D.B. FITZPATRICK & CO., INC.

LIABILITY DRIVEN INVESTING (LDI) IN TODAY'S CAPITAL MARKETS

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Liability Driven Investing (LDI) in Today's Capital Markets

Executive Summary:

The recent financial crisis has created a perfect storm for managers of defined benefit plans: falling equities and very low interest rates have caused funding ratios to fall to alarming levels for many companies. Liability Driven Investing (LDI), understandably, has gained interest as mangers seek to decrease the volatility of funding ratios. There are, however, serious risks to extending the duration of assets in the present environment, and managers should be very cautious in implementing LDI strategies now.

I. Heightened Interest in the LDI Investing Framework

In past decades asset allocation decisions by sponsors of corporate defined benefit plans (DB plans) have been based on views regarding the long-term risk/return characteristics of the various investable asset classes. Investment policies typically delineated broad asset allocations and then gave the plan's consultants and investment advisors relatively wide discretion in policy implementation.

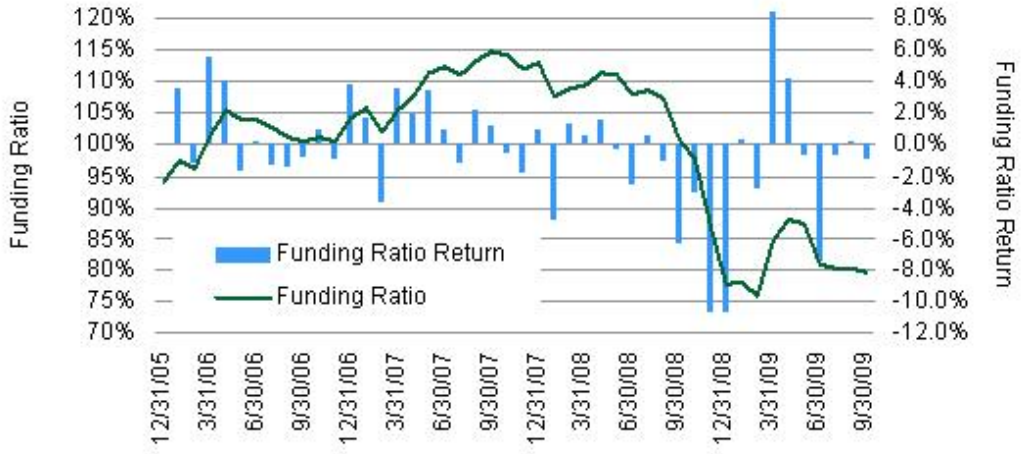
This approach resulted in large allocations (60%-75%) to risky asset classes (common equities, real estate, private equity, etc.) that have relatively high expected returns (i.e., equity risk premia) but low pricing sensitivities to interest rate and yield curve changes. This presents a challenge to DB plan sponsors whose liability duration structure is typically very long (12-15 years). Equities and equity type financial instruments have very low durations (1-2 years), underscoring the relatively low interest rate sensitivity of equities. In addition, most DB plans developed core fixed income strategies with durations close to the Barclay's Aggregate Index duration, which has ranged between 4 and 6 years. This obviously resulted in a very large mismatch between the duration of a plan's assets and liabilities.

This disparity has resulted in extreme volatility of the funding ratios of many DB plans in recent years as a result of extreme valuation shifts in many plans' assets and liabilities. For example, the burst of the so-called "Tech Bubble" in 2001-2002 resulted in stock market declines as the Greenspan Fed pushed interest rates to low levels. This of course caused the funding ratio of many

plans to decline as the present value of the liabilities rose with reduced Treasury yields and the value of portfolios heavily dependent on equities declined. In other words the asset/liability structures were not hedged for a declining interest rate environment. The markets reversed in 2003-2006, thereby giving some relief as funding ratios improved. However the credit market collapse of 2008 once again resulted in plunging funding ratios as both equity markets and interest rates plummeted (see chart 1 below).

Chart 1

US Pension Fund Fitness Tracker of the Typical US Corporate Plan's Funding Ratio



(Source: UBS)

At the same time the markets were presenting challenges to the plan sponsors' funding ratio management, the U.S. Congress, regulators and accountants prepared laws and rules that enhanced the public visibility of DB plans' funding problems and promulgated certain courses of action for plans deemed endangered or critical.

The Pension Protection Act of 2006 (the Act) among other things replaced the 30 year U.S. Treasury rate used to value vested benefits with segmented investment grade corporate bond yields. This change is interesting in that it suggests that credit spreads between high corporate bonds and Treasuries will have an important impact on funding ratios (i.e., narrowing spreads result in increasing the present value of the liabilities while expanding spreads reduce the present value of the liabilities). More importantly, the Act places a number of constraining rules on plans that are deemed "endangered" (funding ratios of less than 80%) and critical (funding ratios of less than 65%)[1].

[1] http://www.dol.gov/ebsa/pdf/ppa2006.pdf (United States Department of Labor: "The Pension Protection Act of 2006").

The Financial Accounting Standards Board (FASB) Statement No. 158 goes one step further and requires a defined benefit plan's assets and obligations be measured at the date of the employer's fiscal year end statement of financial position[2]. Furthermore, the overfunded or underfunded status of defined benefit plans must be recognized as an asset or liability in the statement of a company's financial position.

