MILLIMAN Q2-2015 PENSION STUDY: APPLYING THE MILLIMAN MANAGED RISK STRATEGY

INTRODUCTION, EXPLANATION, AND APPLICATION OF THE MILLIMAN MANAGED RISK STRATEGY TO THE MILLIMAN 100 PENSION FUNDING INDEX

Milliman

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AS RISK MANAGEMENT BECOMES A HIGHER PRIORITY FOR PENSION PLANS, A SIMPLE HEDGING STRATEGY FOR EQUITY RISK BECOMES IMPERATIVE FOR THEIR SUCCESS. THE MILLIMAN MANAGED RISK STRATEGY AIMS TO ADDRESS THE TENSION BETWEEN EQUITIES' HIGHER GROWTH POTENTIAL AND THE RISKS THEY POSE.

"For the past 15 years, Milliman has conducted an annual study of the 100 largest defined benefit pension plans sponsored by U.S. public companies. The Milliman 100 Pension Funding Index projects the funded status for pension plans included in our study, reflecting the impact of market returns and interest rate changes on pension funded status, utilizing the actual reported asset values, liabilities, and asset allocations of the companies' pension plans" (Ehrhardt, Wadia, Milliman 100).

Milliman's Financial Risk Management team conducted a study using the Milliman 100 Pension Funding Index (Milliman 100). We applied the Milliman Managed Risk Strategy™ (MMRS) to the index's returns since its inception in 2000. The results of the study are striking. But before we discuss the value added by MMRS, it is important to contextualize the problems faced by pension plans in today's market.

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INTRODUCTION

HOW TO FUND PREDICTABLE LIABILITIES WITH UNPREDICTABLE ASSETS?

Funding predictable liabilities with unpredictable assets is a problem individuals and companies alike must deal with in today's retirement landscape. In the past, some companies transferred this risk to individuals via 401(k)-plans. More recently, plan sponsors have engaged in well-publicized, large-scale pension buyouts (e.g., Bristol-Myers Squibb and Motorola). Whenever this risk has been faced—whether by individuals or pensions—it historically has been dealt with through the one-size-fits-all strategy of diversification. We argue here that diversification alone is no longer enough.

Recently, pension plans have trended toward explicit risk management approaches in their investment strategies. They often start this effort by setting and defining goals for:

- Short-term risk
- Long-term risk
- Acceptable levels of variability

Increased allocations to long bonds (the LDI approach) and increased diversification via alternative assets are two ways that plans have tried to achieve these goals. However, neither of these approaches protects against systematic market risk – the most significant risk pension plans with an equity component face. Systematic market risk is risk that is inherent in the very structure of the market. It is unpredictable and undiversifiable; no market participant is immune to it. By its very nature, a diversification strategy cannot fully address systematic market risk.

MMRS explicitly addresses systematic market risk and in doing so helps achieve all three objectives through a combination of volatility management and a capital protection strategy. By using exchange-traded futures as an overlay on existing portfolio assets, it protects against large market losses, and addresses the challenge pensions face in managing the higher risk generally associated with the pursuit of higher growth via equities.

OVERVIEW OF THE MILLIMAN 100 PENSION FUNDING INDEX

In order to appreciate the potential effect of MMRS on pension funded ratios as explained in this paper, it is useful to first have a basic understanding of the Milliman 100 Pension Funding Index and how it works. Put simply, the Milliman 100 is designed to be a barometer of the funded ratio of the 100 largest pension plans of publicly traded companies in the U.S. The funded ratio is a measure of current pension assets, expressed as a percentage of projected pension benefit obligations. A ratio of one or greater implies that the plan's assets are currently sufficient to meet its expected obligations, while a ratio less than one suggests the assets fall short of being able to meet future liabilities.

The Milliman 100 Index is calculated by creating a hypothetical portfolio of the pensions' assets. The data used to create the Milliman 100 come from the Form 10-K annual reports, (which all publicly traded companies are required to file each year), as well as from other publicly available data. In addition to nominal asset and liability amounts, Milliman also uses reported asset allocation data; in the absence of a detailed list of individual plan holdings, asset allocations represent a reasonable proxy for estimating returns. The return estimates are created by matching the asset classes found in the pension plans with financial market indexes that are believed to best represent the performance of each asset class. Once a year, the asset classes in the Milliman 100 index are rebalanced to reflect the actual asset class weights in the latest annual reports. In the interim, the Milliman 100 Index is updated monthly based on the returns of the respective underlying market indexes.

Through this simple, rules-based approach, the Milliman 100 is able to generate ongoing estimates of pension assets and liabilities and provide a valuable real-time indicator of the health of the largest U.S. corporate pension plans. The Milliman 2015 Pension Funding Study can be found at http://us.milliman.com/PFS/. See the appendix at the end of this report for more details on the methodology.

EXPLANATION OF THE MILLIMAN MANAGED RISK STRATEGY

THE TWO COMPONENTS OF MMRS AND HOW IT AFFECTS A PENSION PLAN'S PERFORMANCE

The two components of MMRS—volatility management and a capital protection strategy—combine effectively to hedge a pension plan's equity risk. They also complement other risk management strategies that pension plans use to enhance their control over investment returns.

Across market cycles, MMRS may capture up to 70% to 80% of equity's positive performance during bull markets, while potentially limiting exposure to only 25% to 30% of downside risk in crisis periods.

