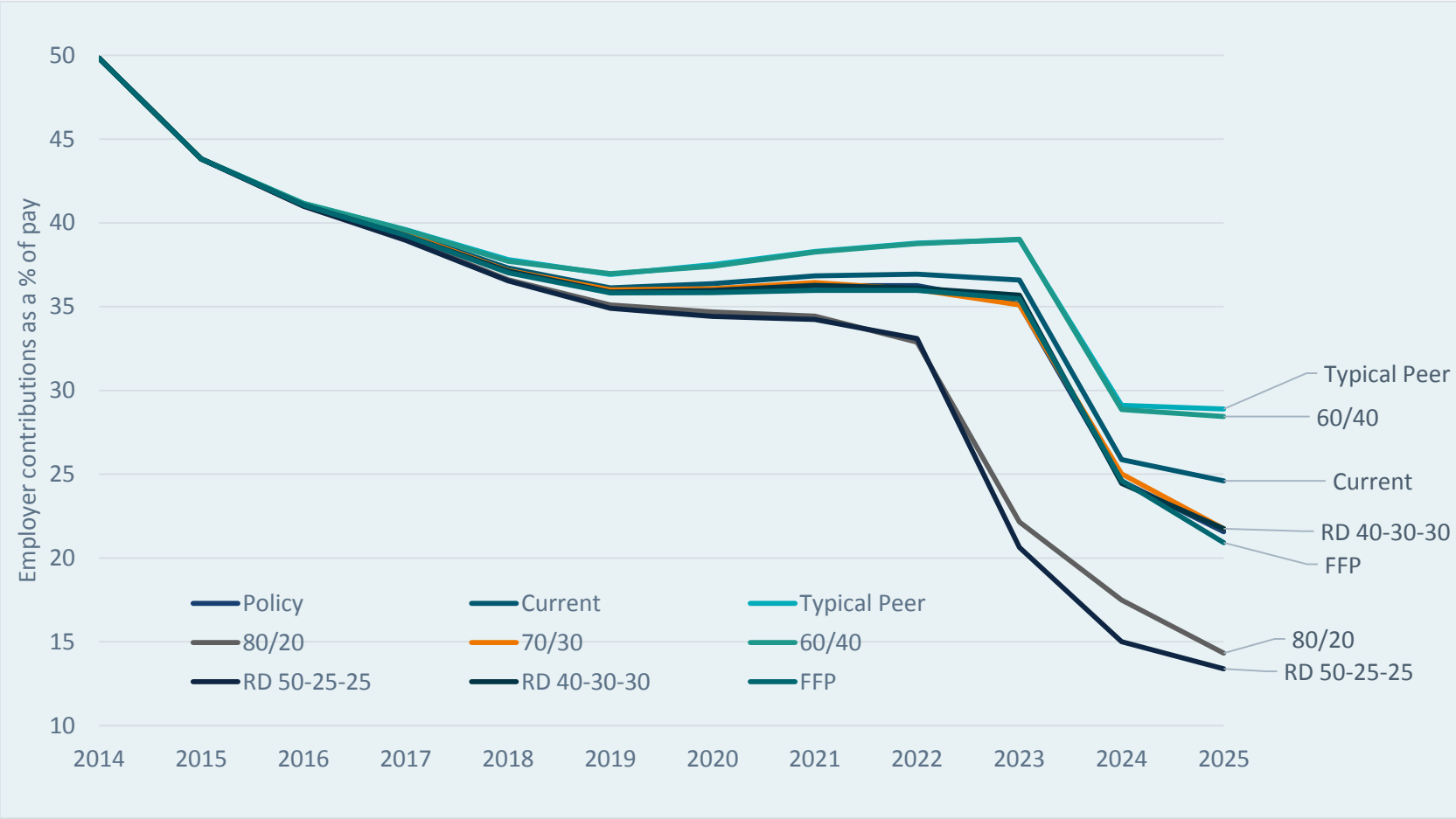


	Policy	Current	Typical Peer	80-20	70-30	60-40	RD 50-25-25	RD 40-30-30	FFP
Best Case	13	13	13	13	13	13	13	13	13
Median	25	26	29	18	25	29	15	24	25
Worst Case	92	91	87	99	93	89	88	85	85

Based on 5,000 independent simulations. Best case defined as 0th percentile. Worst case defined as 100th percentile. Median outcome is the 50th percentile.

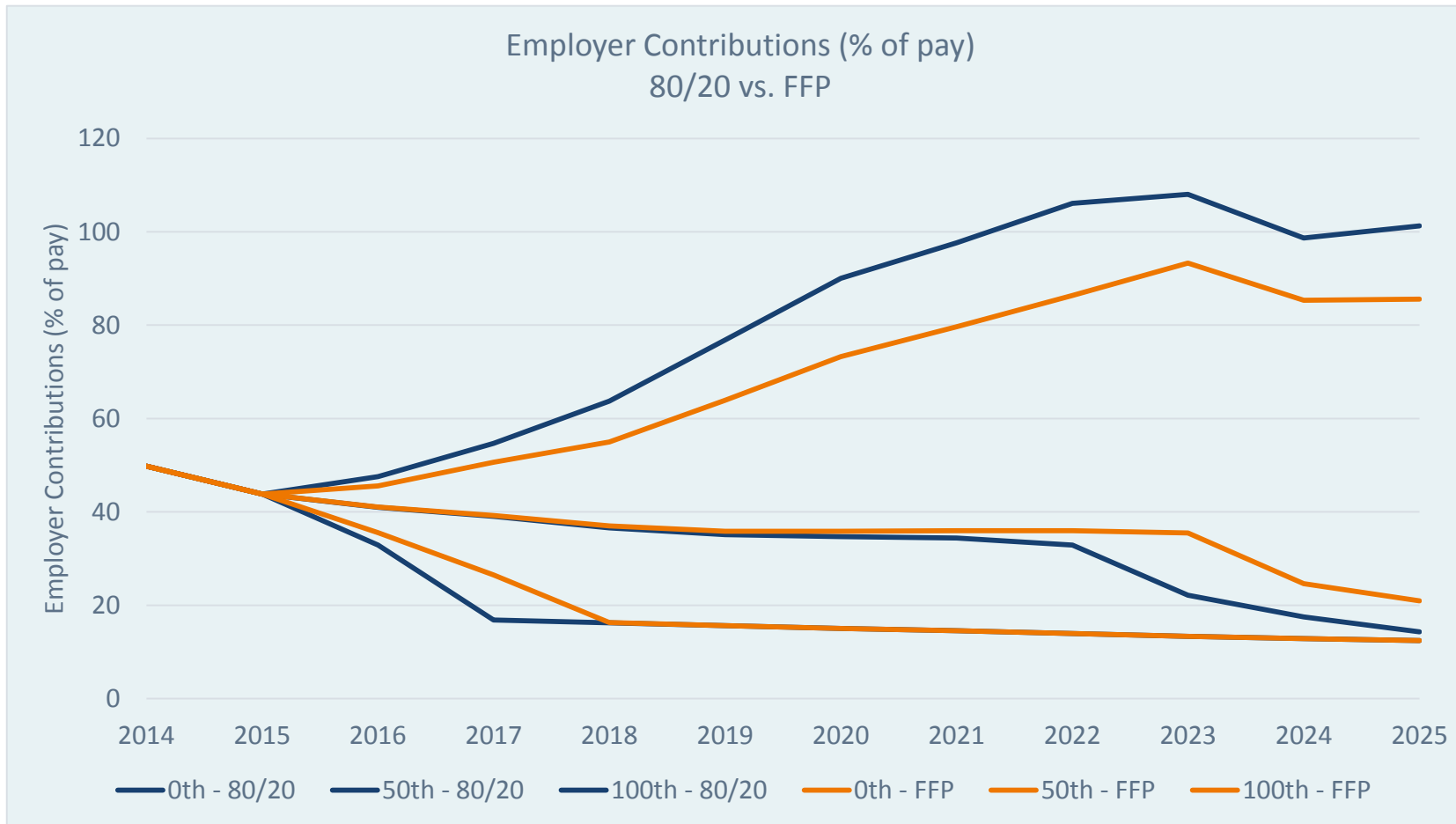
Employer contributions as % of pay

Median projections



Employer contributions as a % of pay

Forecast comparison between the 80/20 and FFP models



V. Appendices

A. Key Actuarial Assumptions

B. Capital Market Assumptions

Appendix A. Key Actuarial Assumptions

Key actuarial assumptions

Asset valuation method	Market value of assets less unrecognized returns in each of the last nine semi-annual accounting periods. Unrecognized return is equal to the difference between the actual market return and the expected return on the market value, and is recognized semi-annually over a five-year period.
Amortization period	Remaining balance of December 31, 2007 UAAL is amortized over a fixed (decreasing or closed) period with 8 years remaining as of December 31, 2014. Any changes in UAAL after December 31, 2007 will be separately amortized over a fixed 18-year period effective with that valuation. Effective December 31, 2013, any changes in UAAL due to plan amendments (with the exception of a change due to retirement incentives) will be amortized over a 10-year fixed period effective with that valuation. The entire increase in UAAL resulting from a temporary retirement incentive will be funded in full upon adoption of the incentive.
Investment rate of return	7.25%
Inflation rate	3.25%
Projected salary increases	General: 4.75% to 13.50%; Safety: 4.75% to 14.00%
Cost of living adjustments	3% per year except for Tier 3 and PEPRA Tier 5 (3% COLA) disability benefits and Tier 2 benefits that are valued as a 3.25% increase per year. Safety Tier C and E benefits and benefits for PEPRA Tier 4 and Tier 5 members covered under certain memoranda of understanding are assumed to increase at 2% per year. All increases are contingent upon actual increases in CPI.

