

Using Bonds in a Return-Generating LDI Portfolio



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In its most basic design, a liability-driven investment (LDI) framework consists of two separate but intertwined pools of assets: a liability-matching portfolio and a return-generating portfolio. While the former is designed to closely match the interest rate sensitivity and other characteristics of the pension's liability, the latter seeks to generate investment returns above the liability growth rate at an appropriate level of risk (defined relative to a pension plan's liability). The return-generating portfolio contains any asset classes not used in the liability-matching portfolio.

Within this context, my article seeks to answer three

questions: 1) Do fixed income asset classes with attractive yields — that is, yields above those of investment grade bonds — belong in a return-generating portfolio? 2) If yes, how much should be allocated to them versus equities? In other words, what combination of spread products and equities produces the least amount of risk for a given excess return target (portfolio return minus liability return)? 3) What impact should macroeconomic expectations have on asset allocation decisions?

To address these issues, I first came up with capital market assumptions for a few asset classes (as shown in Figures 1 and 2 below). The expected return

Figure 1: Return, volatility and correlation assumptions

	Pension Plan's Liability	Long U.S. Treasury	Long U.S. Corporate	Long U.S. Gov/Credit	U.S. Corporate High Yield	Bank Loans	Emerging Market Debt	U.S. Equity — All Cap	30-Year Treasury STRIPS
Duration									
As of April 30, 2010	11.9	13.0	12.4	12.5	4.3	0.0	6.5	N/A	30.0
Entire Period (1/1997 – 4/2010)	11.6	11.0	10.4	10.7	4.6	0.0	5.2	N/A	30.0
Expected Returns (Annualized)									
10-Year Time Horizon	5.75%	3.80%	5.75%	5.00%	6.75%	6.25%	6.75%	8.00%	4.50%
Historical Returns (Annualized)									
1 Year	27.02%	0.52%	30.44%	14.79%	42.58%	32.27%	28.29%	40.90%	-15.18%
3 Year	7.50%	6.50%	6.28%	6.51%	7.02%	2.68%	7.23%	-4.56%	3.21%
5 Year	5.39%	5.12%	5.23%	5.32%	8.49%	4.39%	9.32%	3.28%	-1.74%
Entire Period (1/1997 – 4/2010)	8.32%	7.34%	7.10%	7.40%	6.83%	5.02%	9.98%	5.71%	5.95%
Historical Volatility (Annualized)									
1 Year	11.27%	8.78%	8.80%	6.90%	7.31%	5.77%	5.34%	11.94%	18.95%
3 Year	15.66%	13.01%	14.93%	11.78%	17.25%	13.20%	14.99%	20.99%	31.36%
5 Year	13.27%	10.93%	12.37%	10.09%	13.41%	10.18%	11.94%	16.93%	27.18%
Entire Period (1/1997 – 4/2010)	11.09%	9.54%	9.68%	8.81%	10.29%	6.47%	13.15%	16.71%	24.52%
Historical Correlation to Liability									
1 Year	1.00	0.41	0.93	0.80	0.43	0.60	0.48	0.16	0.41
3 Year	1.00	0.58	0.92	0.87	0.35	0.08	0.58	0.27	0.58
5 Year	1.00	0.64	0.93	0.89	0.34	0.06	0.57	0.23	0.62
Entire Period (1/1997 – 4/2010)	1.00	0.78	0.93	0.93	0.30	0.04	0.36	0.09	0.71

Source: Bank of America Merrill Lynch, Barclays Capital, Citigroup, Russell Investments, Credit Suisse, ING Investment Management