Figure 1 (page 2) displays the extent to which MMRS can create such an asymmetric result. The green-shaded area represents distribution of an equity portfolio; the blue-shaded area is the same portfolio, with the application of MMRS.

Notice how skewed the "static portfolio" is. This is typical for stock returns. Large losses can occur in a short time period, but they can take months or years to rebuild. MMRS normalizes the distribution of portfolio returns, cutting off much of the fat left tail. Reducing the downside exposure cinches in the skewed distribution significantly while maintaining a comparatively large amount of upside potential.

FIGURE 1. IMPROVED DISTRIBUTION OF RETURNS WITH MANAGED RISK STRATEGY

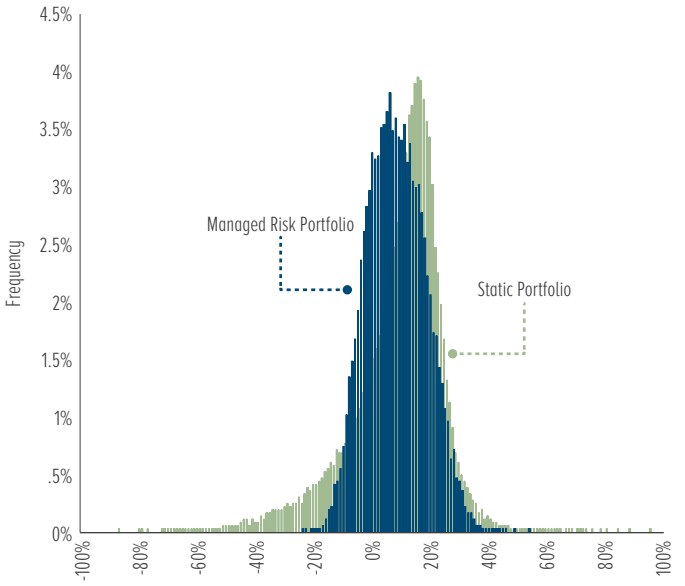
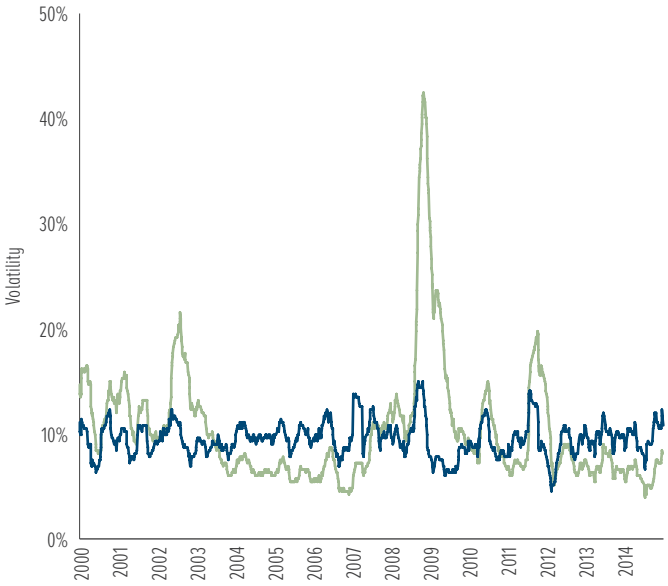


FIGURE 2. QUARTERLY REALIZED VOLATILITY, 2000 TO 2014



60/40 PORTFOLIO WITH OVERLAY TO MANAGE VOLATILITY (TARGET: 10%)

60/40 EQUITY/BOND STATIC ALLOCATION

This graph takes a 60/40 portfolio that is 60% invested in the total return MSCI All Cap World Index (ACWI) and 40% invested in the BarCap Agg, with the portfolio rebalanced monthly to 60/40.

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Over time, the combination of similar upside and much less downside improves portfolio performance. An investment with a return profile like the "managed risk portfolio" in Figure 1 has a better chance to outperform its "static" counterpart over full market cycles.

The first element of MMRS is volatility management. Volatility management adjusts portfolio exposure between high-risk assets (equities) and low-risk assets (bonds and/or cash) in order to target a defined level of volatility. This addresses a plan's risk management goals in a holistic way, because it:

- Manages daily volatility
- Sets long-term volatility targets
- Adjusts risk-exposures according to portfolio movement

The risk of a static portfolio and a portfolio with MMRS is illustrated in Figure 2. While the average volatility level of a portfolio may be acceptable over the long run, day-to-day events may create large fluctuations in volatility in the short run. A pension fund that maintains a static allocation does not meet its short-term risk objectives and accepts levels of variability that it can neither predict nor hedge against. Static allocation does not mean static volatility.

The second element of MMRS is the asset hedge, or capital protection strategy. The capital protection strategy is directional and recognizes that the larger the loss the portfolio has experienced, the higher the sensitivity the plan sponsor is to further losses. Therefore, in periods of sustained equity losses, the capital protection strategy decreases a portfolio's exposure to further declines in the market. In periods of high positive returns, MMRS allocates excess cash back into equities. The result is a responsive, dynamic asset allocation. Again, MMRS is addressing a plan's risk management goals in a holistic way because it:

- Locks in returns made before sharp market drops
- Reduces exposure to risky assets as markets move from bull to bear; and,
- Controls portfolio variability, beyond a stand-alone volatility management strategy

Operationally, both parts of the strategy are implemented with equity futures contracts. Asset allocations for each unique fund in the plan can be represented as a mixture of index exposures. Once that mixture is determined, volatility management and the capital protection strategy can be applied to the portfolio by buying and selling futures contracts on that mixture of indices. These futures contracts are inexpensive, transparent and highly liquid.