Source: Segal Actuarial Valuation as of 12/31/2014

Appendix B. Capital Market Assumptions



**PERSPECTIVES
THAT DRIVE
ENTERPRISE
SUCCESS**

JANUARY 2015
Capital Market Assumptions

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Summary

Methodology

APPROPRIATE FRAME OF REFERENCE

- Over the short-term, capital markets may reflect irrational investor behavior as prices diverge from fair value.
- Mean reversion may occur over the long-run as prices converge to underlying fundamentals due to long-term investor rationality.
- In our opinion, a 10-year outlook is a reasonable time frame to expect fundamental valuation measures to mean-revert.

Asset	Return Methodology	Volatility Methodology
Inflation	25% weight to the University of Michigan Survey 5-10 year ahead inflation expectation and the Survey of Professional Forecasters (Fed Survey), and the remaining 50% to the market's expectation for inflation as observed through the TIPS breakeven rate	-
Cash	Real yield estimate + inflation forecast	Last ten years of realized volatility
Bonds	Nominal bonds: current annualized yield Real bonds: real yield + inflation forecast	Last ten years of realized volatility
International Bonds*	Current yield + implied currency effect	Last ten years of realized volatility
Credit	Current option-adjusted-spread + U.S. 10-year Treasury – default rate	Last ten years of realized volatility
International Credit*	Current option-adjusted-spread + foreign 10-year Treasury – default rate + implied currency effect	Last ten years of realized volatility
Private Credit	High yield forecast + 2% illiquidity premium	Last ten years of realized volatility
Equity	Dividends (current yield) + real earnings growth (historical average) + inflation on earnings (inflation forecast) + P/E change (cyclical adjusted P/E)	Last ten years of realized volatility
International Developed Equity*	Dividends (current yield) + real earnings growth (historical average) + inflation on earnings (international inflation forecast) + P/E change (cyclical adjusted P/E) + implied currency effect	Last ten years of realized volatility
Private Equity	Small-cap domestic equity forecast + 3% illiquidity premium	20% higher than small-cap volatility
Commodities	Cash + inflation forecast	Last ten years of realized volatility
Hedge Funds	Return coming from traditional beta + 3.0% (alternative beta and alpha)	165% of last ten years of realized volatility
Real Estate	Cap rate – capex + Inflation forecast	Half of REIT's volatility
REITs	Same as private real estate	Last ten years of realized volatility
Risk Parity	Expected Sharpe Ratio*target volatility + cash rate	Target volatility

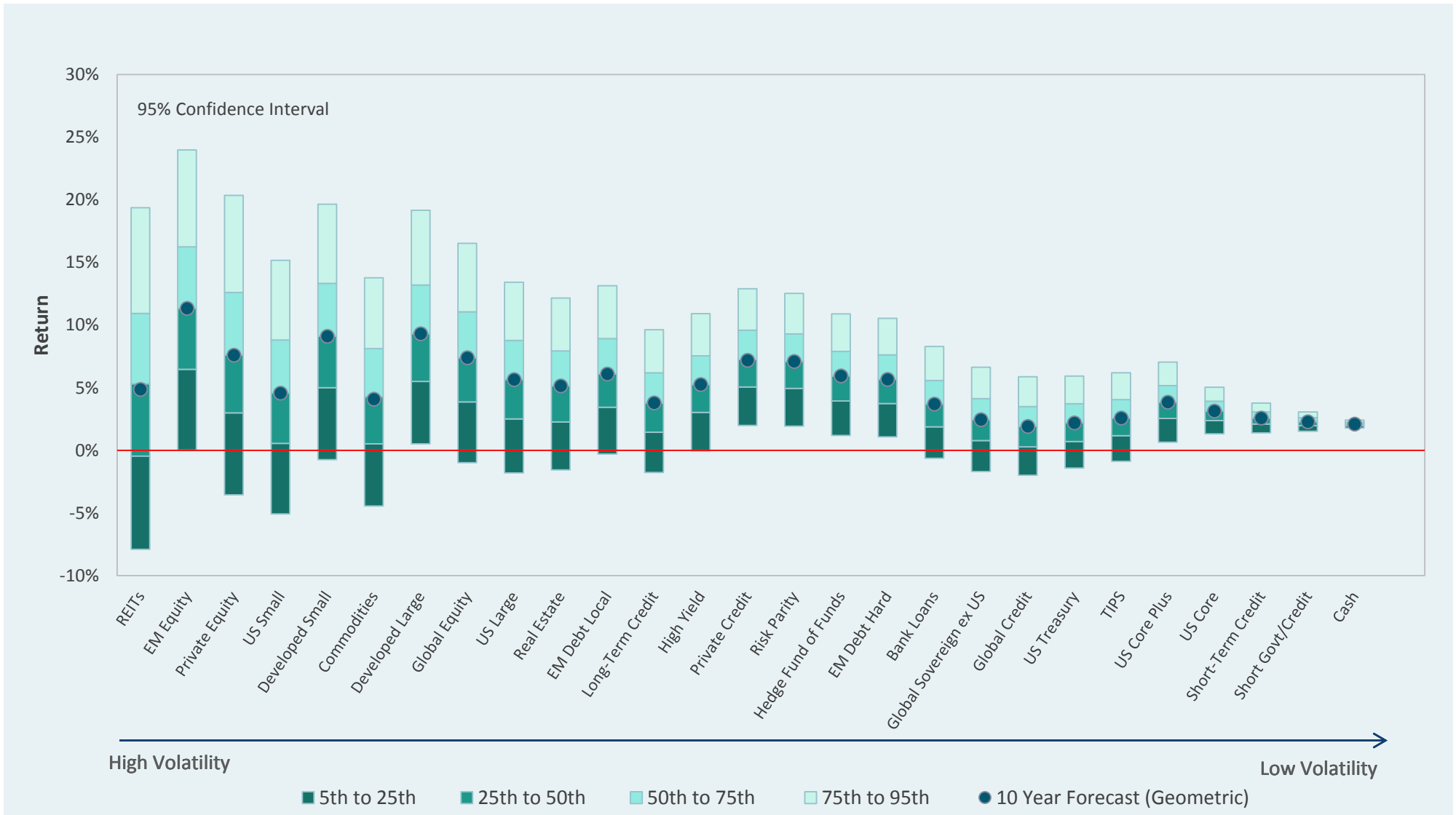
*We use local inflation for international developed equity and fixed income markets. When using local inflation rates, expected returns are adjusted for the implied currency effect based on currency forward contract rates (See Appendix)

10 year return & risk assumptions

Asset Class	Index Proxy	Ten Year Return Forecast		Standard Deviation Forecast	Sharpe Ratio Forecast	Ten Year Historical Sharpe Ratio
		Geometric	Arithmetic			
Equities						
US Large	S&P 500	5.7%	6.7%	14.7%	0.25	0.47
US Small	Russell 2000	4.7%	6.5%	19.8%	0.13	0.4
International Developed	MSCI EAFE	9.5%	11.0%	18.2%	0.41	0.25
International Small	MSCI EAFE Small Cap	9.2%	11.0%	19.7%	0.36	0.32
Emerging Markets	MSCI EM	11.5%	13.9%	23.7%	0.4	0.4
Global Equity	MSCI ACWI	7.4%	8.7%	16.5%	0.32	0.35
Private Equity	Cambridge Private Equity	7.7%	10.2%	23.7%	0.24	1.07
Fixed Income						
Cash	30 Day T-Bills	2.1%	2.1%	0.6%	-	-
US TIPS	Barclays US TIPS 5 - 10	2.6%	2.8%	6.3%	0.07	0.47
US Treasury	Barclays Treasury 7 - 10 year	2.2%	2.4%	6.4%	0.01	0.65
Global Sovereign ex US	Barclays Global Treasury ex US	2.5%	2.8%	7.9%	0.05	0.18
Core Fixed Income	Barclays US Aggregate Bond	3.1%	3.2%	3.2%	0.31	0.96
Core Plus Fixed Income	Barclays US Corporate IG	3.8%	4.0%	5.9%	0.29	0.67
Short-Term Gov't/Credit	Barclays US Gov't/Credit 1 - 3 year	2.3%	2.3%	1.3%	0.17	1.09
Short-Term Credit	Barclays Credit 1 - 3 year	2.6%	2.6%	2.3%	0.22	0.88
Long-Term Credit	Barclays Long US Corporate	3.7%	4.3%	11.0%	0.15	0.55
High Yield Corp. Credit	Barclays High Yield	5.2%	5.8%	10.5%	0.3	0.61
Bank Loans	S&P/LSTA	3.7%	4.1%	8.7%	0.19	0.44
Global Credit	Barclays Global Credit	1.9%	2.2%	7.4%	-0.02	0.49
Emerging Markets Debt (Hard)	JPM EMBI Global Diversified	5.7%	6.1%	8.9%	0.41	0.72
Emerging Markets Debt (Local)	JPM GBI EM Global Diversified	6.2%	7.0%	12.9%	0.32	0.46
Private Credit	High Yield + 200 bps	7.8%	8.4%	10.5%	0.55	-
Other						
Commodities	Bloomberg Commodity	4.1%	5.7%	18.2%	0.11	-0.1
Hedge Funds	HFRI Fund of Funds	6.0%	6.4%	9.1%	0.43	0.29
Core Real Estate	NCREIF Property	5.1%	5.9%	13.2%	0.23	0.93
REITs	Wilshire REIT	5.1%	8.1%	26.4%	0.11	0.38
Risk Parity		7.1%	7.6%	10.0%	0.50	-
Inflation		2.1%	-	-	-	-

Investors wishing to produce expected geometric return forecasts for their portfolios should use the arithmetic return forecasts provided here as inputs into that calculation, rather than the single-asset-class geometric return forecasts. This is the industry standard approach, but requires a complex explanation only a heavy quant could love, so we have chosen not to provide further details in this document – we will happily provide those details to any readers of this who are interested.

