Pension Solutions' Quarterly

Pension Fiscal Fitness Monitor
1st Quarter 2012

Aaron Meder, FSA, CFA, EA
Head of US Pension Solutions

Gary Veerman
Pension Solutions Strategist

Legal & General
INVESTMENT MANAGEMENT
AMERICA

DISCLAIMER: Views and opinions expressed herein are as of April 2012 and may change based on market and other conditions. The material contained here is confidential and intended for the person to whom it has been delivered and may not be reproduced or distributed. The material is for informational purposes only and is not intended as a solicitation to buy or sell any securities or other financial instrument or to provide any investment advice or service. LGIMA does not guarantee the timeliness, sequence, accuracy or completeness of information included. Past performance should not be taken as an indication of guarantee of future performance and no representation, express or implied, is made regarding future performance.

Pension Fiscal Fitness Monitor

The Legal & General Investment Management America Pension Fiscal Fitness Monitor highlights the market-related funding ratio performance of the typical corporate defined benefit pension plan. We analyze the funding ratio performance for a traditional "60/40" investment approach along with three Level 1 LDI (LDI implementation without the use of derivatives or a liability benchmark) and three Level 2 LDI (LDI implementation with the use of derivatives and an explicit liability benchmark) model portfolios assuming 60%, 40% and 20% in equities with the remainder in a model Liability Hedging Asset (LHA) component.

Funding Ratio Performance –1st Quarter 2012

Exhibit 1 summarizes the historical asset, liability, and funding ratio performance for a typical liability profile, a traditional 60% equity / 40% aggregate bond ("60/40") investment strategy, three LDI Level 1 implementation portfolios summarized in our white paper "Level 1 LDI: Selecting the appropriate benchmark" and three LDI Level 2 implementation portfolios summarized in our white paper "Level 2 LDI: Three key implementation considerations". The highlights are as follows:

Liability Performance: Decreased 2% as the discount rate rose due to an increase in interest rates slightly offset by a tightening of credit spreads. See Exhibit 2 for details on all relevant key market indicators.

Asset Performance:

- Liability Hedging Assets (LHA) (i.e. long duration bonds) decreased with liabilities.
- Equities were up 12% for the quarter after an 8% rally in the fourth quarter of 2011.

Funding Ratio Performance (assuming 100% funding level at beginning of period):

- The traditional approach ended the first quarter with a 9% higher funding ratio as assets rose 7% and liabilities fell 2%.
- The Level 1 LDI model portfolios' funding ratios increased 3-6%, a less positive funding ratio outcome relative to the traditional approach. The larger the allocation to equities the better the funding ratio outcome.
- The Level 2 LDI model portfolios' funding ratios increased 1-5%, a less positive funding ratio outcome relative to the traditional approach. The larger the allocation to equities the better the funding ratio outcome.

Exhibit 1: Historical asset, liability, and funding ratio performance for a typical "60/40" investment strategy, Level 1 and Level 2 LDI model portfolios

Liability Performance (market-related only)

Description	3/31/2012	2/29/2012	1/31/2012	1Q12	1-Year	3-Year (annual)	5-Year (annual)	10-Year (annual)	Since 12/31/1996 (annual)	Volatility since 12/31/1996 (annual)
Liabilities	-3%	0%	1%	-2%	24%	19%	10%	10%	9%	12.2%

Asset Performance (market-related only)

Description	3/31/2012	2/29/2012	1/31/2012	1Q12	1-Year	3-Year (annual)	5-Year (annual)	10-Year (annual)	Since 12/31/1996 (annual)	Volatility since 12/31/1996 (annual)
Traditional "60/40"	0%	3%	4%	**7%**	3%	16%	3%	6%	6%	**10.3%**
Level 1: 60% Equities/40% LHA[1]	-2%	2%	3%	**4%**	14%	19%	6%	9%	8%	**11.0%**
Level 1: 40% Equities/60% LHA[2]	-2%	1%	3%	**2%**	18%	18%	7%	9%	8%	**9.8%**
Level 1: 20% Equities/80% LHA[3]	-2%	1%	2%	**1%**	17%	15%	7%	8%	7%	**8.7%**
Level 2: 60% Equities/80% IR Hedge/10% CS Hedge[4]	-3%	2%	4%	**3%**	21%	21%	8%	11%	10%	**12.5%**
Level 2: 40% Equities/90% IR Hedge/30% CS Hedge[5]	-3%	1%	3%	**1%**	23%	20%	9%	11%	10%	**11.7%**
Level 2: 20% Equities/100% IR Hedge/50% CS Hedge[6]	-3%	0%	2%	**-1%**	25%	19%	10%	10%	9%	**11.5%**

Funding Ratio Performance (market-related only)