These accounting and regulatory changes, coupled with falling interest rates and stock prices, have created a perfect storm for plan sponsors in recent years. Many financial market academics and participants have recognized the problems inherent in the asset/liability mismatch discussed above. More than twenty years ago Martin Leibowitz (1986, 1987) devised bond immunization techniques that immunized a discrete set of liabilities with a dedicated bond portfolio with the same duration as the liabilities. Leibowitz (1989) also recognized that the duration of equities is low (i.e., 2.3 years). In more recent years a DB plan investment process called Liability Driven Investing (LDI) has gained heightened interest by the investment community. It is important to note that LDI is no one single model or formulation but is instead a process, the goals of which may be achieved with a variety of tools. The principal objective of all LDI techniques is the minimization of the volatility of a DB plan's funding ratio at the lowest possible cost to the plan's sponsor. Although embracing LDI's overall objectives is appropriate, one must recognize that no one LDI program is suitable for all plans. Instead it is wise to create a set of references by which individual plans can use customized LDI tools that are appropriate for them in a given economic environment. Implementing unsuitable LDI techniques in a rushed response to this decade's perfect storm will prove to be very costly to the financial health of the plan and its corporate sponsor.

II. Implementation and Costs of LDI Techniques

All LDI tools are designed to reduce a DB plan's funding volatility by increasing duration of a plan's assets. In this section, we will broadly discuss a couple of LDI techniques and the potential pitfalls and costs to the plan and plan sponsor.

(1) *REDUCE THE ALLOCATION TO EQUITIES* – Since equities have a very low duration (i.e., pricing sensitivity to interest rate changes), reducing the plan's allocation to equities will increase the duration of the assets and thereby reduce the volatility of the funding ratio. If in fact a plan sells all of its equity securities and also extends the duration of the resulting fixed income portfolio to the duration of the liabilities, theoretically the plan can be immunized against interest rate risk and the volatility of the funding ratio can be reduced to zero.

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[2] http://www.fasb.org/pdf/aop_FAS158.pdf (Financial Accounting Standards Board: "Statement No. 158").

This solution of the asset/liability duration mismatch, however, comes at a very steep price. Equities are volatile in the short run but have consistently generated returns approximately 400 to 550 basis points above risk-free bonds (Fama and French, 2002). This equity risk premia increases a DB Plan's portfolio returns by at least 250 to 350 basis points annually. Restricting a portfolio from earning this return over time is simply unacceptable. In addition, reducing the allocation to equities robs the portfolio of adding additional excess returns through the alpha generating abilities of select equity managers. Of course, equity securities can be replaced by equity derivative overlays which can generate at least the passive portion of the excess returns resulting from the equity risk premia. However, plans engaging in long bonds and equity overlay structures will be constrained from utilizing alpha generating managers.

(2) *FIXED INCOME DURATION EXTENSIONS* – The portfolio's fixed income duration can be extended by interest rate swaps (i.e., vanilla swaps), the purchase of long Treasury STRIPS, and corporate bonds. Each of these techniques has its own set of advantages and disadvantages. For example, interest rate swaps can be complicated and embody significant counter party risk (i.e., Lehman Bros.). Use of corporate bonds can be problematic due to limited supply and the addition of credit risk. Also, the longest duration of corporate bonds is in the range of 11 to 12 years, thereby limiting one's ability to extend duration beyond 12 years. The addition of credit risk, however, allows the portfolio to pick up some equity risk premia. However, we believe such premia are more optimally generated by pure equity securities. Investing in long-term STRIPS is one of the most efficient ways to extend duration since the STRIP market is deep and can extend duration to 20 plus years. But each of these fixed income duration extending techniques results in "locking in" today's very low bond yields. In our opinion, this will result in forgoing significant alpha available by allowing active bond managers to add alpha in changing interest rate and yield curve environments.

In brief, LDI duration extending techniques can impose very high costs and should therefore be implemented with very careful consideration of these costs and market conditions. One needs to be especially careful in today's market of low interest rates and modest equity market valuations.

III. Capital Markets in the Fall of 2009

The yield curve has steepened from earlier this year when global economic collapse seemed a real possibility, but the curve is still significantly below where it was before the financial crisis began in September 2008 (see chart 2 below). The flight to quality that has kept Treasury yields low is still alive to a large extent, as investors remain concerned with credit market conditions, the housing crisis in the US, and the risk that the global economy will fall back into recession. Similarly, current swap rates are down significantly from where they were before the crisis began (see chart 3 below).