MILLIMAN 100 PENSION FUNDING INDEX WITH AND WITHOUT THE MILLIMAN MANAGED RISK STRATEGY

APPLYING MMRS TO THE MILLIMAN 100 GENERATES A SIGNIFICANTLY HIGHER FUNDED STATUS

The Milliman 100 has 15 years of history based on market indices that are representative of the underlying pensions' asset allocations. We asked the question, "what would that history look like with MMRS applied to it?" Naturally, any study that asks this type of "what if" question has the benefit of hindsight. However, the rules-based methodology of MMRS makes it relatively simple to go back and apply it to any stream of index returns. Running this test required a minor change to the index return frequency; the Milliman 100 uses monthly index returns, but MMRS is implemented on a daily basis. To address this, we generated a series of daily returns using the same underlying indices. Before applying MMRS, the difference between the monthly versus daily return streams was approximately one basis point annually.

In Figures 3 to 7, we compare the performance of our daily return stream portfolio with MMRS to the actual Milliman 100 Index since 2000. Liabilities, contributions, and benefit payments were all held constant. Underlying investments and allocations for the MMRS study were taken directly from data used to generate the original Milliman 100. The only difference is the employment of MMRS, but the result is a drastic improvement in funded status.

The results of our analysis suggest that the implementation of MMRS improved the funded ratio by 20 percentage points, changing the Milliman 100's funding deficit into a funding surplus. In dollar terms, that amounts to an aggregate improvement in funded status of $335 billion.

Readers who follow the Milliman 100 likely recognize the graph in Figure 4. It shows the monthly funded status of the 100 largest defined benefit pension plans sponsored by US public companies. Since 2000, these 100 companies have had enough assets to meet their projected obligations only 25% of the time.

Juxtapose the graph in Figure 4 with the one in Figure 5 (page 4). With the comprehensive risk management techniques in place under MMRS, our study suggests that the companies in the M100 Index could instead have been overfunded nearly 2/3 of the time with no additional contributions.

FIGURE 3. FINAL VALUES OF M100 AS OF JUN-2015 (FIGURES IN $ BILLIONS)

	Portfolio		
	M100 Actual	M100 w/ MMRS	Difference
Market Value of Assets	$1,448.9	$1,783.5	$334.7
Projected Benefit Obligation	$1,692.4	$1,692.4	$0.0
Funded Status	-$243.6	$91.1	$334.7
Funded Ratio	85.6%	105.4%	19.8%
Internal Rate of Return Jan 2000 - Jun 2015	5.7%	6.8%	1.1%