Range of likely 10 year outcomes



Relevant market movements

- US equity investors experienced solid returns in 2014 for large cap equities, and moderate returns for small cap equities. Multiple expansion in 2014 proved a tailwind for large cap equities and a headwind for small cap equities. Valuations, as measured by the price-to-earnings ratio, remain above average for large cap equities and are near historic highs for small cap equities. This may indicate that multiple expansion will be less of a tailwind for these asset classes in the near future, and would indicate losses if valuations experience mean-reversion.
- EAFE equity investors saw losses in the low single-digits, which was driven primarily by price multiple contraction. Price multiples remain slightly below average for large cap equities, and more so in the small cap space. Small cap equities experienced a significant 17% multiple expansion in 2014. Our forecasts assume a repricing in EAFE equity which bolsters large cap and small cap equity returns by 0.75%.
- Emerging Market equity markets experienced considerable volatility, and ended 2014 with a slight loss. According to our price multiple indicators, Emerging Market equities is the most undervalued of the equity asset class. Mean reversion in this asset class would lead to healthy gains, and we forecast an additional 1.5% annual return to this asset class due to its relatively cheap valuation.
- Developed country sovereign yields have dropped to all-time lows upon concerns over lacking economic growth and deflation. Our forecast of 2.5% for global sovereign bonds reflects this movement. Global central bank policy continued to diverge, with the Bank of Japan and the European Central Bank implementing bond purchasing programs.
- U.S. breakeven inflation expectations fell further over the year to 1.7%, which has led to lower expected domestic inflation of 2.1%. Since inflation is a component of forecasted equity return, this decrease affects equity returns commensurately.
- Concerns about long-term global economic growth led to a strengthening of the US dollar relative to developed market currencies and a decrease in US long-term interest rates.
- Investment grade credit spreads widened over the year as companies took advantage of historical low interest rates to issue debt, making 2014 the largest year of debt issuance on record with \$1.6 trillion of new issuance in this space.
- The price of oil dropped from nearly \$100/barrel to below \$50 since the beginning of 2014. While oil price movement has been a major political and economic story over the last six months, these large movements have typically had minimal effects on traditional portfolios with smaller allocations to commodities (and oil). Despite recent volatility, we generally expect commodities to return inflation plus a cash flow yield. Although roll return can be a large contribution to commodity returns, they are not considered in our forecast.
- Real estate cap rates remain near historic lows of the last three decades. Over the long-run, we expect no return contribution from a change in valuation.

Inflation

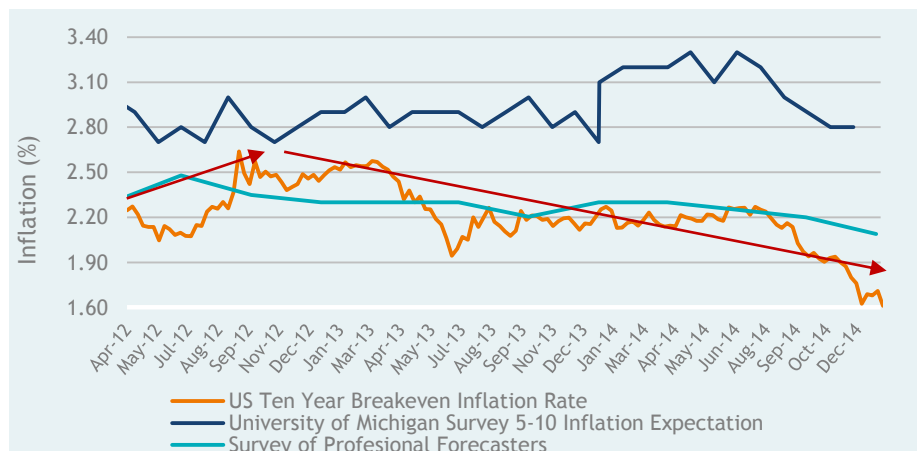
Inflation

The market's expectations for 10-year inflation can be inferred by taking the difference between the U.S. 10-year Treasury yield and the U.S. 10-year Treasury Inflation-Protected (TIPS) yield (referred to as the breakeven inflation rate). While the breakeven rose in 2012, it fell throughout 2013 and then fell further in 2014 H2, with the latest breakeven pricing in a 1.68% rate of inflation over the next decade.

The latest University of Michigan Survey 5-10 year forward inflation expectation, a survey of about 500 households around the nation, is 2.8%. Historically, this survey of inflation tends to be higher than actual future inflation.

A more stable indicator over time has been the Survey of Professional Forecasters (conducted quarterly). The most recent expectation for long-term inflation is 2.09%.

MONTHLY BREAKEVEN INFLATION/UOM SURVEY/PROFESSIONAL FORECASTERS SURVEY

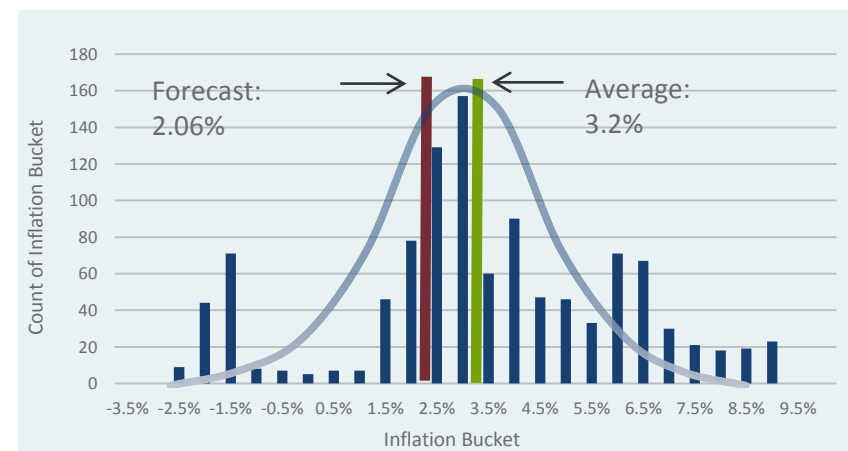


Source: Bloomberg, Philly Fed

To develop our inflation forecast, we assign a 50% weight on the 10-year TIPs Breakeven and a 25% weight on each of the two surveys. Based upon the December 31, 2014 data, our 10-year inflation forecast is 2.06%, which is 0.34% lower when compared to last year's estimate, and remains below the long-term average.

	10-Year Forecast
University of Michigan Survey (25% weight)	2.80%
Survey of Professional Forecasters (25% weight)	2.09%
US 10-Year TIPS Breakeven Rate (50% weight)	1.68%
Inflation Forecast	2.06%

US ROLLING TEN YEAR AVERAGE INFLATION HISTOGRAM SINCE 1923



Source: Bloomberg

Fixed income

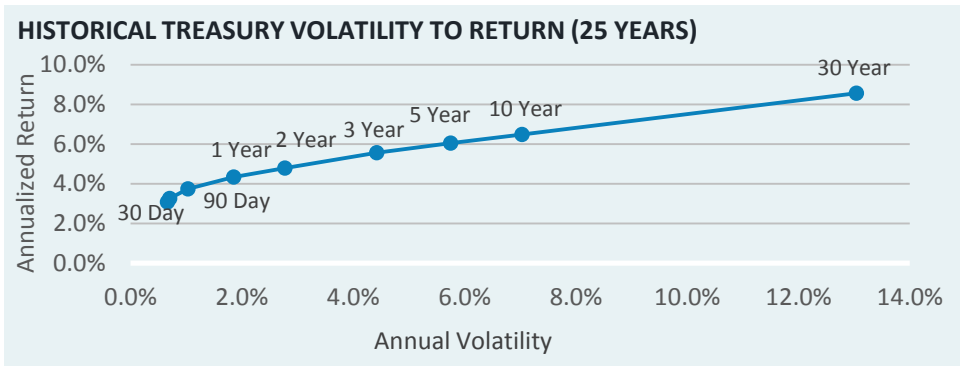
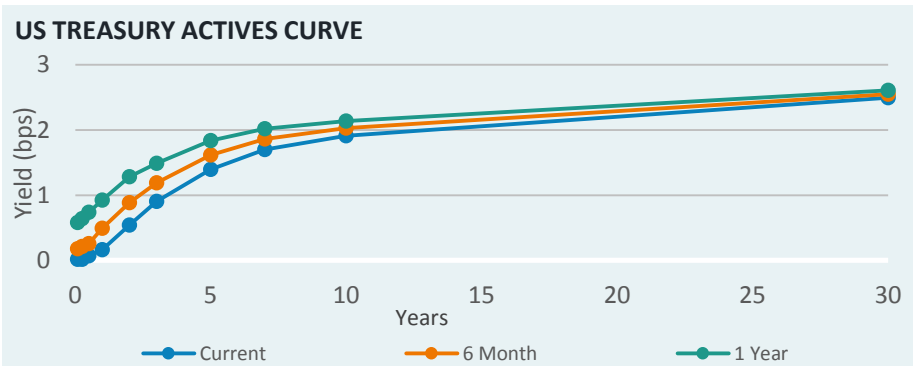
Cash

Over the course of 2014 the yield curve as a whole has fallen. The yield curve movement has caused cash rates to drop over this time period.