Chart 2

Yield curves: currently, before the financial crisis and during the crisis

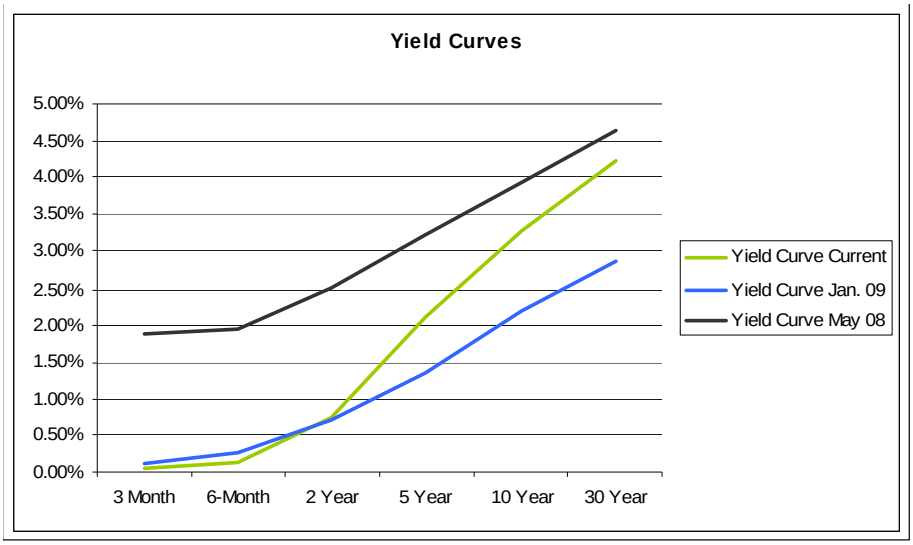
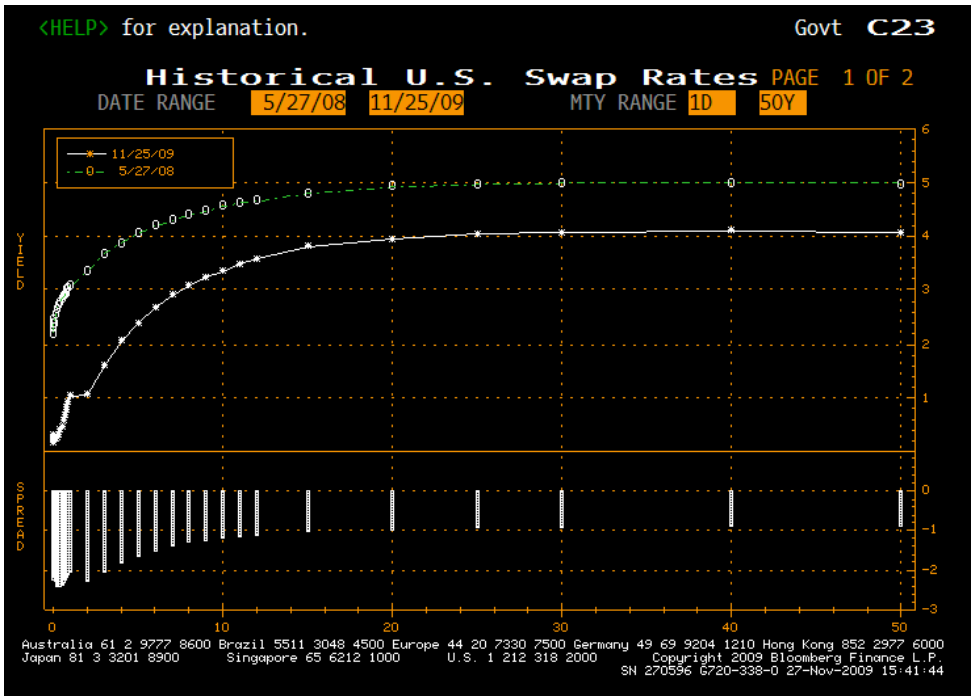


Chart 3

Swap rates: currently and before the financial crisis



Despite strong performance recently, the outlook for Treasuries is grim. The Federal Reserve appears much more concerned with avoiding a double dip

recession than with curtailing inflation in the medium and long term, and is set to keep the Fed Funds Rate low for an extended period (probably into 2011) until the risk of the economy falling back into recession is abated. There is a good chance the Fed will overshoot and inflation, albeit controlled for now (as chart 4 indicates), will rise above its target range in the next few years, prompting Treasury yields to rise. Yields are also set to move higher as the global economy returns to positive growth, credit markets improve, and investors move their money out of safe havens and into riskier assets.

Chart 4

Consumer Price Index

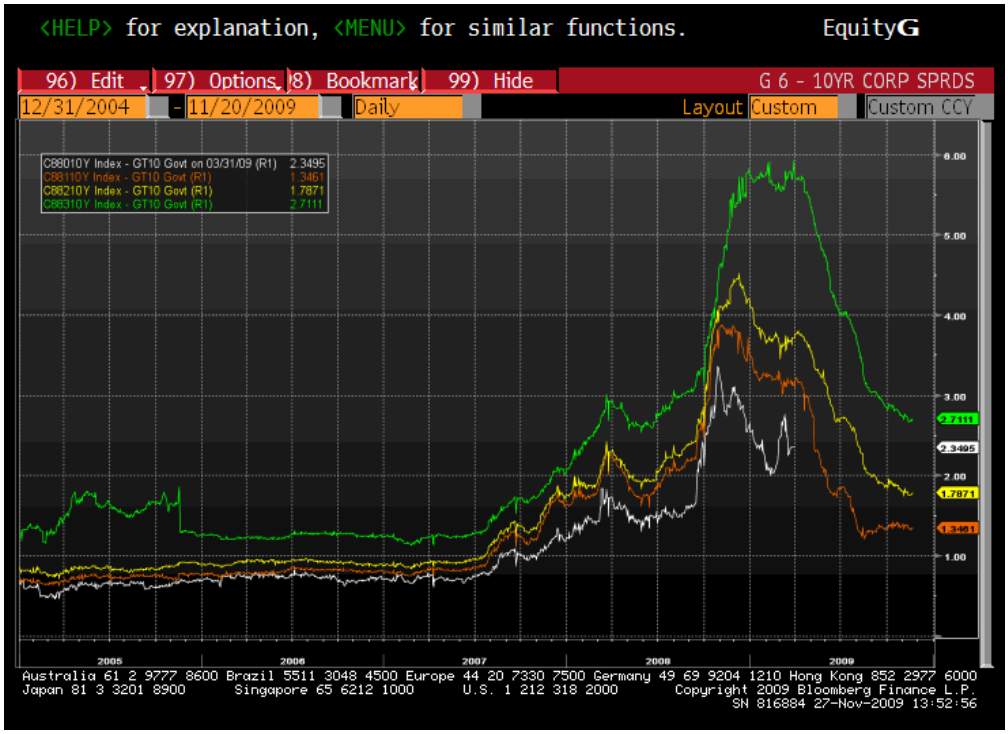
The fiscal position of the US government also threatens to send interest rates higher. Over the next few years US government debt as a percentage of GDP is set to hit levels not seen since the aftermath of WWII. Investors' appetite for Treasuries has been remarkably strong throughout the financial crisis, but that appetite will be seriously tested in the years ahead. Foreign central banks are likely to diversify their holdings away from Treasuries as the fiscal position in the US deteriorates. It seems very unlikely that the US government will be able to finance its debt in the coming years at the current low interest rates. The depreciation of the dollar this year will only exacerbate the problem for Treasuries – investors will look to equities and other investments outside the US (especially to emerging markets) for higher returns as the dollar loses value.