Figure 2: Long-term correlation assumptions

	Pension Plan's Liability	Long U.S. Treasury	Long U.S. Corporate	Long U.S. Gov/Credit	U.S. Corporate High Yield	Bank Loans	Emerging Market Debt	U.S. Equity — All Cap	30-Year Treasury STRIPS
Sample Pension Plan's Liability	1.00								
Long U.S. Treasury	0.78	1.00							
Long U.S. Corporate	0.93	0.67	1.00						
Long U.S. Gov/Credit	0.93	0.93	0.90	1.00					
U.S. Corporate High Yield	0.30	(0.10)	0.54	0.21	1.00				
Bank Loans	0.04	(0.31)	0.26	(0.03)	0.76	1.00			
Emerging Market Debt	0.36	0.13	0.51	0.33	0.62	0.36	1.00		
U.S. Equity — All Cap	0.09	(0.13)	0.29	0.07	0.62	0.43	0.62	1.00	
30-Year Treasury STRIPS	0.71	0.88	0.55	0.80	(0.20)	(0.39)	0.01	(0.19)	1.00

Source: Bank of America Merrill Lynch, Barclays Capital, Citigroup, Russell Investments, Credit Suisse, ING Investment Management

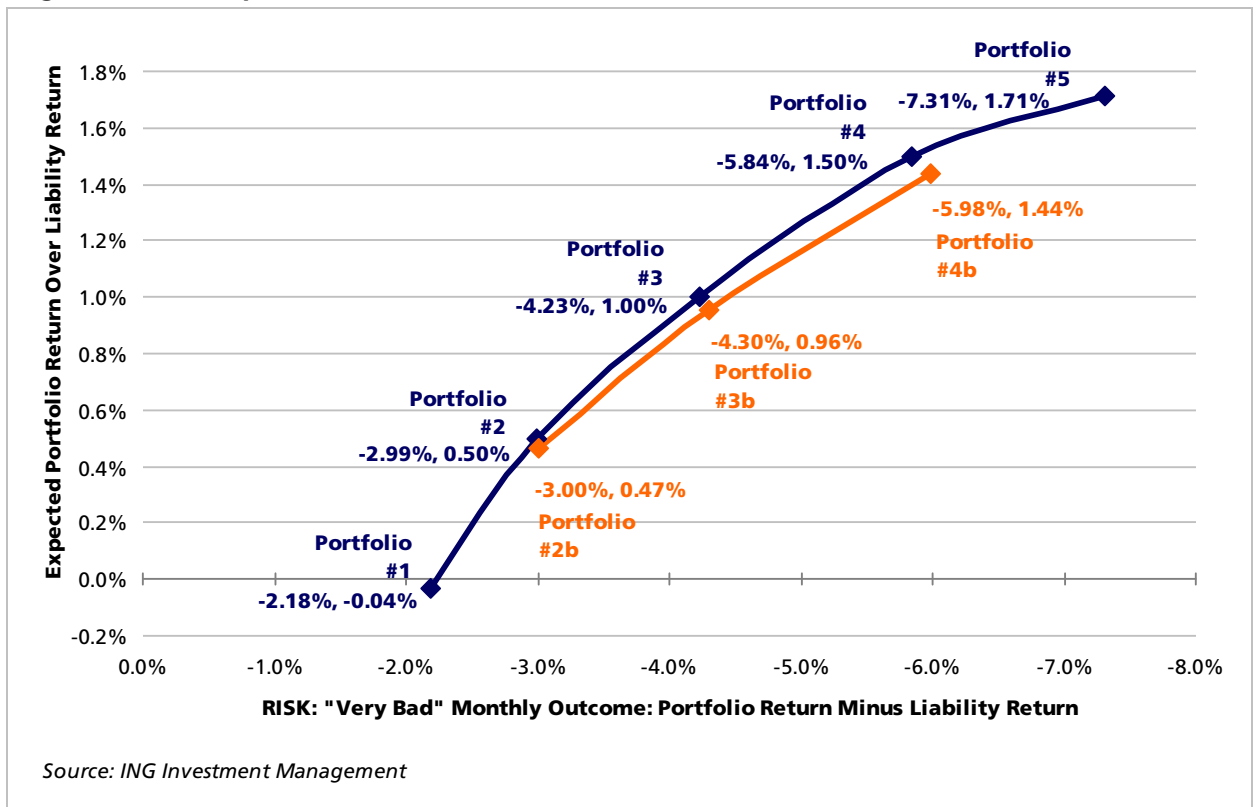
numbers are based on forward-looking assumptions from a variety of investment managers and consultants. Volatility and correlation assumptions are based on historical data from January 1997 to April 2010 and are divided into a series of one-, three- and five-year periods.