FIGURE 4. MILLIMAN 100 WITHOUT MMRS FUNDED STATUS

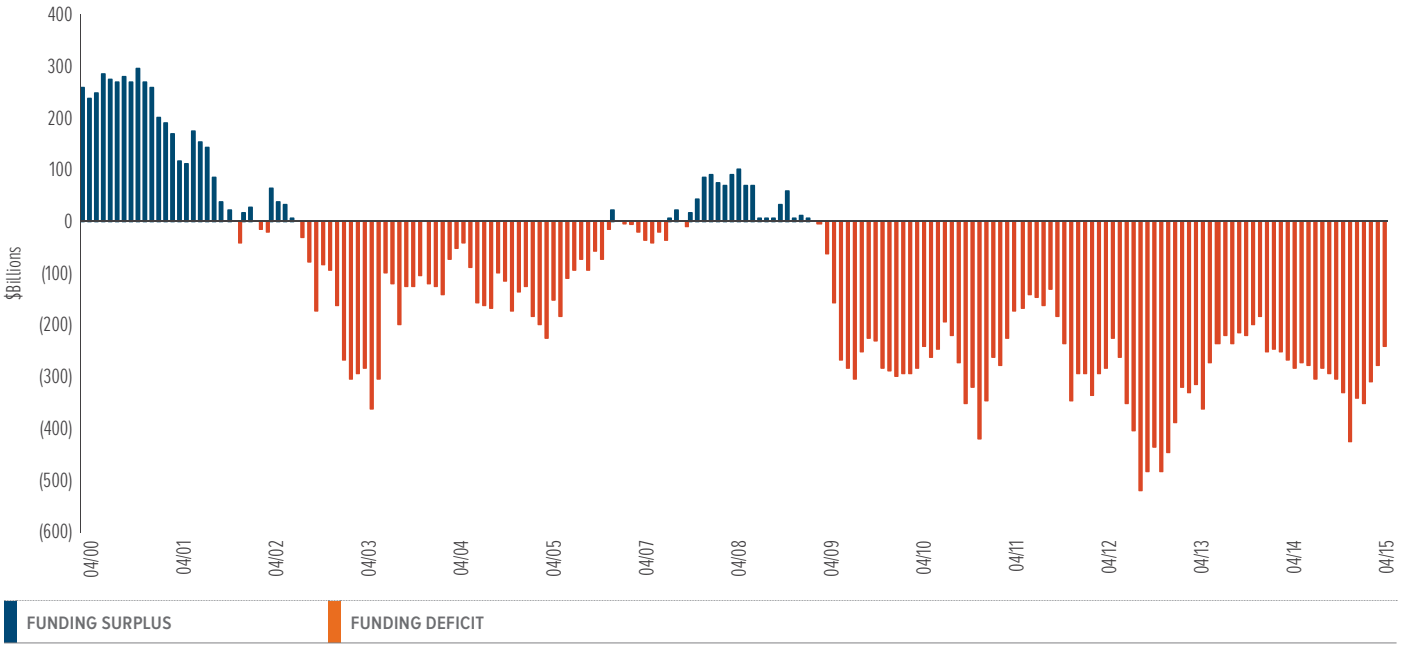

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Figure 6 displays the cumulative difference between Figure 4 and Figure 5. This can be thought of as the cumulative "benefit" of the strategy, building on itself year-over-year. Since 2000, there have been two economic downturns: the bursting of the dot-com bubble and the 2008 financial crisis. These are two periods during which companies in the Milliman 100 likely breached their short- and long-term risk thresholds. Not surprisingly, these are the periods when the study shows high outperformance under MMRS. Figure 6 shows that MMRS not only offers the potential to stabilize volatility, but it may also contribute to a higher funded status over full market cycles.

A lower-risk portfolio that ends up with higher return can seem counterintuitive. The rationalization behind modern portfolio theory (MPT), developed by Harry Markowitz in the 1950s, says that each unit of risk an investor takes on should be compensated with a unit of return. However, investment returns are not independent

FIGURE 5. MILLIMAN 100 WITH MMRS FUNDED STATUS

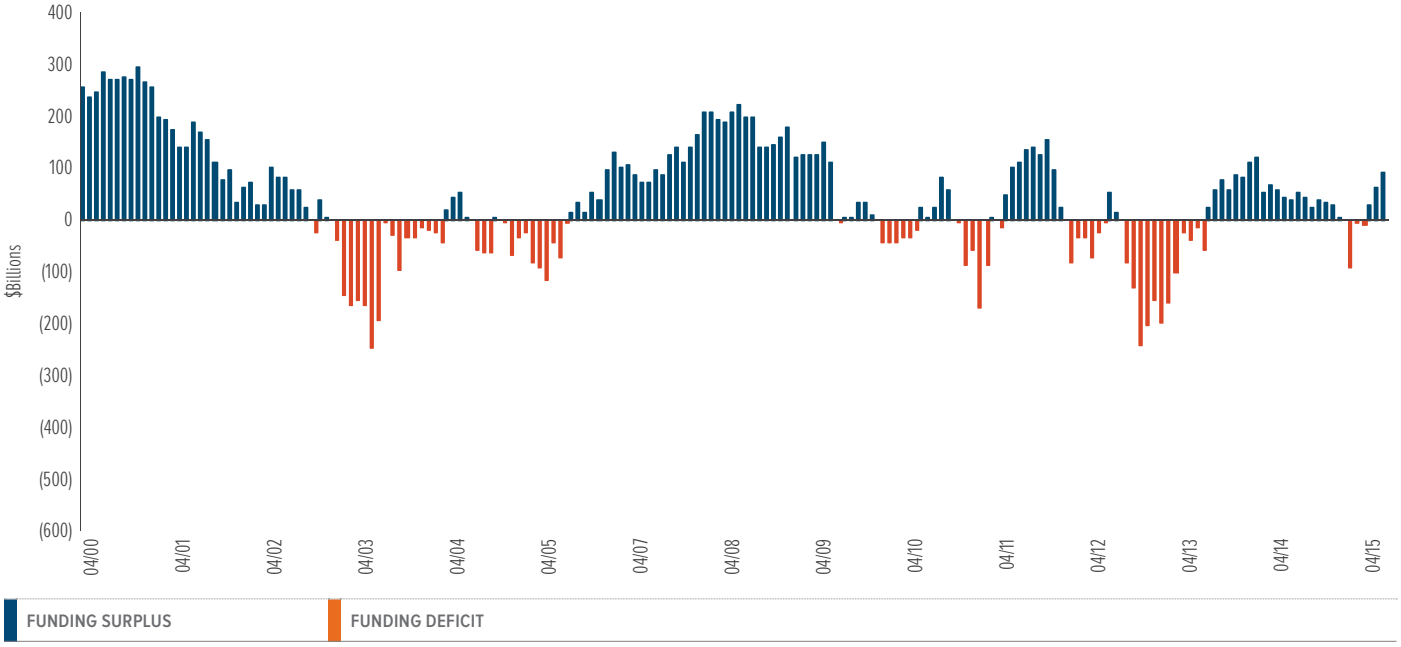
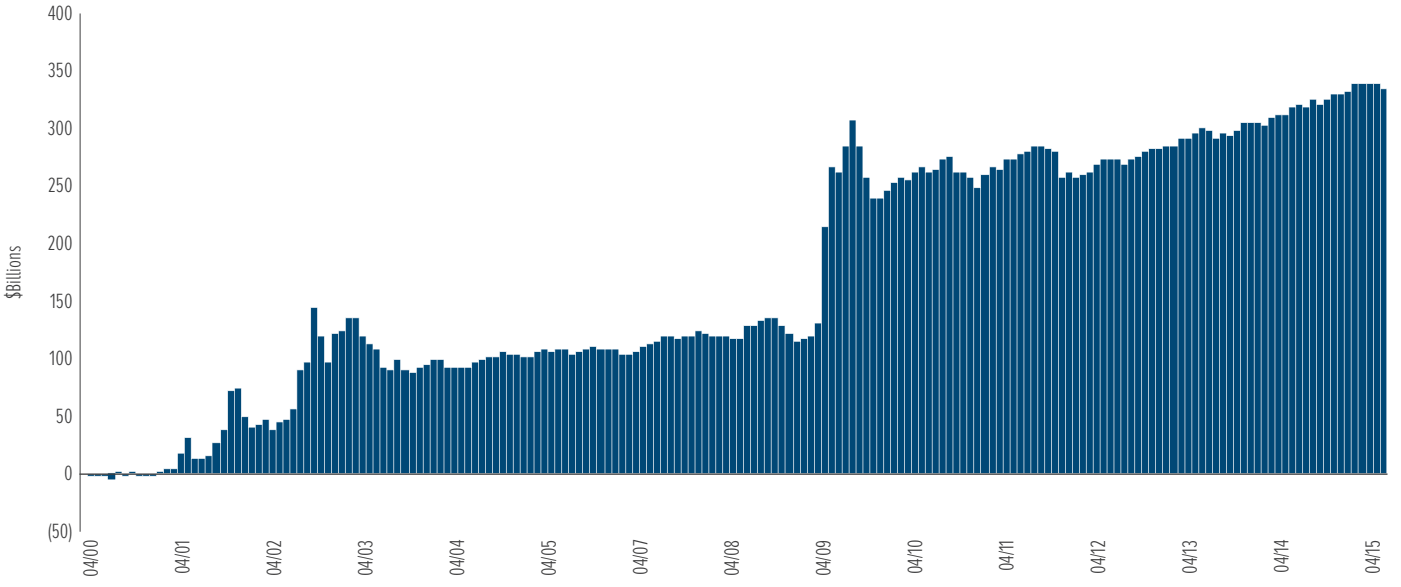