Corporate spreads have fallen recently as financial markets recovered from their meltdown late last year (see chart 5). This is consistent with the recovery

in the equity markets. Since corporate bond yields have a significant implied equity risk premia, it was no surprise that corporate fixed income spreads widened during the 2008 credit crisis and have narrowed with the rebound in global equities since March. We expect corporate spreads to continue to fall as the economy makes its way out of the present malaise. This is of special import to DB managers since falling corporate spreads imply greater liabilities, as liabilities are now discounted using corporate bond yields according to the Pension Protection Act of 2006. However, the effects of narrowing spreads may be offset by the absolute rise in yields that we anticipate.

Chart 5

Corporate spreads



The rally in equities has been led by China and other emerging markets, as well as domestic names benefiting from rising commodity prices (see chart 6). Even with these recent strong results the S&P 500 is down significantly over the last 18 months, and is even down over the last 10 years. Needless to say, the recent financial crisis was a very bad time to hold equities, but stocks around the world are poised to outperform in the next few years as global economic growth resumes and credit markets stabilize. The prospects are best in China and other emerging economies providing China with the resources it needs to fuel its very high growth rates. The rise of the middle class consumer in China will tend to stabilize the global economy during the next 10 to 20 years. Equities are always volatile in the short run, but forgoing the equity risk premia is likely to be very costly to investors over the next 5-10 years.

Chart 6
Equity indices over last two years

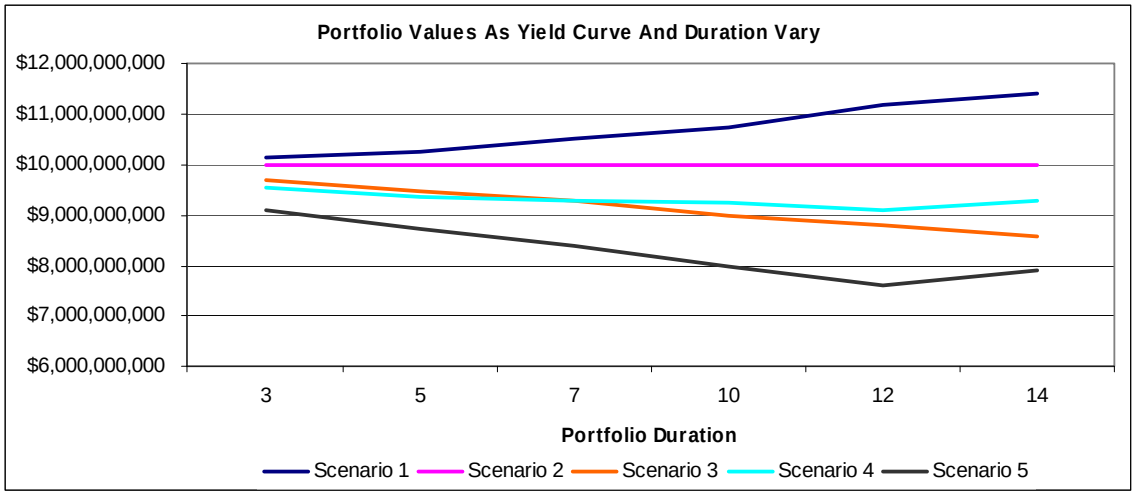
Given the double hit of falling equity prices and falling interest rates in recent years, it is natural for DB managers to take a closer look at LDI as they reposition their portfolios. For DB plans that are currently fully funded, selling equities and extending the duration of their portfolios by purchasing long duration bonds and interest rate swaps makes some sense if the goal is to decrease the variability of the funding ratio. However, giving up on equities would not be advisable even for fully funded DB plans, since equities provide a risk premia that is likely to be very valuable for investors in the years ahead.

For DB plans that are underfunded, it is even clearer that selling equities and increasing the duration of their portfolios would be very risky given the present state of the capital markets. Doing so would expose their assets to a significant risk of big losses if interest rates rise, and many signs point to interest rates doing just that. DB managers moving to extend the duration of their assets at this point are likely to look foolish in the years ahead: first they were hit by a perfect storm of falling equities and falling interest rates, and then they were hit again by rising interest rates decimating a long duration portfolio.

IV. Effects of Duration Extensions On A Hypothetical $10 Billion Portfolio

Before engaging in LDI duration extensions, it is important to analyze the effects of such portfolio adjustments on portfolio performance. Although minimizing the volatility of the funding ratio is an appropriate goal, we should be cognizant of the potential costs to portfolio performance. We illustrate through a simple hypothetical example the effects of changes in the Treasury yield curve on portfolio asset valuation in chart 7 below.