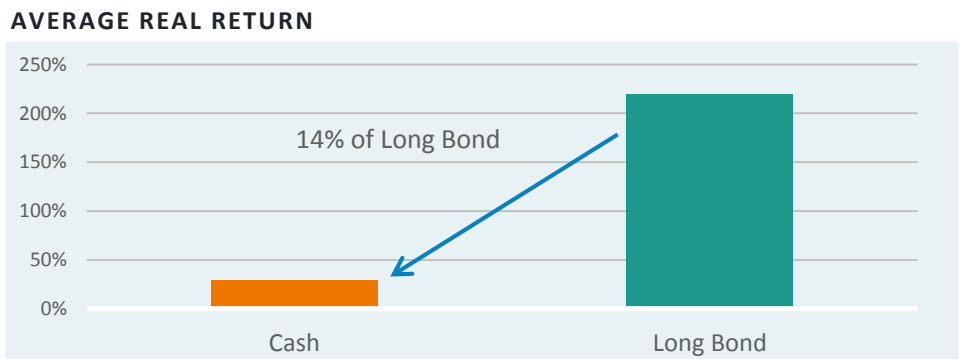
Over rolling ten year time periods, the average historical real return to cash has been 14% of the real return to long bonds.

By applying the historical real return relationship between long bonds and cash, we get a 2 bps real return to cash from our current 11 bps real return forecast for long bonds.

Adding our inflation forecast of 2.06% results in a nominal return to cash of 2.08%.



	10-Year Forecast
Cash	2.08%
Inflation Forecast	-2.06%
Real Return	0.02%



Source: Bloomberg

Source: MPI

Rates

Despite some market participants holding the view that rates would rise, the trajectory of 10 year Treasuries during 2014 was consistently towards lower yields.

This move was particularly noticeable during the latter part of the year and the very early part of 2015.

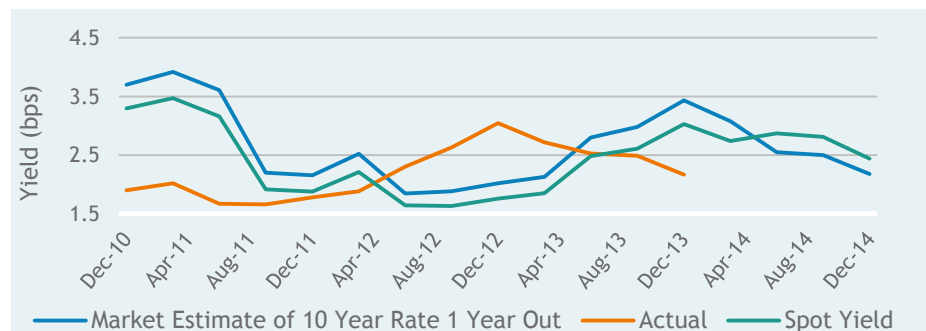
Despite this US Treasury yields have been higher than a number of other government bond markets, including in countries regarded as significantly less financially stable.

Our forecast of rates is based upon the current yield, with all cash flows reinvested at the current yield.

10-Year Forecast

US 10-Year Treasury	2.17%
Inflation Forecast	-2.06%
Real Return	0.11%

MARKET ESTIMATE OF 10 YEAR RATE 1 YEAR OUT



Source: Bloomberg

US 10-YEAR TREASURY YIELD



Source: Bloomberg

Real rates

There was a notable divergence between real and nominal rates during 2014.

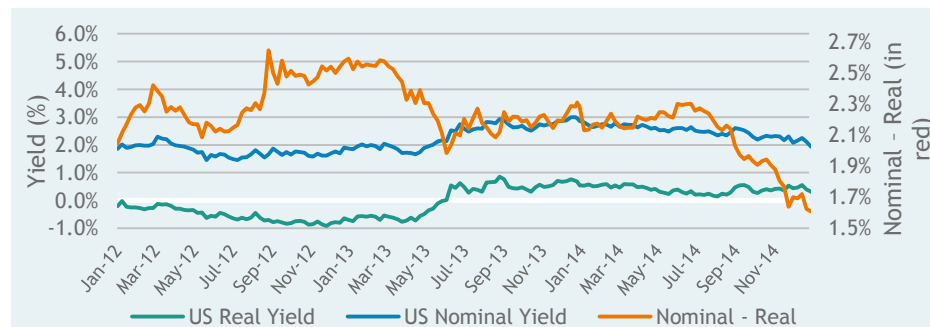
While the returns from TIPS can be volatile given the daily changes in the markets' inflation expectations over the long run, its performance is determined by the Consumer Price Index.

As TIPS are quoted in real terms, in order to get the nominal return forecast we add the TIPS current yield to our inflation forecast. Our nominal 10 year TIPS return forecast is 2.55%.

10-Year Forecast

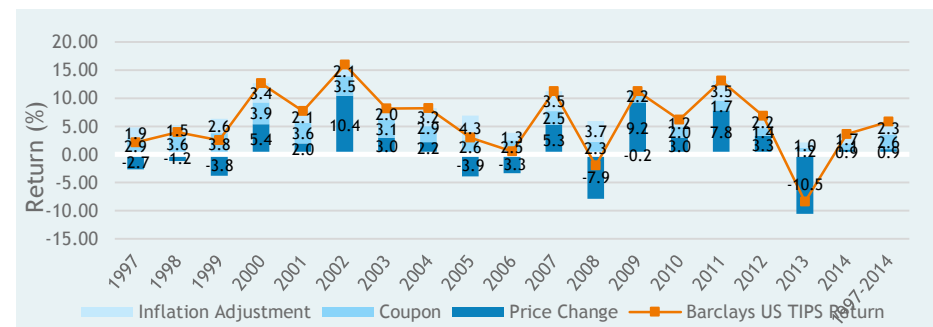
US 10-Year TIPS Yield	0.49%
Inflation Forecast	+2.06%
Nominal Return	2.55%

NOMINAL YIELD VS REAL



Source: Bloomberg

COMPOSITION OF BARCLAYS CAPITAL US TIPS INDEX RETURN



Source: DFA

Core fixed

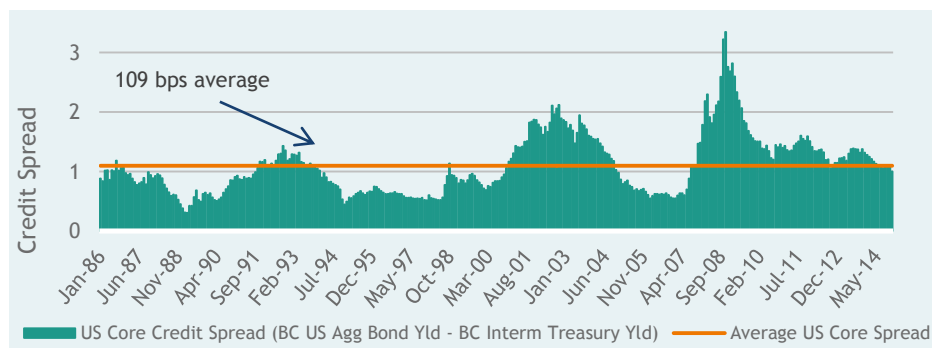
Following continued healthy economic growth in the US, the Federal Reserve ended its bond purchasing program (QE). In anticipation of the Fed's announcement to raise interest rates, short-term US yields increased.

Within the Core universe, Investment Grade credit spreads widened over the year as companies took advantage of historically low interest rates to issue debt, making 2014 the largest year of issuance on record (\$1.6 trillion).

10-Year Forecast

Barclays US Option-Adjusted Spread	+1.0%
Effective Default	0.10%
US 10-Year Treasury	+2.2%
Nominal Return	3.1%
Inflation Forecast	-2.1%
Real Return	1.0%

US CORE CREDIT SPREAD



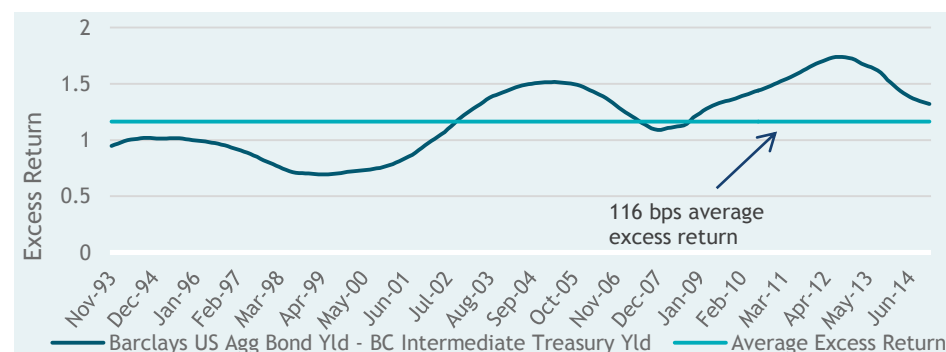
Source: MPI

The mortgage-backed security (MBS) market continued to receive support from the Fed through the end of the QE program in October. As a result, MBS spreads remained tight to US Treasuries.

Credit fixed income return is composed of a bond term premium (duration) and credit spread.

We use appropriate default rates and credit spreads for each fixed income category to provide our forecast 10 year return.