FIGURE 6. CUMULATIVE DIFFERENCE BETWEEN MILLIMAN 100 WITH AND WITHOUT MMRS



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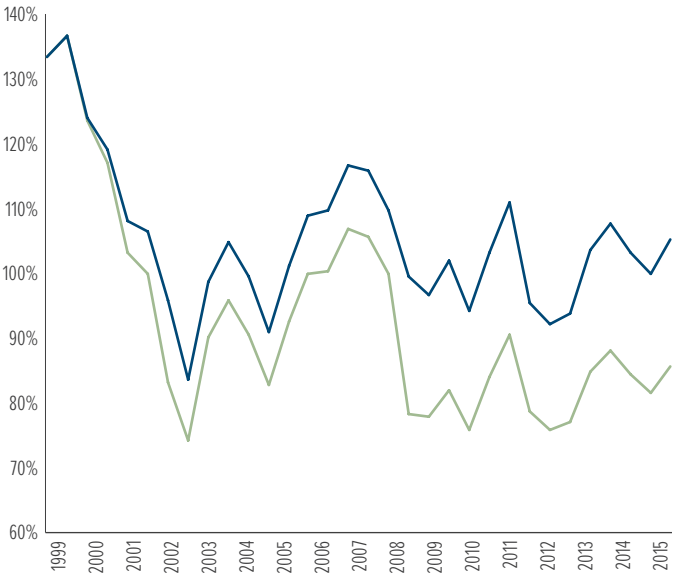
of one another. If a portfolio loses value in one year, it has less capital to generate returns in the next. Additionally, pension plans must wrestle with a problem unique to the retirement industry: the periodic sale of assets to fund benefit payments.

Whether the market is up, down, or flat, pension plans still must pay out benefits. When times are good, plans can use asset gains to fund these payments. When the market dips, the plan sponsor funds these payments by tapping into existing plan assets, their own pocket, or their employees' pockets. Periodic selling of assets, especially at market bottom, forces pension plans to lock in losses during a crisis. This dynamic has played a central role in these pensions' ongoing underfunded status. Essentially, a number of pension plans in the Milliman 100 sold at market bottom, and without a proper risk management strategy in place for equities, locked in their losses.

The benefit of an equity risk management strategy like MMRS extends beyond crisis periods however. During the latest six-year bull market, the difference between the Milliman 100 with and without MMRS continued to grow. The reason for this phenomenon is simple. The hypothetical portfolio with MMRS has a larger pool of assets to fund an identical obligation. The drawdowns of the unhedged portfolio were too big to be offset by its returns during subsequent rising markets.

The funded ratio comparison in Figure 7 offers a year-by-year comparison of the Milliman 100 with and without MMRS. In rising markets, the two closely follow one another. Excluding 2003 and 2009, the portfolios move in tandem, and reductions in the funded ratio are largely dependent upon changes in interest rates and projected liabilities. These changes, however, do not have nearly as dramatic an effect on funded ratios as falling markets. In these periods—2003 and 2009— MMRS stops the funded ratio from falling an additional 7% and 13%, respectively.

FIGURE 7. FUNDED RATIO COMPARISON - ASSETS / PROJECTED BENEFIT OBLIGATIONS



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SHORT AND LONG-TERM RISK IN ITS NATURAL HABITAT—BEAR MARKETS AND THE MILLIMAN 100

"AND NOW I SAW, THOUGH TOO LATE, THE FOLLY OF BEGINNING A WORK BEFORE WE COUNT THE COST; AND BEFORE WE JUDGE RIGHTLY OF OUR OWN STRENGTH TO GO THROUGH WITH IT."