Chart 7



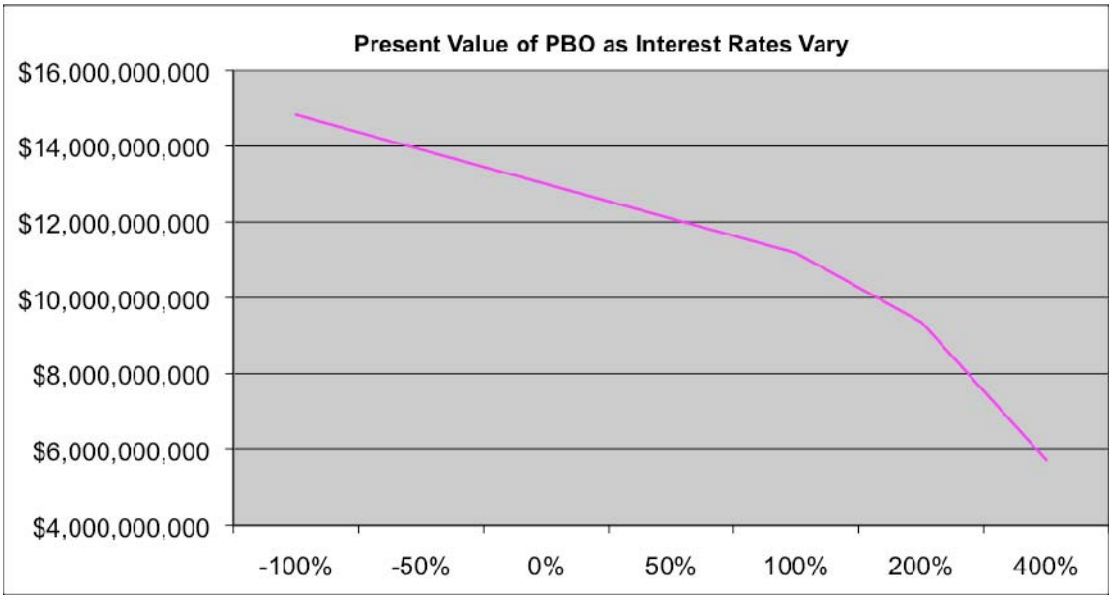
We hypothesize five different future yield curves and then plot the value of the asset portfolio as a function of duration. Scenario 1 assumes lower interest rates from present levels and a flattening of the yield curve[3]. The value of this portfolio is an increasing function of duration. Scenario 2 assumes interest rates are unchanged from where they stand today. Scenario 3 assumes interest rates rise 100 basis points across the yield curve. Scenario 4 assumes interest rates rise across the yield curve, but more on the short end as the curve flattens out. Scenario 5 is similar to scenario 4, but with even higher interest rates across the curve. Chart 7 shows that yield curves with higher interest rates cause the portfolio value to be a decreasing function of duration.

In chart 7 we can see the dramatic effect of short term changes in the yield curve on portfolio performance as duration increases. In the event of a moderate rise in the yield curve we can expect a decline of only 3% to 7% in portfolio value in a short duration portfolio while a longer duration portfolio would be expected to decline by 12 % to 14%. If the yield curve rises

[3] Details of all scenarios are explained in Appendix A.

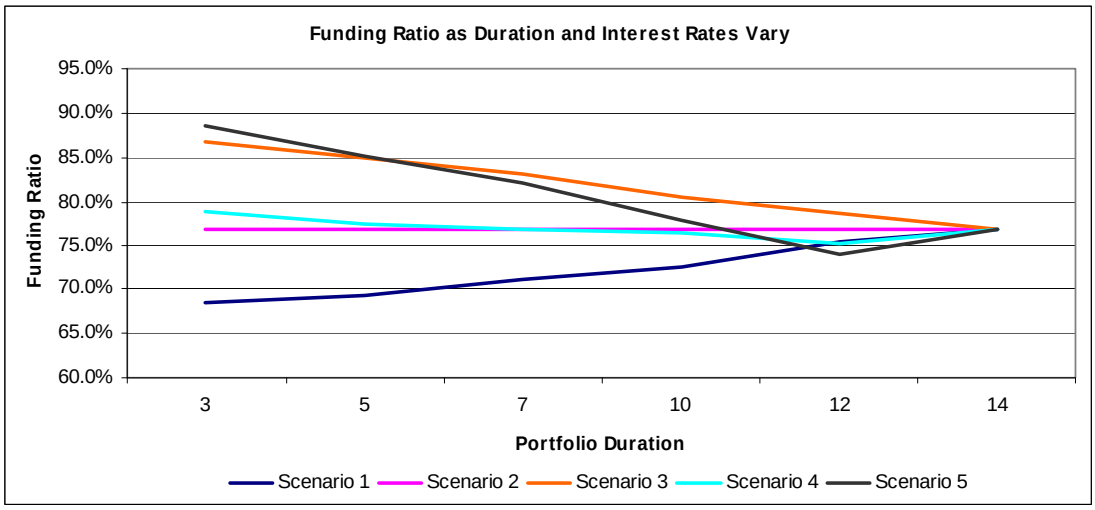
significantly and flattens out (as is consistent with our forecast), scenario 5 shows that a long duration portfolio could fall more than 20%. In this case even a short duration portfolio would fall 10%. Of course if rates were to continue to decline significantly in 2010 and 2011 (an unlikely event in our view), the portfolio value would appreciate by 10% to 12% for a long duration portfolio, while a short duration portfolio would only appreciate by 1.5% to 3%.

Chart 8



In Chart 8 we show that the present value of the pension benefit obligations (PBO) will change dramatically with moderate changes in interest rates for our hypothetical portfolio with an assumed duration of 14 years. A moderate rise in interest rates of 100 to 200 basis points will cause the present value of the plan's obligations to decline by 20% to 30%. Moreover, a moderate rise in interest rates will result in a much more rapid improvement in the plan's funding ratio with a short duration portfolio than a long duration portfolio (see Chart 9 below).

