Executive summary. One of the prime tenets of investing is that diversification reduces risk. It verges on an undeniable law of nature. After all, buying diverse assets with limited correlation to each other should lead to lower portfolio volatility and risk. This is an important issue facing pensions today amid the growing interest in derisking—the strategy of reducing risk as a plan’s funding level improves (Sparling and Inglis, 2012).

But lower portfolio volatility may in fact not reduce risk for pension plans, because they have a unique definition of risk. Pension risk focuses on asset volatility in relation to the pension’s liability, which normally has significant interest rate sensitivity and volatility. Therefore, the best way to reduce pension risk is to build an asset portfolio that acts like the liability. Adding bonds can do that, but diversification is less successful.
This study shows that diversifying a portfolio away from bonds and into alternatives can actually raise pension risk. Diversifying away from equities reduces risk only modestly, and the benefits should be weighed against the hurdles of implementation.

Many pensions today are underfunded and maintain aggressive asset portfolios to avoid “locking in losses.” Meanwhile, their sensitivity to pension risk has ratcheted higher as changing accounting rules have increased their impact on company financials. These factors explain the growing interest in strategies for derisking, or reducing risk as funding levels improve.

The key question is how to accomplish this, because the definition of investment risk for a traditional pension plan is unique. Pension risk is defined as volatility relative to the valuation change of the liability, and that value is greatly affected by interest rate changes. Lowering the absolute volatility of the asset portfolio can actually increase risk; therefore, controlling this volatility should take a backseat to managing the assets’ relationship to the liability’s risk factors.

Enter alternatives investing. These investments have become popular following the successes of several endowments that specialize in them. But risk reduction for a pension plan may be better achieved by owning assets that are closely correlated to the plan’s liability. This paper analyzes the following questions: Is a pension portfolio improved by adding alternative assets? What assets should fund that position, and what effect might such a strategy have on returns?

IMPORTANT: The projections or other information generated by the Vanguard Capital Markets Model® regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. VCMM results will vary with each use and over time. The VCMM projections are based on a statistical analysis of historical data. Future returns may behave differently from the historical patterns captured in the VCMM. More important, the VCMM may be underestimating extreme negative scenarios unobserved in the historical period on which the model estimation is based.

Notes on risk: All investments involve some risk. Be aware that fluctuations in the financial markets and other factors may cause declines in the value of your account. There is no guarantee that any particular asset allocation or mix of funds will meet your investment objectives or provide you with a given level of income. Investments in bond funds are subject to interest rate, credit, and inflation risk. Diversification does not ensure a profit or protect against a loss in a declining market. The performance of an index is not an exact representation of any particular investment, as you cannot invest directly in an index.
Testing strategies using alternatives
Because liability valuation is based on long corporate bond rates, interest rate exposure is one of the primary risks facing pension plans. The Citibank Pension Liability Index (CPLI), begun in 1995, is a widely accepted benchmark for the discount rates used to measure returns on pension liability, and we used this as our liability target. The assets used for our study, which covers the period December 31, 1995, through March 31, 2012, are the primary components of liability-driven investment (LDI)-based pension plans: bonds, as represented by the Barclays U.S. Long Corporate Bond Index, and equities—in this case, a typical 67%/33% mix of the Standard & Poor’s 500 Index and the MSCI EAFE Index, respectively. Long-term bonds are the low-risk choice for a traditional plan, and equities are the usual way to add higher return to a portfolio.

Because of their success in the endowment field, alternative strategies have become popular among pension plan fiduciaries. However, testing these strategies is a challenge, because return data are often limited and suffer from various quality issues. For these reasons, we focused on two alternative asset classes that have documented index history: real estate (represented by the FTSE NAREIT Real Estate Index) and commodities (represented by the Goldman Sachs Commodity Index, GSCI). As highlighted later in this paper, these asset classes exhibited levels of volatility typical among alternatives. They also have had little correlation to other assets until recent years when, as many alternatives did, they began tracking equities more closely. When inserted into our test portfolios, the two alternatives were equally weighted (individual testing showed that commodities fared better during the test period, but equal weighting was applied to avoid data-mining questions and to represent the most likely scenario).