ROLLING 10 YEAR EXCESS RETURN



Source: MPI

Credit summary

	Core	Long-Term Credit	Global Credit	High Yield	Bank Loans	EM Debt (USD)	EM Debt (Local)	Private Credit
Index	BC US Aggregate	BC Long US Corporate	BC Global Credit	BC US High Yield	S&P LSTA	JPM EMBI	JPM GBI	BC US High Yield + 2%
Method	OAS + US 10-Year	OAS + US 10-Year	OAS + Global 10-Year Treasuries	OAS + US 10-Year	LIBOR + Spread	OAS + US 10-Year	Current Yield	High Yield + 2% illiquidity premium
Spread to	Intermediate US Treasury	Long-Term US Treasury	Global Long-Term Treasuries	Intermediate US Treasury	LIBOR	Intermediate US Treasury	-	-
Default Assumption	-1.0%	-4.5%	-3.0%	-3.8%	-3.5%	-0.5%	-0.5%	-
Recovery Assumption	90%	95%	40%	40%	90%	60%	40%	-
Spread	1.0%	1.7%	1.5%	5.3%	3.8%	3.7%	-	-
Yield	-	-	-	-	-	-	6.5%	-
Risk Free Yield	2.2%	2.2%	1.8%	2.2%	0.3%	2.2%	-	-
Effective Default	-0.1%	-0.2%	-1.8%	-2.3%	-0.4%	-0.2%	-0.3%	-
Expected Currency Effect	-	-	0.4%	-	-	-	-	-
Nominal Return	3.1%	3.7%	1.9%	5.2%	3.7%	5.7%	6.2%	7.8%
Inflation Forecast	-2.1%	-2.1%	-2.1%	-2.1%	-2.1%	-2.1%	-2.1%	-2.1%
Real Return	1.0%	1.6%	-0.2%	3.1%	1.6%	3.6%	4.1%	5.7%

*We use local inflation for international developed equity and fixed income markets. When using local inflation rates, expected returns are adjusted for the implied currency effect based on currency forward contract rates (See Appendix)

Equities

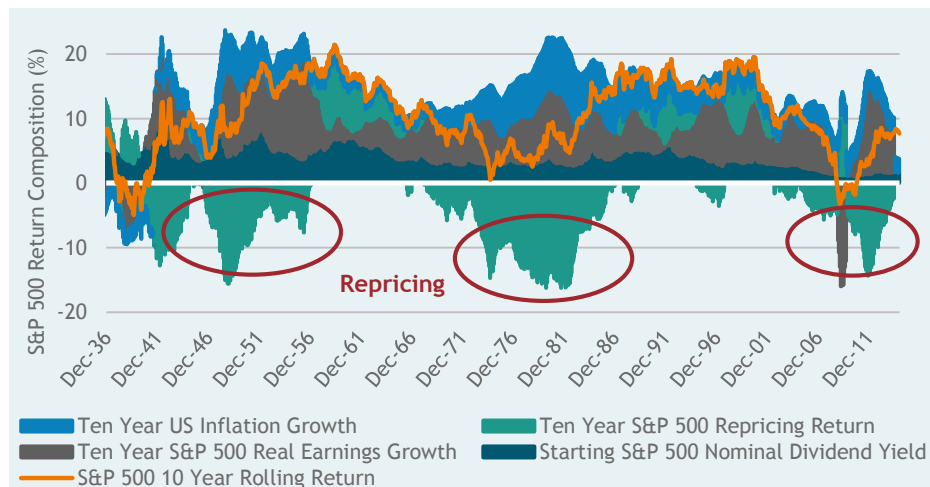
Equities

Historical equity returns can be broken down into earnings growth, dividend yield, inflation, and repricing. Over the very long-term, repricing represents a small portion of return to equity investors, but over shorter time frames, the effect on return can vary considerably.

If investors are willing to pay more for earnings, it could signal that investors are more confident in positive earnings growth going forward, while the opposite is true if investors pay less for earnings. It is somewhat surprising that investor confidence varies so much given that the long-term earnings growth is relatively stable.

Investor confidence in earnings growth can be measured using the Shiller P/E Ratio. In short, if the P/E ratio is too high/low relative to history, we expect future returns to be lower/higher than the long-term average. Implicit in this analysis is the assumption that P/E's will mean revert over 10 years.

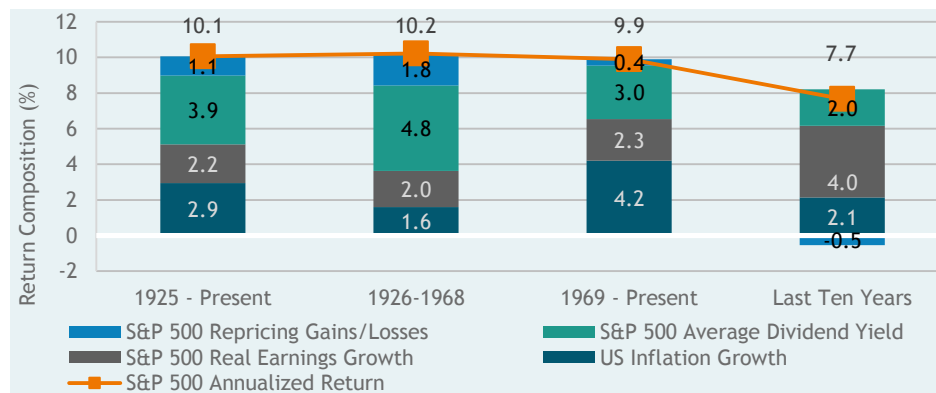
TRAILING TEN YEAR S&P 500 RETURN COMPOSITION (%)



We make a conservative repricing estimate given how widely repricing can vary over time. We then skew the repricing adjustment because the percentage change in index price is larger with each incremental rise in P/E when P/E's are low, compared to when they are high.

Shiller P/E Percentile Bucket	Lower P/E	Upper P/E	Repricing Assumption
Lower 10%	-	10	2.00%
10% - 20%	10	11	1.50%
20% - 30%	11	12	0.75%
30% - 45%	12	15	0.50%
45% - 55%	16	17	0.0%
55% - 70%	17	20	-0.25%
70% - 80%	20	22	-0.50%
80% - 90%	22	26	-1.25%
Top 10%	26	-	-1.50%

S&P 500 RETURN COMPOSITION (%)



Global equity

Global Equity is a combination of US Large, International Developed, Canada, and Emerging Market equities. We can therefore combine our existing return forecasts for each of these asset classes, along with a Canada equity forecast, to arrive at our Global Equity return forecast.

We use the MSCI ACWI Index as our benchmark for Global Equity and apply the country weights of this index to determine the weightings for our Global Equity return calculation.

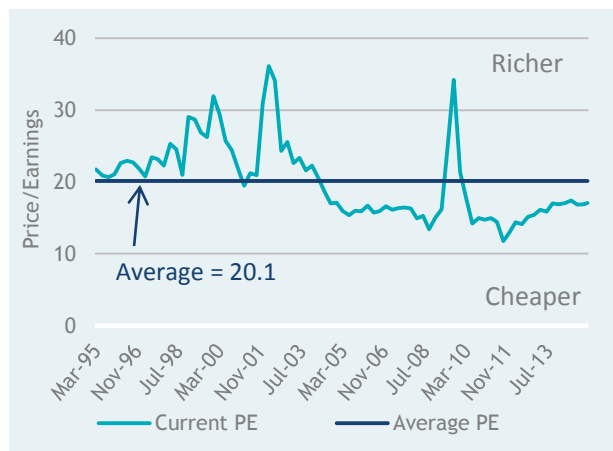
As with other equity asset classes, we use the historical standard deviation of the benchmark (MSCI ACWI Index) for our volatility forecast.

The valuation of Global Equities are driven by the richness/cheapness of the underlying markets, as indicated by the current Price/Earnings ratio.

The underperformance of Emerging Markets in recent years has detracted from Global Equity returns, while US equities have buoyed returns.

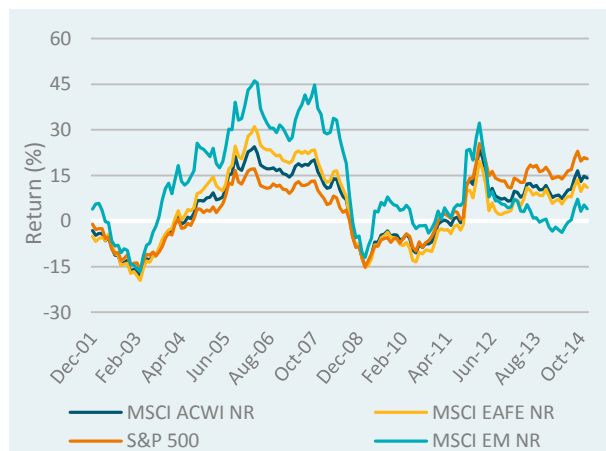
2015 CMA Forecast:
 7.4% Geometric Rtn
 8.7% Arithmetic Rtn
 16.5% St. Deviation
 0.32 Sharpe Ratio

GLOBAL EQUITY P/E RATIO HISTORY



Source: Bloomberg, as of 2/1/15

MARKET PERFORMANCE (3 YR ROLLING)



Source: MSCI, Standard & Poor's, as of 12/1/14

MARKET WEIGHTINGS

Market	Weight	CMA return	Weighted return
US Large	57.6%	5.7%	3.3%
Developed Large	32.5%	9.5%	3.1%
Emerging Markets	6.6%	11.5%	0.8%
Canada	3.3%	9.4%	0.3%
Global equity forecast			7.4%