Chart 9



We assume that the present value of liabilities given today's yield curve is $13 billion, and therefore that the funding ratio is 77% before changes in the yield curve are introduced. With the same hypothetical yield curves used to create chart 7 we calculate the funding ratio as a function of portfolio duration. Chart 9 shows that if interest rates fall (scenario 1) it is best to have a long duration portfolio of assets. If, on the other hand, interest rates rise, as we expect, the funding ratio falls as the duration of the asset portfolio increases. This can be seen clearly in the results of scenarios 3, 4, and 5. With rising interest rates the funding ratio is highest when the portfolio duration is lowest.

The purpose of this hypothetical example is only to illustrate changes in interest rates on portfolio valuations, liabilities, and funding status. It does not reflect the effects of the timing of yield curve changes, corporate bond & interest rates swap spreads changes, equity risk premia changes, etc. In Appendix A we summarize the effects of some of these dynamics over time.

V. Implications & Recommendations

The evolution of LDI philosophy and techniques during the last few years has provided a useful framework for managing DB plan assets and liabilities. Funding status and the relative duration of assets and liabilities should be monitored continuously and actively managed. In a perfect world, LDI matching of asset and liability durations reduces funding volatility and is therefore a wonderful thing. In the real world, however, LDI duration extensions of a plan's portfolio can be very costly. This is especially true in today's low interest rate and moderate equity valuation environment. LDI duration extending techniques should be implemented cautiously and only after careful consideration of the benefits and costs as opportunities arise in the financial markets. Although we recommend management be familiar with LDI methodologies and be ready to

implement the appropriate LDI strategies over time, the capital market conditions of late 2009 present a particularly risky time to aggressively extend portfolio duration.

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December 2, 2009

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Appendix A

Table 1: Used in charts 7 and 9

Beginning Portfolio Value	$10,000,000,000
Duration of Portfolio	*Variable*
Present Value of Liabilities	$13,000,000,000
Duration of Liabilities	14

Scenario 1 - Bull Flattener - Long Rates Fall More than Short Rates						
Interest Rate Move	**-0.50%**	**-0.50%**	**-0.75%**	**-0.75%**	**-1.00%**	**-1.00%**
Duration:	**3**	**5**	**7**	**10**	**12**	**14**
Portfolio Value	$10,150,000,000	$10,250,000,000	$10,525,000,000	$10,750,000,000	$11,200,000,000	$11,400,000,000
Liabilities Value						$14,820,000,000

Scenario 2 - Rates Remain Constant						
Interest Rate Move	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**
Duration:	**3**	**5**	**7**	**10**	**12**	**14**
Portfolio Value	$10,000,000,000	$10,000,000,000	$10,000,000,000	$10,000,000,000	$10,000,000,000	$10,000,000,000
Liabilities Value						$13,000,000,000

Scenario 3 - Rates Rise 100 bps Across Curve						
Interest Rate Move	**1.00%**	**1.00%**	**1.00%**	**1.00%**	**1.00%**	**1.00%**
Duration:	**3**	**5**	**7**	**10**	**12**	**14**
Portfolio Value	$9,700,000,000	$9,500,000,000	$9,300,000,000	$9,000,000,000	$8,800,000,000	$8,600,000,000
Liabilities Value						$11,180,000,000

Scenario 4 - Bear Flattener - Rates Rise More at Short End						
Interest Rate Move	**1.50%**	**1.25%**	**1.00%**	**0.75%**	**0.75%**	**0.50%**
Duration:	**3**	**5**	**7**	**10**	**12**	**14**
Portfolio Value	$9,550,000,000	$9,375,000,000	$9,300,000,000	$9,250,000,000	$9,100,000,000	$9,300,000,000
Liabilities Value						$12,090,000,000

Scenario 5 - Extreme Bear Flattener - Rates Rise More at Short End						
Interest Rate Move	**3.00%**	**2.50%**	**2.25%**	**2.00%**	**2.00%**	**1.50%**
Duration:	**3**	**5**	**7**	**10**	**12**	**14**
Portfolio Value	$9,100,000,000	$8,750,000,000	$8,425,000,000	$8,000,000,000	$7,600,000,000	$7,900,000,000
Liabilities Value						$10,270,000,000

Portfolio Values						
Duration:	3	5	7	10	12	14
Scenario 1	$10,150,000,000	$10,250,000,000	$10,525,000,000	$10,750,000,000	$11,200,000,000	$11,400,000,000
Scenario 2	$10,000,000,000	$10,000,000,000	$10,000,000,000	$10,000,000,000	$10,000,000,000	$10,000,000,000
Scenario 3	$9,700,000,000	$9,500,000,000	$9,300,000,000	$9,000,000,000	$8,800,000,000	$8,600,000,000
Scenario 4	$9,550,000,000	$9,375,000,000	$9,300,000,000	$9,250,000,000	$9,100,000,000	$9,300,000,000
Scenario 5	$9,100,000,000	$8,750,000,000	$8,425,000,000	$8,000,000,000	$7,600,000,000	$7,900,000,000

	Funding Ratio					
Duration:	3	5	7	10	12	14
Scenario 1	68.5%	69.2%	71.0%	72.5%	75.6%	76.9%
Scenario 2	76.9%	76.9%	76.9%	76.9%	76.9%	76.9%
Scenario 3	86.8%	85.0%	83.2%	80.5%	78.7%	76.9%
Scenario 4	79.0%	77.5%	76.9%	76.5%	75.3%	76.9%
Scenario 5	88.6%	85.2%	82.0%	77.9%	74.0%	76.9%

Table 2: Used in chart 8

Present Value of Liabilities $13,000,000,000
Assumed PBO Duration 14 years

Pension Benefit Obligation Value Changes as Interest Rates Change

Interest Rate Movement (in bps)	**Value**
-100%	$14,820,000,000
-50%	$13,910,000,000
0%	$13,000,000,000
50%	$12,090,000,000
100%	$11,180,000,000
200%	$9,360,000,000
400%	$5,720,000,000

Below are a series of hypothetical defined benefit plans which show how the duration of assets and liabilities affect funding ratios.