—DANIEL DEFOE, ROBINSON CRUSOE

(—AND EVERY DB PLAN SPONSOR, MARCH 2009)

There are many ways to define risk. Harry Markowitz defined it as price fluctuation. Fellow Nobel laureate William Sharpe defined it as systematic risk, or beta, in the capital asset pricing model. In its most basic terms, risk is the difference between expectation and reality. It is uncertainty. And it is everywhere.

Diversification, although capable of lowering a portfolio's risk, neither eliminates nor effectively controls risk. Equity markets go through prolonged periods of unexpected, negative returns, and this affects nearly every stock. MMRS is able to rein in long-term risk by consistently managing it on a short-term basis. Its basic principle is volatility management. By controlling volatility, plans are much better equipped to count the cost of their investments before going through with them.

Consider that, in eight out of the 15 years of this study, actual return has differed from expected return by more than 4.5%. For example, in 2011, expected return was 7.8%, and actual return was 3.1%. In aggregate, that means the companies in the Milliman 100 did not reach even half of their target returns in 2011. Up or down, the difference from portfolio expectation is risk.

Figure 8 (page 6) shows the difference between expected return and actual return in absolute terms. If the difference is higher, the risk level is greater.

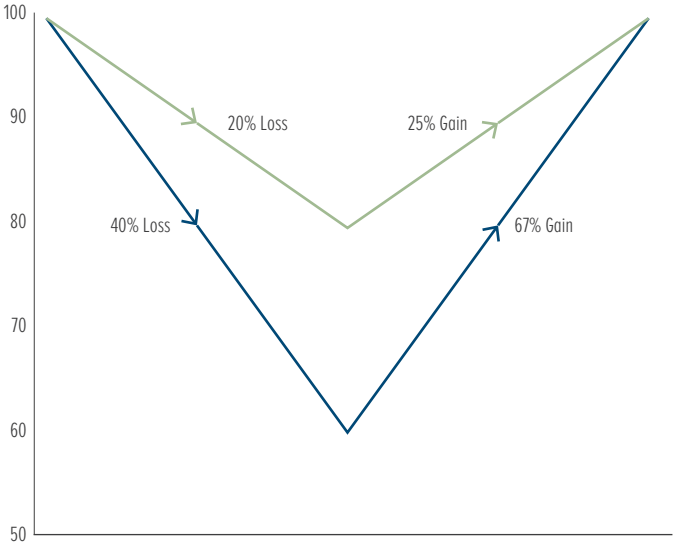
By defining risk as realized return minus expected return, an interesting trend emerges. Notice the years in the table where expectations differ widely from reality: 2000 to 2002, and 2008. They are all years in which Milliman 100 experienced negative performance. These four negative years account for nearly two-thirds of the risk, or deviation from expectation, experienced in the study.

FIGURE 8. EXPECTATION AND REALITY

Year	M100 Expected Return	M100 Actual Return	Absolute Difference
2000	9.4%	-1.3%	10.7%
2001	9.4%	-4.8%	14.2%
2002	9.2%	-11.4%	20.6%
2003	8.5%	19.4%	10.9%
2004	8.4%	10.1%	1.7%
2005	8.4%	9.3%	0.9%
2006	8.3%	13.2%	4.9%
2007	8.3%	7.5%	0.8%
2008	8.1%	-21.3%	29.4%
2009	8.1%	13.2%	5.1%
2010	8.0%	10.4%	2.4%
2011	7.8%	3.1%	4.7%
2012	7.5%	9.3%	1.8%
2013	7.4%	10.5%	3.1%
2014	7.3%	9.6%	2.3%

Expected Returns taken from the 2015 Milliman 100 Pension Funding Study.

20% loss vs. 40% loss

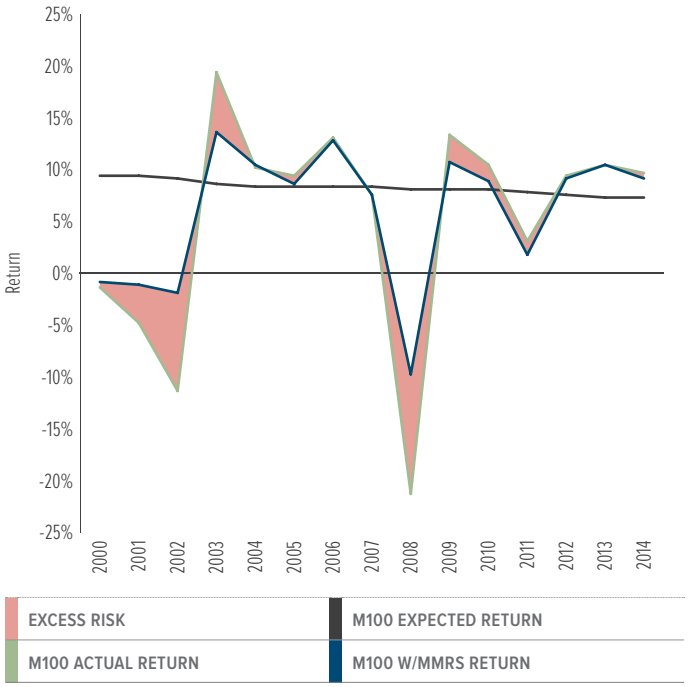


Why does this occur? It is because the pattern of returns matters. Large losses must be followed by even larger gains to break even.