Source: Verus

Equity summary

	US Large	US Small	EAFE	EAFE Small	EM
Index	S&P 500	Russell 2000	MSCI EAFE Large	MSCI EAFE Small	MSCI EM
Method	Building Block Approach: current dividend yield + historical average real earnings growth + inflation on earnings + repricing + expected currency effect				
Current Shiller P/E Ratio	26.3	39.6	14.6	-	10.7
Regular P/E Ratio	18.2	33.0	16.4	20.7	12.7
2014 Shiller P/E Expansion	5.6%	0.5%	-9.6%	-	-12.5%
2014 Regular P/E Expansion	6.9%	-1.7%	-4%	-16.6%	0.6%
Current Shiller P/E Percentile Rank	90%	100%	15%	-	1%
Current Regular P/E Percentile Rank	70%	91%	45%	24%	25%
Average of P/E Methods' Percentile Rank	80%	96%	30%	24%	13%
2014 Total Return	13.7%	4.9%	-4.2%	-4.5%	-2.1%
Shiller PE History	1926	1988	1982	Not Enough History	2005
Long-Term Average Shiller P/E	17.5	20.8	23.8	-	18.4
Current Dividend Yield	1.9%	1.2%	3.2%	2.5%	2.9%
Long-Term Average Real Earnings Growth	2.2%	2.9%	2.6%	3.0%	5.0%
Inflation on Earnings	2.1%	2.1%	1.4%*	1.4%*	2.1%*
Repricing Effect (Estimate)	-0.5%	-1.5%	0.8%	0.8%	1.5%
Implied Currency Effect*	-	-	1.5%*	1.5%*	-
Nominal Return	5.7%	4.7%	9.5%	9.2%	11.5%
Inflation Forecast	-2.1%	-2.1%	-2.1%	-2.1%	-2.1%
Real Return	3.6%	2.6%	7.4%	7.1%	9.4%

*We use local inflation for international developed equity and fixed income markets. When using local inflation rates, expected returns are adjusted for the implied currency effect based on currency forward contract rates (See Appendix)

Alternatives

Private equity

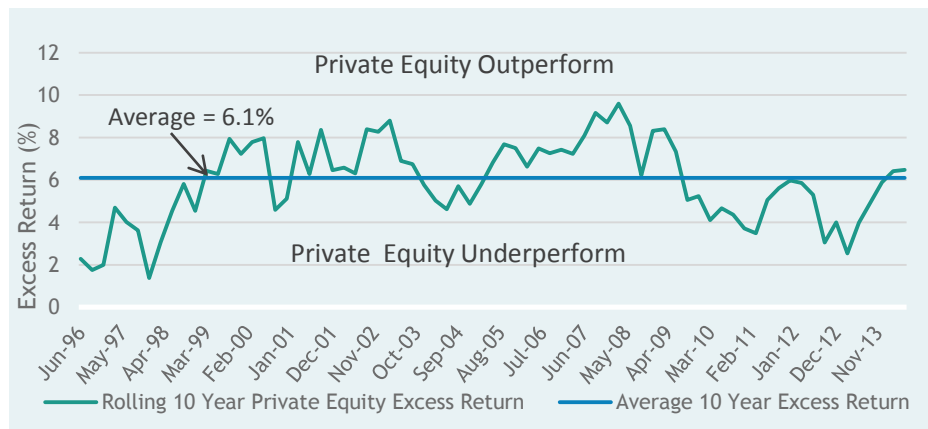
Private equity and public equity returns are historically correlated because the underlying economic forces driving these asset class returns are quite similar.

The return relationship between the two can vary in the short-term, but over the long-term investors have traditionally believed the return from private equity should carry a premium, based on the illiquidity investors experience.

10-Year Forecast

Small Cap Forecast	+4.7%
Illiquidity Premium Estimate	+3.0%
Nominal Return	7.7%
Inflation	-2.1%
Real Return	5.6%

ROLLING 10 YEAR PRIVATE EQUITY EXCESS RETURN (PE – SMALL CAP)



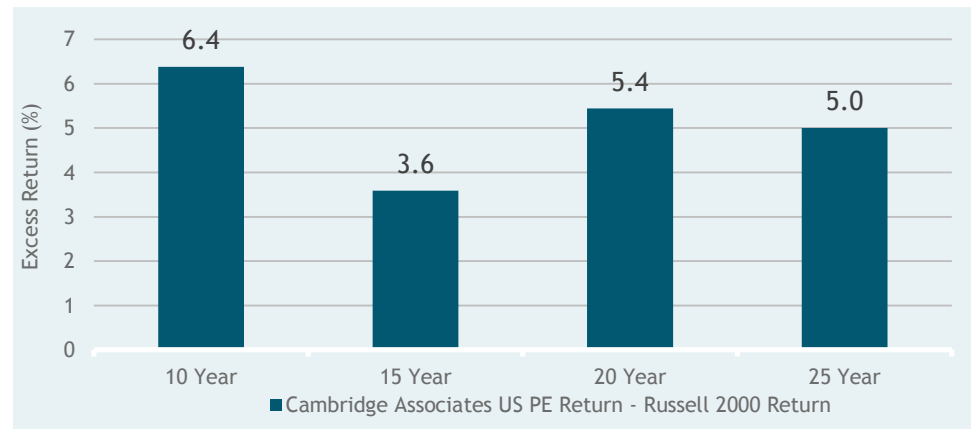
Source: MPI

The traditional approach, which we use this year again, is to estimate an illiquidity premium of 3.0% on top of our U.S. small cap forecast of 4.7%.

Recent literature has begun to suggest that it may be better to model private equity as being similar to a simple developed equity beta. This work suggests that some or all of the illiquidity premium is retained by the managers in the form of higher fees.

Over the course of 2015 we will be investigating this literature further and may choose to adjust our methodology for next year.

PRIVATE EQUITY EXCESS RETURN



Source: MPI

Hedge funds

Traditional betas explain approximately half of the variation in hedge fund net of fee returns, while the remaining unexplained portion can be attributed to alternative betas, skill, luck, or biases in the index.

We develop the systematic component of return by applying the historical weights of each traditional beta to our capital market assumptions.

As estimated by Ibbotson-Chen-Zhu 2010, the annualized unexplained portion of net of fee return is approximately 3.0%, which is statistically significant.

We add this estimate to our estimate of return coming from traditional betas to get a total net of fee return.

Traditional Betas	Weight	2015 CMA	10-Year Forecast
Equity	32%	6.6%	2.1%
Bonds	-21%	3.9%	-0.9%
Cash	89%	2.1%	1.8%
Traditional Beta Nominal Return			3.0%
Alternative Beta, Skill			3.0%
Nominal Return			6.0%
Inflation			-2.1%
Real Return			3.9%

Returns Explained by Systematic Factors

Equity market betas

Other traditional betas (bond, credit)

Alternative betas (value, carry, momentum, volatility)

Returns NOT Explained by Systematic Factors

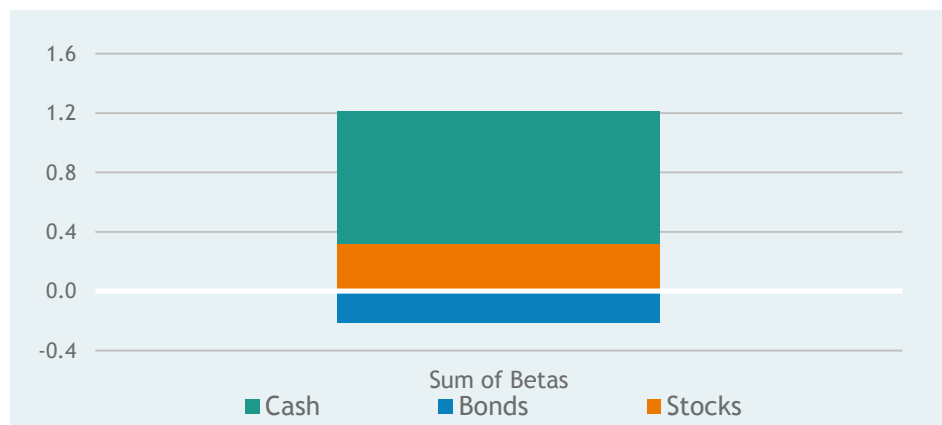
Skill

Luck

Biases

Source: Ilmanen, Antti. *Expected Returns*

HISTORICAL BREAKDOWN OF TRADITIONAL BETA



Source: Ibbotson-Chen-Zhu 2010

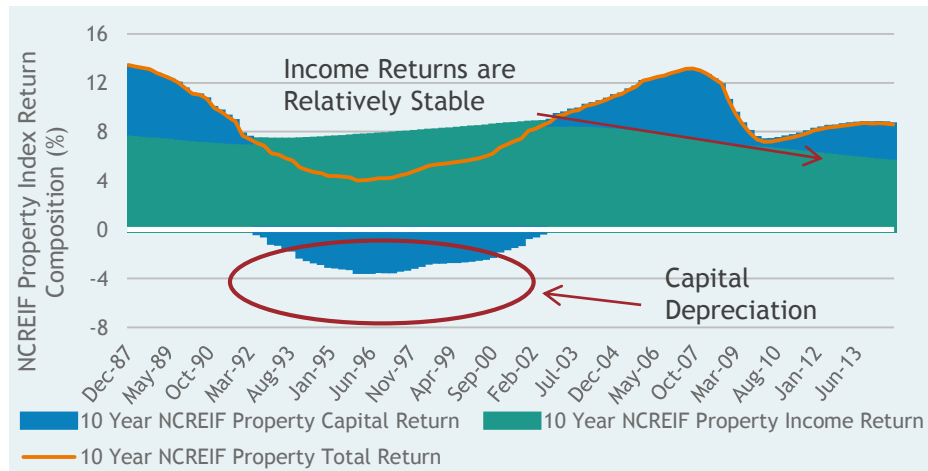
Private core real estate/REITs

Performance of the NCREIF property index can be decomposed into an income return (Cap Rate) and capital return. The return coming from income has historically been more stable than the return derived from capital changes.

The Cap rate is the ratio earnings less expenses to price, and does not include extraordinary expenses.