Diversify or hedge?
A pension portfolio’s risk can be reduced simply by buying assets that act like the liability. Current law requires that liability be valued based on market rates along the yield curve; the overall effective rate is very similar to that of a high-quality long corporate bond. Therefore, buying that sort of bond should lead to a low-risk portfolio, and it does. (Keep in mind, however, that even a portfolio composed solely of bonds of appropriate quality and duration cannot eliminate all risk. It would, for instance, face downgrade and default risk, although liability would not be affected.)

As shown in Figure 1, on page 4, a diversified asset portfolio cannot offer the same level of pension risk reduction as a bond portfolio. In a comparison of the correlation of the return on the CPLI to those of the Barclays U.S. Long Corporate Bond Index and a typical diversified portfolio (40% equities, 40% long bonds, and 20% alternatives evenly split between real estate and commodities), the diversified portfolio frequently and dramatically failed to track the liability.

Figure 2, on page 4, shows the episodic nature of alternative assets’ correlation to the CPLI (in gold) and to equities. The blue line shows that after 2007, stocks and alternatives verged on near-perfect correlation (Philips, Walker, and Kinniry, 2012).
Figure 1. Correlation of CPLI to a balanced portfolio and an all-bond portfolio

12-month rolling periods: December 31, 1995, through March 31, 2012

![Graph showing correlation of CPLI to a balanced portfolio and an all-bond portfolio](image)

Source: Vanguard.

Figure 2. Correlation of alternatives to CPLI and S&P 500

12-month rolling periods: December 31, 1995, through March 31, 2012

![Graph showing correlation of alternatives to CPLI and S&P 500](image)

Source: Vanguard.
Can alternatives help?

Most pension plans are not 100% bonds. Can diversification help them to mitigate risk? It depends. Figure 3, on page 6, shows the results of a gradual diversification into alternatives funded from either equities or bonds. Starting at the left, with no investment in alternatives, and ending at the far right, with a large, 40% allocation to alternatives, the graph shows the change in tracking error as alternatives are added. The tracking error reflects the portfolio’s volatility relative to its liability. A rising tracking error indicates rising relative volatility.

The red line in Figure 3 starts at a 40% equity/60% bond mix, with bonds funding the growing alternative position. It finishes at the far right with a 40%/20%/40% asset mix. The steadily rising line means that funding the alternatives allocation from bonds increases the risk of the portfolio relative to its liability.

The blue line in the figure shows a similar setup but starts with a 60% equity/40% bond mix, with equities funding the alternative position, and finishes at a 20%/40%/40% mix. Here, the tracking error did drop and hit a low point at a 24% allocation to alternatives. There was a decline in risk when adding alternatives funded only by equities, but the gain was quite modest—at best, a 3% reduction in tracking error. Plan sponsors must decide whether such a small drop in risk is worth a 24% allocation shift into alternatives.

An aberration?

Some may argue that because the period studied (1995 through first-quarter 2012) was unusual, the failure of the alternatives strategy was aberrant. But this period was no friend of equities as pension risk controls, either. In previous decades, equities had “duration”—that is, they tended to rise with declining interest rates, showing a positive correlation with interest rate change in a useful 0.2 to 0.3 range. During the test period, equity duration turned negative. Although we expected a low correlation between alternative investments and interest rates, the lack of equity duration affected the study’s results, and yet, alternatives still were not able to statistically improve the portfolio’s risk profile. (Note: When we “artificially” raised equity’s correlation to interest rates to 0.2, the optimal alternatives allocation dropped from 24% to 2%.)