Notice that the best and worst performing years in Figure 8 had returns around +20% and -20%, However, the highest performing year (2003, 19.4%) was only 11% greater than its expectation. On the other hand, the worst performing year (2008, -21.3%), was nearly 30% less than its expectation. Deviations from expectation tend to be greater during years of negative returns.

The graph in Figure 9 shows the potential for MMRS to mitigate excess equity risk. The shaded region represents risk that MMRS could have mitigated. Over this time period, the Milliman 100 not only breached acceptable levels of variability, but did so for a lower return!

FIGURE 9. EXPECTED RETURNS VS. PORTFOLIO RETURNS



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Finally, it is worth looking at another way to measure plan risk: volatility of sponsor contribution. As a plan matures, it becomes increasingly dependent upon asset performance. Plan sponsors expect to pay a growing number of employees with positive returns, and one bad year can mean a drastic increase above a sponsor's predicted contributions. On the other hand, when investment values exhibit greater stability, contribution rates are more predictable. As America ages, and plans continue to mature, risk management strategies such as MMRS will likely play an increasingly important role in stabilizing contribution rates.

TRENDS IN PENSION PLAN RISK MANAGEMENT AND GLOBAL ECONOMICS

MAD LIBS™: "IN THESE _____ ECONOMIC TIMES..."
ADJECTIVE

Tough, uncertain, risky, difficult—these terms have become synonymous with today's economic environment. Risk is nothing new though. In the study outlined above, the Milliman 100 missed expectations long before the 2008 financial crisis. What is new is

the heightened awareness pensions have of investment volatility. Although they are entities geared toward long term investments, they increasingly feel the sharpened edge of short-term trends.

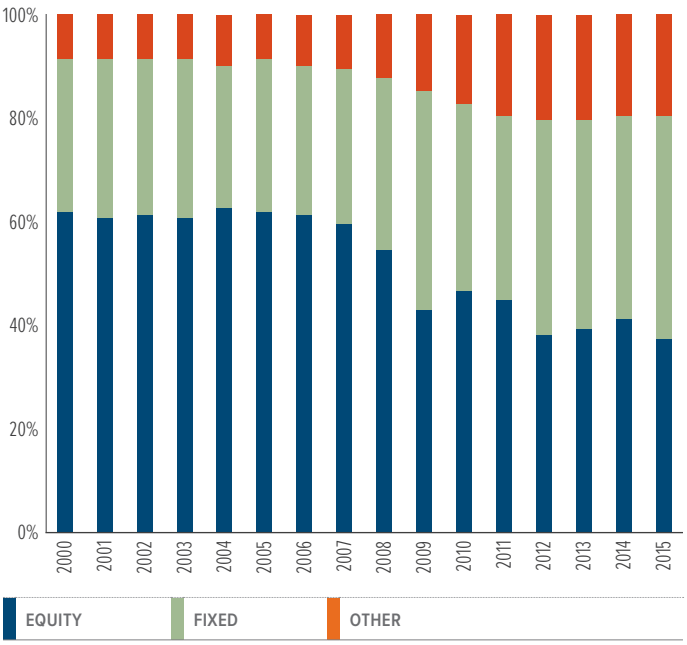
This stronger sensitivity to asset/liability mismatch manifests itself in a trend away from traditional equities and into bonds. Figure 10 captures the Milliman 100's shrinking equity allocation. Other asset classes include real estate, private equity, hedge funds, commodities, and cash equivalents.

From 2008 into 2015, allocation to equities decreased from 60% to below 40%. Over the same time period, the S&P 500 has more than tripled in value from its March 3, 2009 low of 676.53. This trend, therefore, cannot be explained by plans searching for higher returns. Rather, they are searching for more stable returns.

In this paper's introduction, the increasing popularity of LDI was mentioned as an example of pension plans trending toward risk-focused investment approaches. LDI is a process of matching liability returns with asset returns. Liabilities are affected by changes in interest rates and inflation, and as such, an LDI strategy attempts to find assets that hedge against adverse changes in these two market forces.

That protects against interest rate risk, but it leaves a large gap where equities are involved. MMRS can act alongside LDI, or as a stand-alone risk management strategy. It completes the picture, so to speak, because bonds are not the only asset class being used to pay out benefits. It offers exposure to the growth potential that so many plans need, while mitigating the risk they cannot afford.

FIGURE 10. ALLOCATION BY ASSET CLASS



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SUMMARY

THE MILLIMAN MANAGED RISK STRATEGY EFFECTIVELY CONTROLS PORTFOLIO VOLATILITY. THE FUNDED STATUS OF THE M100 WITH MMRS WAS 20 PERCENTAGE POINTS HIGHER THAN THE M100 WITHOUT MMRS.

The Milliman 100 Pension Funding Study is an annual report with monthly updates concerning the funded status of the largest 100 defined benefit pension plans sponsored by public US companies. We took historical index data from this study and tested it to see how the Milliman 100 might have performed if MMRS had been used for risk management. The result was not only lower risk in those years where market return was negative, but also higher outperformance overall.