REITs 10-Year Forecast	
Nominal Return Forecast	5.1%
Inflation	-2.1%
Real Return	3.0%

TRAILING 10 YEAR NCREIF PROPERTY INDEX RETURN COMPOSITION (%)



Source: NCREIF

A more accurate measure of the yield investors receive should include non-recurring capital expenditures; we assume a 2.0% capex expenditure.

We also assume income growth will track inflation as inflation is passed through to rents.

Over the last ten years performance between private real estate and REITs is similar, although REITs have experienced a lower Sharpe ratio due to higher volatility.

Compared to private real estate, REITs should provide a higher return due to leverage and a lower return because of liquidity.

We assume the effects of leverage and liquidity offset each other, therefore our forecast for private real estate becomes our forecast for REITs.

Private Real Estate 10-Year Forecast	
Current Cap Rate	+5.0%
Capex assumption	-2.0%
Income Growth (Inflation)	+2.1%
Nominal Return	5.1%
Inflation	-2.1%
Real Return	3.0%

Commodities

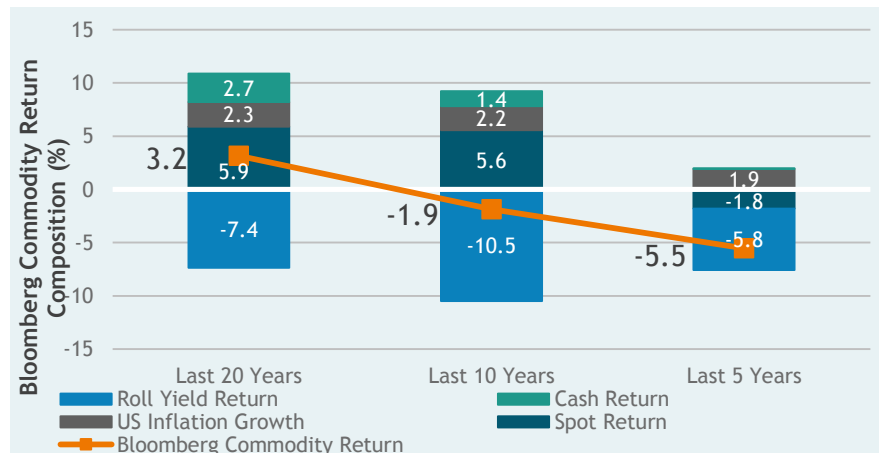
Commodity returns can be decomposed into four sources: collateral return (cash), inflation, spot changes, and roll yield.

	10-Year Forecast
Collateral Return (Cash)	+2.08%
Roll Return	+0.00%
Inflation	+2.06%
Nominal Return	4.14%
Inflation	-2.06%
Real Return	2.08%

Roll return represents either the backwardation or contango present in futures markets. Backwardation occurs when the futures price is below the spot price, which results in an additional profit. Contango occurs when the futures price is above the spot price, and this results in a loss to commodity investors. Historically, futures markets fluctuate between backwardation and contango. Although roll return can be a large contribution to commodity returns, they are not considered in our forecast as there is no consistent methodology to forecast roll return. Over the most recent 10-year period, roll return has been negative, contributing -10.5% to the Bloomberg Commodity total return.

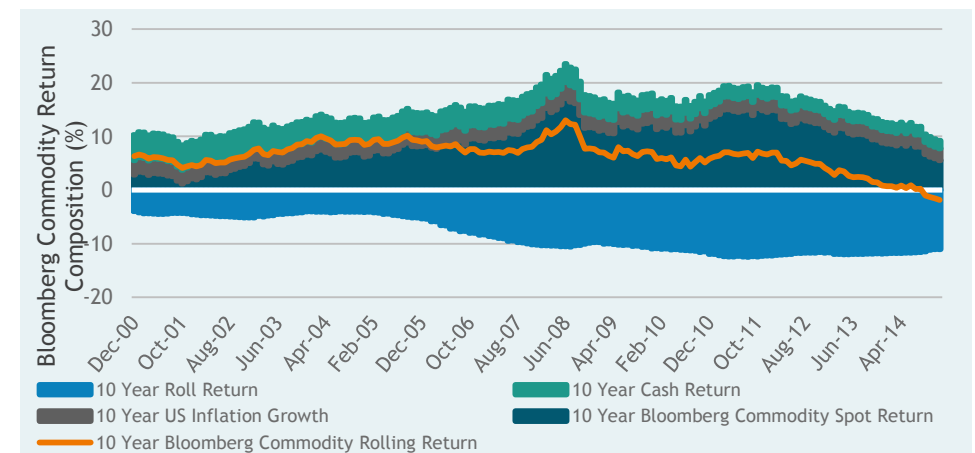
Our 10-year commodity forecast combines collateral (cash) return with inflation to arrive at the nominal return, and subtracts out inflation to arrive at the real return.

BLOOMBERG COMMODITY RETURN COMPOSITION (%)



Source: MPI, Verus

TRAILING 10 YEAR BLOOMBERG COMMODITY RETURN COMPOSITION (%)



Source: MPI, Verus

Risk parity

Risk Parity is built upon the philosophy of allocating to risk premia rather than to asset classes. Because Risk Parity by definition aims to diversify risk, the actual asset allocation can appear very different from traditional asset class allocation.

We model Risk Parity using an assumed Sharpe Ratio of 0.5, which takes into consideration the historical performance of Risk Parity. The expected return of Risk Parity is determined by this Sharpe Ratio forecast, along with a 10% volatility assumption.

We used a 10-year historical return stream from a market-leading product to represent Risk Parity correlations relative to the behaviors of each asset class.

Through greater diversification exposures, Risk Parity funds are suggested to be better able to withstand various difficult economic environments - reducing volatility without sacrificing return, over longer periods.

It is difficult to model Risk Parity, since strategies can differ significantly across firms/strategies. Risk Parity almost always requires explicit leverage. The amount of leverage will depend on the specific strategy implementation style, as well as expected correlations and volatility.