Description	3/31/2012	2/29/2012	1/31/2012	1Q12	1-Year	3-Year (annual)	5-Year (annual)	10-Year (annual)	Since 12/31/1996 (annual)	Volatility since 12/31/1996 (annual)
Traditional "60/40"	3%	3%	3%	**9%**	-16%	-2%	-6%	-4%	-3%	**13.7%**
Level 1: 60% Equities/40% LHA[1]	2%	2%	3%	**6%**	-7%	0%	-4%	-1%	-1%	**10.5%**
Level 1: 40% Equities/60% LHA[2]	1%	1%	2%	**4%**	-5%	-1%	-3%	-1%	-1%	**7.3%**
Level 1: 20% Equities/80% LHA[3]	1%	0%	1%	**3%**	-6%	-3%	-3%	-2%	-2%	**5.2%**
Level 2: 60% Equities/80% IR Hedge/10% CS Hedge[4]	1%	1%	3%	**5%**	-2%	2%	-2%	1%	0%	**8.8%**
Level 2: 40% Equities/90% IR Hedge/30% CS Hedge[5]	0%	1%	2%	**3%**	0%	1%	-1%	0%	0%	**6.0%**
Level 2: 20% Equities/100% IR Hedge/50% CS Hedge[6]	0%	0%	2%	**1%**	1%	0%	-1%	0%	0%	**3.7%**

[1]60% Equities/40% LHA portfolio is 60% S&P 500, 10% Barclays Long Credit, 30% Barclays 15+ STRIPS
[2]40% Equities/60% LHA portfolio is 40% S&P 500, 30% Barclays Long Credit, 30% Barclays 15+ STRIPS
[3]20% Equities/80% LHA portfolio is 20% S&P 500, 60% Barclays Long Credit A-AAA, 15% Barclays 15+ STRIPS, 5% Barclays Long Treasuries
[4]60% Equities/80% interest rate hedge/10% credit spread hedge portfolio is 60% S&P 500, 13% Barclays Long Credit A-AAA, 70% duration matched Treasuries (43% financed with LIBOR)
[5]40% Equties/90% interest rate hedge/30% credit spread hedge portfolio is 40% S&P 500, 38% Barclays Long Credit A-AAA, 60% duration matched Treasuries (38% financed with LIBOR)
[6]20% Equities/100% interest rate hedge/50% credit spread hedge portfolio is 20% S&P 500, 62% Barclays Long Credit A-AAA, 50% duration matched Treasuries (33% financed with LIBOR)
Sources: Legal & General Investment Management America, Bank of America Merrill Lynch, Bloomberg

Focus on risk: While quarterly returns remain an important metric for evaluating the performance of an investment strategy, there is an increasing focus on year-to-year volatility in the plan's funding ratio. This increased focus on risk is especially true of those plan sponsors who have adopted an LDI approach to asset allocation. Exhibit 1 also tracks the volatility of funding ratio returns for each strategy. As you may expect, the greater the allocation to the LHA component or higher the target hedge ratio the lower the volatility of funding ratio returns. This is a positive indicator that those plan sponsors that have adopted LDI strategies with the aim of de-risking have been able to realize it.

Exhibit 2: Historical Market Indicators relevant for Pension Risk Management

Relevant Market Indicators

Description	3/31/2012	2/29/2012	1/31/2012	12/31/2011	12/31/2010	12/31/2009	12/31/2007	12/31/2005	12/31/2000	12/31/1996	Volatility (bps) since 12/31/1996 (annual)
Treasury yield*	**3.3%**	3.0%	2.9%	**2.9%**	4.3%	4.7%	4.5%	4.6%	5.6%	6.7%	**86**
A-AAA Credit Spread (bps)**	**162**	166	181	**186**	137	148	183	110	220	70	**56**
A-AAA Discount Rate**	**4.8%**	4.6%	4.6%	**4.6%**	5.6%	6.1%	6.3%	5.7%	7.8%	7.4%	**84**
MSCI AC World	**229**	228	217	**205**	220	194	247	181	153	100	**17.1%**

*Treasury yield is based on the Merrill Lynch Average US Pension Plan Treasury Index
**A-AAA credit spread and discount rate are based on the Merrill Lynch Average US Pension Plan AAA-A Index

Implications for Pension Risk Management programs

Plan sponsors should set an investment strategy that explicitly manages the three key drivers of funding ratio risk - interest rate, credit spread, and equity market risks. We define and quantify these three risks below using our three Level 1 portfolios as an example.