The reason a portfolio with lower risk resulted in higher cumulative returns is not necessarily intuitive. It has to do with the way portfolio returns and pension plans operate. Whether a portfolio gains money or loses money, it has to pay out a steady stream of benefits to its participants. This forces pension plans to sell assets even at market bottom. The Milliman Managed Risk Strategy lessens the negative impact of market risk in a crisis, so the dip in asset value is not quite so steep. During the corresponding bull market, the unhedged portfolio may realize better returns, but it does so on a smaller asset base. In other words, $50 earning 20% earns an additional $10, but $100 earning 15% earns an additional $15.

Plan sponsors and pension trustees recognize this mathematical fact, and are becoming increasingly sensitive to the exposure of their portfolios to significant losses. In response, they are implementing various types of risk-hedging strategies, one of which is LDI. However, this de-allocation from equities is occurring in tandem with high positive equity returns and low interest rates. There is a need for a risk management solution for interest rate changes *and* stock market changes. That is where MMRS comes in.

Volatility management on a daily basis accomplishes short-term risk objectives. Setting and maintaining volatility targets achieves long-term objectives. MMRS's capital protection strategy stabilizes levels of variability experienced in a crisis. In essence, it answers and applies all three of the risk management goals outlined in the introduction. As such, MMRS represents a unique solution to the challenge of pursuing the much needed growth potential that equities offer, while seeking to mitigate their inherent systematic risk.

APPENDIX

MILLIMAN 100 METHODOLOGY—TAKEN FROM MILLIMAN 2015 PENSION FUNDING STUDY

The results of the Milliman 2015 Pension Funding Study are based on the pension plan accounting information disclosed in the footnotes to the companies' Form 10-K annual reports for the 2014 fiscal year and for previous fiscal years. These figures represent the GAAP accounting information that public companies are required to report under Financial Accounting Standards Board Accounting Standards Codification Subtopics 715-20, 715-30, and 715-60. In addition to providing the financial information on the funded status of their U.S. qualified pension plans, the footnotes may also include figures for the companies' nonqualified and foreign plans, both of which are often unfunded or subject to different funded standards from those for U.S. qualified pension plans. The information, data, and footnotes do not represent the funded status of the companies' U.S. qualified pension plans under ERISA.

EXPECTED INVESTMENT RETURN METHODOLOGY—TAKEN FROM MILLIMAN 2014 PENSION FUNDING STUDY

To develop the expected rate of return used in these calculations, we relied on the most recently available asset statements for each plan, particularly on Statements of Plan Net Assets as disclosed in published Comprehensive Annual Financial Reports (CAFRs). We did not make adjustments for potential differences between actual asset allocations and target policy allocations.

Our method to calculate the expected rate of return was the "building-block method" as outlined in Actuarial Standard of Practice No. 27, using geometric averaging methodology. We used Milliman's capital market assumptions to calculate the 50th percentile 30-year real rate of return, then added the plan's inflation assumption to arrive at the total expected investment return on plan assets. Where the plan inflation assumption was not available, we used a capital market inflation assumption of 2.50%. We did not make any adjustment to the expected rate of return for plan expenses, nor did we include any assumption for investment alpha (i.e. we did not assume any excess return over market averages resulting from active versus passive management).

SIMULATED VS. ACTUAL MILLIMAN 100

Analysis for the MMRS relies on historical data, including: fund returns, index returns, and interest rates. To apply MMRS to the Milliman 100, it is necessary to calculate a daily return stream. Index data used in calculating the original Milliman 100's monthly payoff for its various asset types is retrieved daily. This allows for the calculation of daily total returns (we assume all dividends are reinvested). Indices lacking available daily data are approximated using an appropriate benchmark. If a specific fund lacks returns dating back to the inception of the study, the fund returns are backfilled, using the returns of an appropriate benchmark. These returns are then applied to an asset-weighting equal to that of the Milliman 100 (since 2000). The underlying investment holdings of each fund are rebalanced periodically. The "unprotected" fund consists of static allocation to the underlying investment holdings. The result is a benchmark of simulated daily values. Historically, the difference in return between this benchmark and the actual Milliman 100 was approximately one basis point per year.

MMRS METHODOLOGY

MMRS has two components: volatility management, and a capital protection strategy. These two components consist of numerous parameters, which must be specified before running a backtested analysis.

The volatility management component targets an expected level of volatility. Given the asset allocation of the hypothetical portfolio based on the Milliman 100, our expected realized volatility target is 10%. The capital protection strategy relies on the sale of futures contracts to replicate portfolio performance. To implement both components of MMRS, the managed risk fund includes a futures overlay (in addition to static allocations to the underlying investment holdings).

In an effort to maximize transparency and reliability, the hypothetical portfolio based on the Milliman 100 with MMRS uses the most liquid exchange-traded hedge assets. Trades are assumed to occur once per day, at end-of-day prices. Futures contracts on the S&P 500, Russell 2000, MSCI Emerging Markets, and MSCI EAFE indices are modeled. The number of futures contracts traded each day in the analysis is based solely on the output of the MMRS algorithm, and pre-specified trading thresholds. The payoffs for each futures contract is calculated based on index returns, interest rates, and the futures multipliers. The analysis assumes that all cash held to support the margin for futures contracts earns interest based on the shortest interest rate input into the model. An additional fee of 25 basis points is taken out of the hypothetical portfolio to simulate the MMRS "fee."

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Milliman, Inc. (Milliman) is one of the world's largest independent actuarial and consulting firms. Founded in Seattle in 1947, Milliman has 55 offices in key locations worldwide that are home to over 2,600 professionals, including more than 1,300 qualified consultants and actuaries.

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