2015 CMA Forecast:

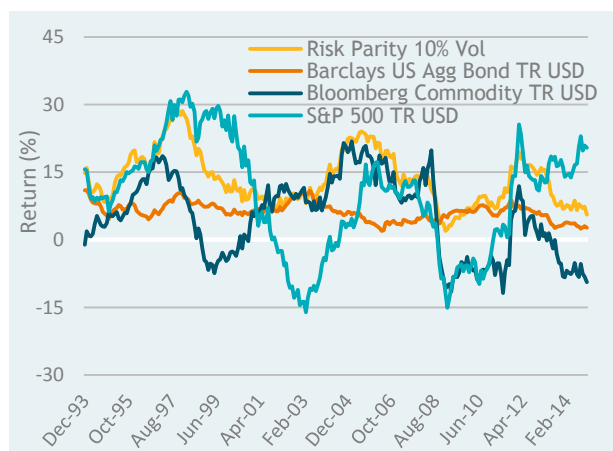
7.1% Geometric Rtn

7.6% Arithmetic Rtn

10% St. Deviation

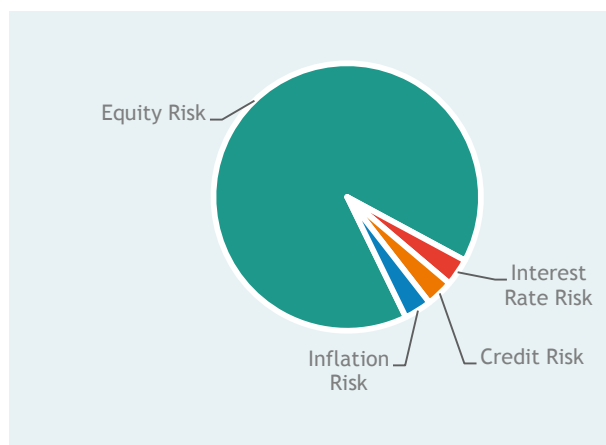
0.5 Sharpe Ratio

VS TRADITIONAL ASSET CLASSES



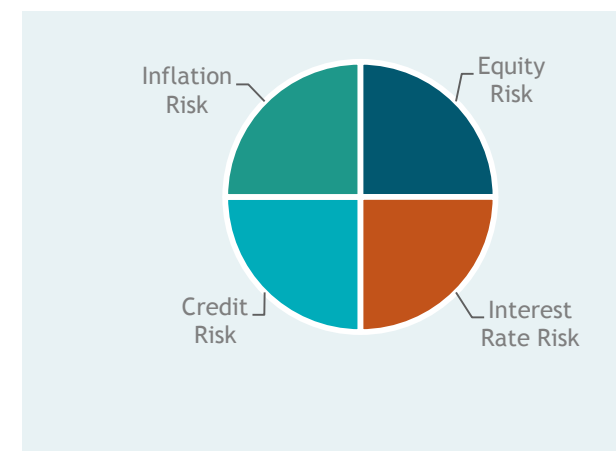
Source: MPI, as of 12/1/14

TRADITIONAL ASSET ALLOCATION



Source: Verus

RISK PARITY

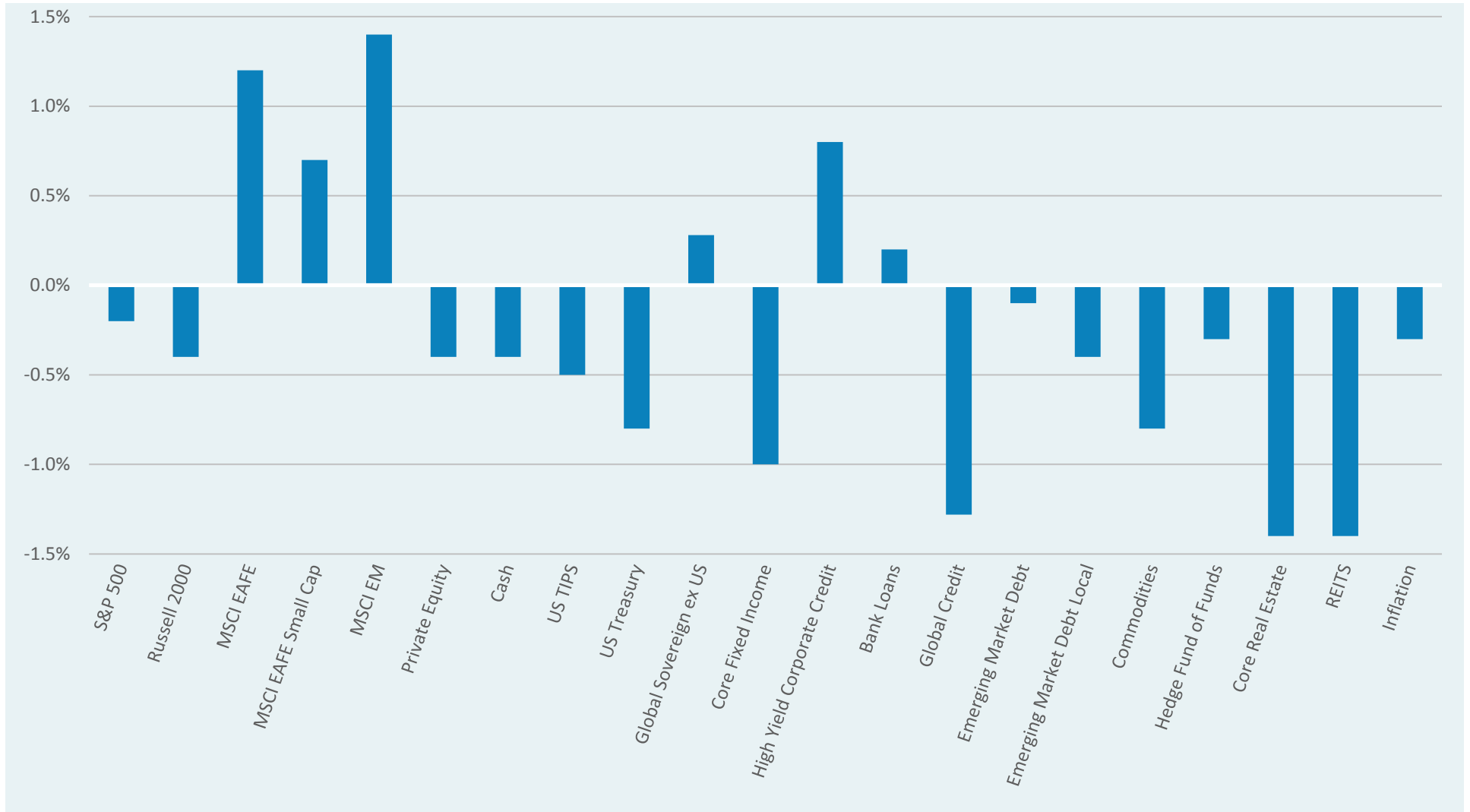


Source: Verus

Appendix

2015 vs 2014 return forecast

2015 VS 2014 RETURN FORECAST



The currency effect

- This last year has re-emphasized the important effect that currency returns can have on unhedged international portfolios. Verus has traditionally taken the view that we do not attempt to forecast currency market movement.
- When forecasting currencies, the “no opinion” position is reflected in the currency forward markets. This market prices currencies at a range of forward dates based on interest rate differentials - they represent the **SPOT** currency price for **FORWARD** delivery. Divergence from these rates is described as currency surprise.
- Investors with no active opinion regarding which direction exchange rates are headed would expect to earn the local currency return of foreign assets after correcting for the forward exchange rate (as priced by the currency forward market). We describe these returns as “hedged”.
- An investor with no active view regarding which direction exchange rates are headed would expect the unhedged and hedged returns from a foreign asset exposure to be identical.
- We therefore forecast foreign assets in local currency terms, then correct for expected currency movement based on currency forward market prices. We do this using 10-year forward rates. Because Verus has not historically expressed a view on currency, this is directly comparable to our previous forecasts.

Currency adjustment

THE EXPECTED CURRENCY EFFECT CAN BE CALCULATED BY IDENTIFYING THE FOLLOWING:

1. Today's currency spot rate
2. The price of a forward currency contract with a maturity equal to our forecasting horizon (10 years)
3. The annualized currency effect implied by this currency contract

EQUATION:

$$[(10 \text{ year contract rate})/(\text{spot rate})]^{(1/\text{years})}-1$$

FOR EXAMPLE:

If a US investor wishes to determine the likely currency affect of investing in Euro-denominated investments, and the EURUSD is currently trading at 1.13 (the spot rate), and a 10-year EURUSD currency forward contract is trading at 1.30, then the investor can use the equation below to calculate the implied currency effect:

$$(1.30/1.13)^{(1/10)} - 1 = 1.41\%$$

This tells us that the expected annualized currency effect for a US investor investing in Euro-denominated assets is a +1.41% currency return.

Correlation assumptions

	Cash	US Large	US Small	Developed Large	Developed Small	EM	PE	TIPS	US Treasury	Global Sovereign	US Core	US Core Plus	Short – Term Govt/Credit	Short-Term Credit	Long-Term Credit	US HY	Bank Loans	Global Credit	EMD USD	EMD Local	Commodities	Hedge Funds	Real Estate	REITs	Global Equity	Risk Parity	Inflation
Cash	1																										
US Large	-0.1	1																									
US Small	-0.1	0.9	1																								
Developed Large	0.0	0.9	0.8	1																							
Developed Small	0.0	0.8	0.8	1.0	1																						
EM	0.1	0.8	0.7	0.9	0.9	1																					
PE	-0.2	0.7	0.7	0.8	0.8	0.7	1																				
TIPS	0.0	0.2	0.1	0.2	0.3	0.3	0.2	1																			
US Treasury	0.0	-0.3	-0.3	-0.2	-0.2	-0.2	-0.2	0.6	1																		
Global Sovereign	0.0	0.2	0.2	0.4	0.4	0.4	0.5	0.6	0.5	1																	
US Core	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.8	0.9	0.6	1																
US Core Plus	-0.1	0.4	0.3	0.5	0.5	0.5	0.6	0.7	0.5	0.5	0.8	1															
Short – Term Govt/Credit	0.3	-0.1	-0.1	0.1	0.1	0.1	-0.2	0.6	0.6	0.6	0.7	0.6	1														
Short-Term Credit	0.0	0.3	0.3	0.5	0.5	0.5	-0.2	0.6	0.2	0.5	0.6	0.8	0.7	1													
Long-Term Credit	-0.1	0.3	0.2	0.4	0.4	0.4	0.1	0.6	0.5	0.5	0.8	1.0	0.4	0.6	1												
US HY	-0.1	0.7	0.7	0.8	0.8	0.7	0.6	0.4	-0.2	0.3	0.2	0.6	0.1	0.6	0.5	1											
Bank Loans	-0.1	0.6	0.6	0.6	0.6	0.6	0.2	0.2	-0.4	0.0	0.0	0.4	-0.1	0.5	0.3	0.9	1										
Global Credit	-0.1	0.6	0.5	0.8	0.8	0.7	0.7	0.6	0.2	0.8	0.6	0.8	0.5	0.8	0.7	0.7	0.5	1									
EMD USD	-0.1	0.6	0.5	0.7	0.7	0.7	0.5	0.7	0.3	0.5	0.6	0.8	0.4	0.7	0.7	0.8	0.6	0.8	1								
EMD Local	0.1	0.7	0.6	0.8	0.8	0.8	0.6	0.5	0.1	0.6	0.4	0.6	0.3	0.5	0.5	0.7	0.4	0.8	0.8	1							
Commodities	0.1	0.5	0.4	0.6	0.6	0.7	0.2	0.3	-0.2	0.4	0.1	0.3	0.1	0.4	0.2	0.5	0.4	0.6	0.5	0.6	1						
Hedge Funds	0.1	0.7	0.6	0.8	0.8	0.8	0.7	0.2	-0.3	0.1	0.0	0.4	0.0	0.4	0.2	0.6	0.6	0.6	0.5	0.6	0.7	1					
Real Estate	-0.1	0.4	0.3	0.3	0.3	0.3	0.3	0.1	-0.1	0.1	0.0	0.2	-0.1	-0.1	0.1	0.2	0.0	0.2	0.2	0.3	0.0	0.3	1				
REITs	0.0	0.8	0.8	0.7	0.6	0.6	0.6	0.2	-0.1	0.3	0.2	0.4	0.0	0.3	0.4	0.7	0.5	0.6	0.6	0.6	0.3	0.4	0.4	1			
Global Equity	-0.1	1.0	0.9	1.0	0.9	0.9	0.8	0.2	-0.2	0.4	0.1	0.4	0.0	0.4	0.4	0.8	0.6	0.7	0.7	0.8	0.6	0.8	0.3	0.7	1		
Risk Parity	0.0	0.5	0.4	0.6	0.6	0.6	0.6	0.7	0.4	0.6	0.6	0.7	0.5	0.6	0.6	0.5	0.3	0.7	0.7	0.7	0.6	0.5	0.3	0.5	0.6	1	
Inflation	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.1	-0.3	0.0	-0.3	-0.2	-0.2	0.0	-0.3	0.2	0.4	0.0	0.0	0.1	0.3	0.2	0.1	0.1	0.1	0.0	1

Note: Correlation assumptions are based on the last ten years. Private Equity and Real Estate correlations are especially difficult to model – we have therefore used BarraOne correlation data to strengthen these correlation estimates.