A few observations on this data:

- Historical investment returns for high yield bonds, bank loans and emerging market debt have been less volatile than returns for U.S. equities over all of the time periods considered in this analysis.
- Investment returns for emerging market debt have been less volatile than those for high yield bonds over the last five years, though the opposite is true over the entire period since January 1997.
- Bank loan returns have been less volatile than those for high yield bonds, and they generally have been less volatile than those for emerging market debt (except for the one-year period).
- High yield bonds and emerging market debt have exhibited a much higher correlation to pension liabilities than bank loans and equities over most of the time periods considered in this analysis.
- The various correlations between high yield bonds, bank loans, emerging market debt and equities have been less than perfect over the timeframe of this analysis, demonstrating diversification potential.

As shown in Figures 3 and 4, the next step of the analysis called for using an optimizer to solve for efficient portfolios in terms of risk and reward.

Figure 3: Portfolio optimization results



Before establishing the risk metric, I first calculated the difference between the portfolio return and the liability return for each month from January 1997 through April 2010. The risk metric was then calculated as the average of the eight worst monthly outcomes (that is, a result in the 5th percentile or below). The reward metric was defined as the expected excess return of an asset portfolio over the liability.

The historical liability returns were derived from the Aa-rated corporate bond yields published by Citigroup. The expected liability return was based on the current Aa-rated corporate bond yield for that index. The cost of future years of service under the pension plan was assumed to be covered by future contributions and was therefore ignored for this analysis.

I then had the optimizer solve for five portfolios, which are depicted in Figures 3 and 4, without any constraints on an allocation to a particular asset class:

- Portfolio #1: the least-risk portfolio
- Portfolio #2: targets excess return of 0.5% over the liability growth rate, with the lowest possible risk level
- Portfolio #3: targets excess return of 1.0% over the liability growth rate, with the lowest possible risk level
- Portfolio #4: targets excess return of 1.5% over the liability growth rate, with the lowest possible risk level
- Portfolio #5: targets excess return of 1.7% over the liability growth rate (the highest possible value based on the assumptions that I used), with the lowest possible risk level

Figure 4: Portfolio optimization results: asset allocation

	Long U.S. Treasury	Long U.S. Corporate	Long U.S. Gov/Credit	U.S. Corporate High Yield	Bank Loans	Emerging Market Debt	U.S. Equity — All Cap	30-Year Treasury STRIPS	Total
Portfolio #1 — Least Risk	0.0%	83.8%	3.1%	0.0%	0.0%	0.0%	0.0%	13.1%	100.0%
Portfolio #2 — Expected Excess Return Target = 0.5%	0.0%	58.1%	0.0%	8.5%	0.0%	0.4%	11.7%	21.3%	100.0%
Portfolio #3 — Expected Excess Return Target = 1.0%	0.0%	28.9%	0.0%	11.8%	0.0%	5.8%	24.3%	29.3%	100.0%
Portfolio #4 — Expected Excess Return Target = 1.5%	0.0%	0.0%	0.0%	16.7%	0.0%	3.6%	42.8%	36.9%	100.0%
Portfolio #5 — Expected Excess Return Target = 1.7% (i.e., highest)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	65.7%	34.3%	100.0%
Portfolio #2b (50% High Yields & 50% Bank Loans) vs #2	0.0%	58.1%	0.0%	4.3%	4.3%	0.4%	11.7%	21.3%	100.0%
Portfolio #3b (50% High Yields & 50% Bank Loans) vs #3	0.0%	28.9%	0.0%	5.9%	5.9%	5.8%	24.3%	29.3%	100.0%
Portfolio #4b (50% High Yields & 50% Bank Loans) vs #4	0.0%	0.0%	0.0%	8.4%	8.4%	3.6%	42.8%	36.9%	100.0%