Hypothetical Pension Portfolio

Market Value of Plan Assets	10,000,000,000			
Allocation			**Duration**	
Global Equities	70%	7,000,000,000	**2.3**	(from Leibowitz)
U.S. Core Fixed Income	30%	3,000,000,000	**4.4**	Barclays Aggregate Duration as of 10/31/09
		Portfolio Duration	**2.93**	

Pension Liabilities Duration:	14 years	
Present Value of Pension Liabilities (PBO)	13,000,000,000	
Discount Rate for Liabilities	4.76%	(Investment-grade corp. bond sector yield as of 10/31/09)

Asset Class	Allocation	Exp .Rate of Return	
Global Equities	70%	9.50%	
Core Fixed Income	30%	3.48%	fixed income rate of return based on Barclays Aggregate yield as of 10/31/09
Portfolio expected rate of return		**7.69%**	

Base Case:

Assumptions:

- Plan maintains 70/30 (stocks/bonds) allocation
- contribution and payout rates are roughly equal
- PBO (pension benefit obligation) increasing 5% per year
- no change in interest rates
- no change in yield spreads

	Market Value Over Time					
Portfolio	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5
Global Equities	7,000,000,000	7,665,000,000	8,393,175,000	9,190,526,625	10,063,626,654	11,019,671,187
Core Fixed Income	3,000,000,000	3,104,400,000	3,212,433,120	3,324,225,793	3,439,908,850	3,559,617,678
Total	**10,000,000,000**	10,769,400,000	11,605,608,120	12,514,752,418	13,503,535,505	14,579,288,865
PBO	**13,000,000,000**	13,650,000,000	14,332,500,000	15,049,125,000	15,801,581,250	16,591,660,313
Funded / (Underfunded)	**(3,000,000,000)**	**(2,880,600,000)**	**(2,726,891,880)**	**(2,534,372,582)**	**(2,298,045,745)**	**(2,012,371,448)**
Funded Ratio	**77%**	**79%**	**81%**	**83%**	**85%**	**88%**

Variation 1 - New Asset Allocation - 60/40

Assumptions

- Plan implements new asset allocation - 60% equities / 40% fixed income
- contribution and payout rates are roughly equal
- PBO (pension benefit obligation) increasing 5% per year
- no change in interest rates
- no change in corp yield spreads

New Asset Allocation		**Duration**
Global Equities	**60%**	**2.3**
Core Fixed Income	**40%**	**4.4**
New Portfolio Duration		**3.14**

	Market Value Over Time					
Portfolio	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5
Global Equities	6,000,000,000	6,570,000,000	7,194,150,000	7,877,594,250	8,625,965,704	9,445,432,446
Core Fixed Income	4,000,000,000	4,139,200,000	4,283,244,160	4,432,301,057	4,586,545,134	4,746,156,904
Total	**10,000,000,000**	10,709,200,000	11,477,394,160	12,309,895,307	13,212,510,837	14,191,589,350
PBO	**13,000,000,000**	13,650,000,000	14,332,500,000	15,049,125,000	15,801,581,250	16,591,660,313
Funded / (Underfunded)	**(3,000,000,000)**	**(2,940,800,000)**	**(2,855,105,840)**	**(2,739,229,693)**	**(2,589,070,413)**	**(2,400,070,963)**
Funded Ratio	**77%**	**78%**	**80%**	**82%**	**84%**	**86%**

Variation 2a and 2b - Utilize 60/40 allocation, include 30-Year Treasury Strips, rates FALL (Bull Flattener), corp. spreads unchanged

Assumptions

- contribution and payout rates roughly equal
- PBO increasing 5% per year
- Interest rates fall in a Bull Flattener environment (fall more at long end)
- no change in corp yield spreads

2a

Asset Allocation		Duration	Rates Fall in Year 1 and 2 By	
Global Equities	**60.0%**	**2.3**	0.25%	
Core Fixed Income	**25.0%**	**4.4**	0.25%	Yield
30-Year Treas Strips	**15.0%**	**30**	0.50%	**4.40%**
Liabilities		***14***	*0.50%*	

Portfolio Duration **7.0**

	Market Value Over Time					
Portfolio	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5
Global Equities	6,000,000,000	6,607,777,500	7,277,120,582	7,968,447,037	8,725,449,505	9,554,367,208
Core Fixed Income	2,500,000,000	2,615,457,000	2,729,635,560	2,810,978,700	2,894,745,865	2,981,009,292
30-Year Treas. Strips	1,500,000,000	1,800,900,000	2,151,805,365	2,224,966,747	2,300,615,617	2,378,836,548
Total	**10,000,000,000**	**11,024,134,500**	**12,158,561,507**	**13,004,392,484**	**13,920,810,987**	**14,914,213,048**
PBO	**13,000,000,000**	14,605,500,000	16,409,279,250	17,229,743,213	18,091,230,373	18,995,791,892
Funded /						
(Underfunded)	**(3,000,000,000)**	**(3,581,365,500)**	**(4,250,717,743)**	**(4,225,350,729)**	**(4,170,419,386)**	**(4,081,578,844)**
Funded Ratio	**77%**	**75%**	**74%**	**75%**	**77%**	**79%**