To reduce risk, a pension portfolio seeks high correlation to the liability, not the low-correlation profile sought by total-return portfolios. Plus, reducing risk through diversification is more prone to failure than investing in pension plans’ best-fitting asset—bonds.

Effect on return

So far, this paper has examined only the risk-control attributes of alternatives. However, because of the current steep yield curve, long corporate bonds offer not only very low risk but also returns similar to many alternative asset classes (see Appendix A-1, Vanguard Capital Markets Model 30-year forecast). By investing in these bonds, a portfolio without alternatives can achieve similar returns with lower pension risk. Figure 4, on page 7, considers two portfolios with similar 30-year expected returns, showing the rolling historical 12-month correlation of each to the CPLI. If the difference (red line) is above zero, the 50% stock/50% bond portfolio has a higher correlation to the liability target than a 40% stock/40% bond/20% alternatives portfolio—and this occurred 82% of the time.
Are results for the 60%/40% and the best alternative portfolios statistically different?

Since the risk reduction was so small, we tested whether the results of the best alternative portfolio (36%/40%/24%, indicated by the gold diamond in Figure 3) were statistically different from those of the original 60%/40% allocation. We calculated the tracking error of monthly returns for each year to analyze portfolio volatility and overall equality, as follows:

Can’t reject equal means: \( t\)-stat = 0.337
Can’t reject equal medians: Wilcoxon \( t\)-stat = 0.413

Because neither value is close to a 95% confidence level (roughly a 2.0 \( t\)-stat), the portfolios’ results are statistically equivalent. (See Appendix A-2 for a full statistics table.)
Figure 4. Correlation to CPLI of diverse portfolios

12-month rolling period: December 31, 1995, through March 31, 2012

Note: Returns forecast based on Vanguard Capital Markets Model, March 2012.
Source: Vanguard.

Arithmetic returns forecast based on VCMM, March 2012
50% stocks/50% bonds/0% alternatives portfolio—center of return distribution: 6.70%
40% stocks/40% bonds/20% alternatives portfolio—center of return distribution: 6.65%
A rich opportunity or hurdle to success?

Clearly, there is no lack of alternatives to choose from. While we have analyzed only those with a clear historical record, no doubt many providers will suggest other options that could work to reduce pension plan risk. Nevertheless, a plan sponsor must clear many hurdles to successfully implement an alternatives strategy. Considerations include the following (Kinniry and Philips, 2012):

- Do you have access to and ability to pick the best managers?
- Can you tolerate alternatives’ opacity and illiquidity, especially for pensions considering termination?
- Do you have proper oversight and time to spend on this asset class?
- Are you able to communicate to and educate your senior leaders?
- Can you overcome the high costs, explicit and embedded?

Another caveat: Alternatives strategies that combine a low-volatility portfolio with rate swaps or interest rate derivatives can work well because they encompass interest rate matching. But investors should remember that the underlying investments bring volatility that bonds purchased using cash do not, and a derivatives package has additional issues such as counterparty and execution risks. Such programs require a higher level of understanding, more due diligence, and receptive senior management.

Conclusion

As funding levels rise, whether because of friendly markets or contributions, pension risk should be reduced. There is little reason for a corporate plan to achieve ever-higher levels of funding but still leave itself open to downside events. This logic has driven the growth of derisking strategies over the past few years. But exactly how to successfully reduce risk is still in question.

Our research concluded that an allocation to bonds is the best way to achieve this objective. Diversification with alternatives has limited application to pensions because of their unique definition of risk. Our study found that funding an alternatives strategy with bonds increased the risk of the pension portfolio. Alternatives investing funded by equities offered a modest advantage but still may not be the right choice because of the implementation hurdles involved.

References


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Source: Vanguard.

Appendix A-2. Statistics—equality of means

Test for Equality of Means Between Series
Date: 05/31/12 Time: 15:33
Sample: 1995 2011
Included observations: 17

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*Test allows for unequal cell variances.

Analysis of Variance

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Category Statistics

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Source: Vanguard.