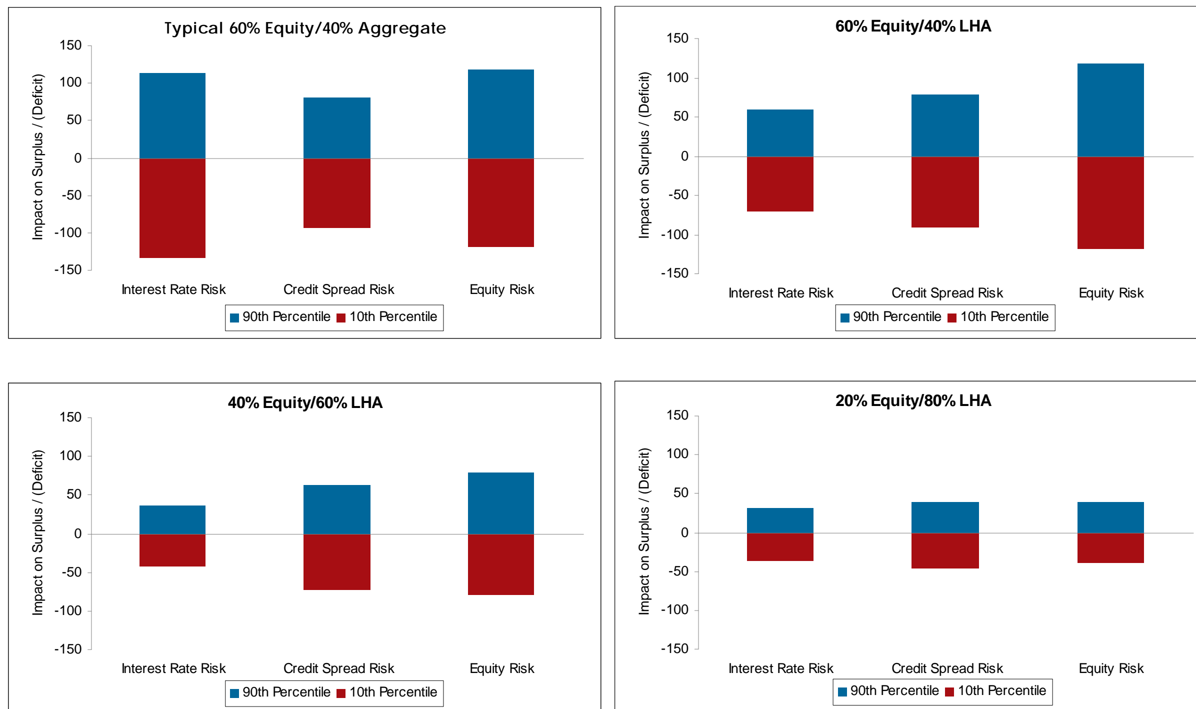
Interest rate risk: The risk that Treasury yields change which then impacts the value of assets and liabilities differently. This is caused by having a duration mismatch between assets and liabilities.

Credit spread risk: The risk that credit spreads change and impact the value of assets and liabilities differently. This is caused by having a spread duration mismatch between assets and liabilities. This is a risk because pension liabilities are discounted using A-AAA corporate bond yields and not Treasury rates. Therefore, discount rates (and the corresponding present value of liabilities) are not only driven by changes in Treasury yields but also credit spreads.

Equity market risk: The risk that equity markets are volatile and can underperform the growth in liabilities attributable to the passage of time (interest cost). Equity market volatility is not highly correlated with the changes in value of liabilities and can cause significant changes in funded status.

Based on historical volatilities of interest rates, credit spreads, and equity markets, Exhibit 3 measures the 10th to 90th percentile impact these three sources of risk could have for the typical pension plan and three Level 1 LDI model portfolios. From a pension surplus / (deficit) perspective, the 10th percentile is a measure of downside risk and the 90th percentile is a measure of upside potential. The results can be interpreted as 1 in 10 years you would expect the outcome to be worse (better) than the 10th percentile (90th percentile). We assume the plans to have $1 billion in liabilities with a 13 year duration profile and are 90% funded.

Exhibit 3: 10th / 90th Percentile Impact on Surplus / (Deficit)



Notes: Based on historical standard deviations from the time period 12/31/1996-12/31/2011.
Analysis assumes equities have no credit spread duration.

We can make a few key observations regarding these three sources of risk for the typical pension plan and implications by implementing the various Level I LDI model portfolios.

- Interest rate risk: For the typical plan, this is both the largest risk and most asymmetric risk. This risk is large because there is a very large duration mismatch (> 10 years) between assets and liabilities. The risk is asymmetric because of the convexity effect in pension liabilities – pension liabilities become increasingly (decreasingly) sensitive to interest rates as rates fall (rise). For this plan, this has the effect of exacerbating the pain when rates fall and dampening the benefit as rates rise.
  - Moving to a portfolio consisting of 60% Equities/40% LHA can reduce interest rate risk significantly (by approximately 50%) and arguably have little to no impact of expected return over the long-term.
  - Reducing equities beyond 60% while increasing the allocation to the LHA component further reduces the interest rate risk mismatch between assets and liabilities.
- Credit spread risk: The risk is significant and also asymmetric. This is smaller than interest rate risk because historically the volatility of credit spreads has been less than the volatility of interest rates.
  - Investing directly in long duration corporate bonds is the best way to reduce credit spread risk mismatch between assets and liabilities.
  - Importantly, equity market performance is highly correlated to changes in credit spreads and needs to be taken into account when structuring a holistic LDI solution.
- Equity market risk: A 60% allocation to equities results in a large and symmetric range of outcomes. In this case interest rate risk is modestly bigger; however, equity market risk can often be the largest source of risk driving the funding ratio.

- Assuming Level 1 implementation, reducing exposure to equities is the best way to reduce the equity market risk relative liabilities.

Overall, these three risks are all large and each had a major impact on funding ratios over the past decade. We encourage plan sponsors to focus their attention on managing all three of these risks.