	Expected Compound Return	Standard Deviation of Returns	Expected Asset Return Over Liability Return	Tracking Error to Liability	5th Percentile Outcome (i.e., Very Bad) *	Increase in Reward vs Increase in Risk
Portfolio #1 — Least Risk	5.82%	10.50%	-0.04%	2.98%	-2.18%	N/A
Portfolio #2 — Expected Excess Return Target = 0.5%	6.47%	10.23%	0.50%	4.29%	-2.99%	0.66
Portfolio #3 — Expected Excess Return Target = 1.0%	7.08%	10.45%	1.00%	6.22%	-4.23%	0.40
Portfolio #4 — Expected Excess Return Target = 1.5%	7.71%	11.24%	1.50%	8.78%	-5.84%	0.31
Portfolio #5 — Expected Excess Return Target = 1.7% (i.e., highest)	8.03%	12.52%	1.71%	11.18%	-7.31%	0.14
Portfolio #2b (50% High Yields & 50% Bank Loans) vs #2	6.44%	10.08%	0.47%	4.25%	-3.00%	
Portfolio #3b (50% High Yields & 50% Bank Loans) vs #3	7.05%	10.24%	0.96%	6.17%	-4.30%	
Portfolio #4b (50% High Yields & 50% Bank Loans) vs #4	7.68%	10.94%	1.44%	8.70%	-5.98%	

* Calculated as portfolio return minus liability return. The average of worst eight outcomes was used to represent the "very bad" outcome.

Source: Bank of America Merrill Lynch, Barclays Capital, Citigroup, Russell Investments, Credit Suisse, ING Investment Management

As you can see with respect to portfolios #2, #3 and #4, the optimizer allocated a good portion of the portfolio's risky assets not only to equities but also to high yield bonds and emerging market debt — of the allocation to risky assets, 32–42% was directed toward these fixed income strategies. The optimizer did not allocate any assets to bank loans due to their low correlation to pension liabilities and lower expected return.

It is important to also consider qualitative factors when making a long-term asset allocation decision. For example, an investor who believes we are going to be in a stagflation environment — that is, high inflation coupled with low economic growth — over the next three to five years may be better served by asset classes that can produce a higher level of income (such as fixed income) relative to those with high capital gains potential (like equities). Also, more secure income would be preferable to less secure income for this investor, a scenario that would favor bank loans over high yield bonds. As an illustration, we split the high yield bond allocations in portfolios #2, #3 and #4 evenly between high yield bonds and bank loans. These new portfolios — referred to as portfolios #2b, #3b and #4b in Figures 3 and 4 — appear to be less efficient based on the assumptions that we used for this analysis, but the difference in both the expected asset return over the liability return and the tracking error to the liability was very small. In addition, these portfolios would also likely end up with better risk and reward characteristics than many other asset classes in a stagflationary economic environment.

Conclusion

In an LDI framework, investment cannot be simply split among equity, fixed income and alternative asset classes. When considering a potential investment in any asset class, a pension plan must first decide whether or not the asset class can help match the duration and term structure of the liability; Treasuries and investment grade corporate bonds are a good example of this. If it cannot, the asset class must either have an expected return above the liability growth rate or have the potential to provide diversification within the portfolio of risky assets in order to be appropriate for further consideration.

Finally, returning to my three original questions:

- 1) Fixed income asset classes with attractive yields — such as high yield bonds, emerging market debt and bank loans — possess compelling risk, return and diversification characteristics that make them suitable for consideration in a return-generating LDI portfolio.
- 2) The exact allocation to spread product versus equities will depend on an investor's excess return target and capital market assumptions for each asset class; with the exception of the least-risk and highest-excess-return portfolios, there most likely is room for both types of investments.
- 3) A macro view of the world is a key first step in deciding which asset classes to include in a portfolio and should inform all asset allocation analysis and decisions. ■

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