2b

Asset Allocation		Duration	Rates Fall in Year 1 and 2 By	
Global Equities	**60.0%**	**2.3**	0.25%	
Core Fixed Income	**13.0%**	**4.4**	0.25%	Yield
30-Year Treas Strips	**27.0%**	**30**	0.50%	**4.40%**
Liabilities		***14***	*0.50%*	

Portfolio Duration **10.1**

	Market Value Over Time					
Portfolio	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5
Global Equities	6,000,000,000	6,607,777,500	7,277,120,582	7,968,447,037	8,725,449,505	9,554,367,208
Core Fixed Income	1,300,000,000	1,360,037,640	1,419,410,491	1,461,708,924	1,505,267,850	1,550,124,832
30-Year Treas. Strips	2,700,000,000	3,241,620,000	3,873,249,657	4,004,940,145	4,141,108,110	4,281,905,786
Total	**10,000,000,000**	**11,209,435,140**	**12,569,780,730**	**13,435,096,106**	**14,371,825,465**	**15,386,397,826**
PBO	**13,000,000,000**	14,605,500,000	16,409,279,250	17,229,743,213	18,091,230,373	18,995,791,892
Funded /						
(Underfunded)	**(3,000,000,000)**	**(3,396,064,860)**	**(3,839,498,520)**	**(3,794,647,107)**	**(3,719,404,908)**	**(3,609,394,066)**
Funded Ratio	**77%**	**77%**	**77%**	**78%**	**79%**	**81%**

Variation 3a and 3b - Utilize 60/40 allocation, include 30-Year Treasury Strips, rates RISE (Bear Flattener), corp. spreads unchanged

Assumptions

- contribution and payout rates roughly equal
- PBO increasing 5% per year
- Interest rates Rise in a Bear Flattener (more rise at short end)
- no change in corp yield spreads

3a

Asset Allocation		Duration	Rates Rise in Year 1 and 2 By	
Global Equities	**60.0%**	**2.3**	0.75%	
Core Fixed Income	**25.0%**	**4.4**	0.75%	Yield
30-Year Treas Strips	**15.0%**	**30**	0.25%	**4.40%**
	Liabilities	***14***	*0.25%*	

Portfolio Duration **7.0**

	Market Value Over Time					
Portfolio	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5
Global Equities	6,000,000,000	6,456,667,500	6,948,092,534	7,608,161,325	8,330,936,651	9,122,375,633
Core Fixed Income	2,500,000,000	2,417,500,000	2,436,608,162	2,557,951,248	2,685,337,220	2,819,067,014
30-Year Treas. Strips	1,500,000,000	1,448,550,000	1,402,214,507	1,470,923,018	1,542,998,246	1,618,605,160
Total	**10,000,000,000**	**10,322,717,500**	**10,786,915,203**	**11,637,035,591**	**12,559,272,117**	**13,560,047,806**
PBO	**13,000,000,000**	13,172,250,000	13,346,782,313	14,014,121,428	14,714,827,500	15,450,568,875
Funded / **(Underfunded)**	**(3,000,000,000)**	**(2,849,532,500)**	**(2,559,867,110)**	**(2,377,085,837)**	**(2,155,555,383)**	**(1,890,521,068)**
Funded Ratio	**77%**	**78%**	**81%**	**83%**	**85%**	**88%**

3b

Asset Allocation		Duration	Rates Rise in Year 1 and 2 By	
Global Equities	**60.0%**	**2.3**	0.75%	
Core Fixed Income	**13.0%**	**4.4**	0.75%	Yield
30-Year Treas Strips	**27.0%**	**30**	0.25%	**4.40%**
	Liabilities	***14***	*0.25%*	

Portfolio Duration **10.1**

	Market Value Over Time					
Portfolio	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5
Global Equities	6,000,000,000	6,456,667,500	6,948,092,534	7,608,161,325	8,330,936,651	9,122,375,633
Core Fixed Income	1,300,000,000	1,300,847,080	1,311,129,105	1,376,423,335	1,444,969,217	1,516,928,684
30-Year Treas. Strips	2,700,000,000	2,607,390,000	2,523,986,112	2,647,661,432	2,777,396,842	2,913,489,287
Total	**10,000,000,000**	**10,364,904,580**	**10,783,207,752**	**11,632,246,092**	**12,553,302,710**	**13,552,793,604**
PBO	**13,000,000,000**	13,172,250,000	13,346,782,313	14,014,121,428	14,714,827,500	15,450,568,875
Funded / **(Underfunded)**	**(3,000,000,000)**	**(2,807,345,420)**	**(2,563,574,560)**	**(2,381,875,336)**	**(2,161,524,790)**	**(1,897,775,271)**
Funded Ratio	**77%**	**79%**	**81%**	**83%**	**85%**	**88%**

Variation 4 - Utilize 60/40 allocation, EXCLUDE 30-Year Treasury Strips, rates RISE (Bear Flattener), corp. spreads unchanged

Assumptions

- contribution and payout rates roughly equal
- PBO increasing 5% per year
- Interest rates Rise in a Bear Flattener (more rise at short end)
- no change in corp yield spreads

Asset Allocation		Duration	Rates Rise in Year 1 and 2 By	
Global Equities	**60.0%**	**2.3**	0.75%	
Core Fixed Income	**40.0%**	**4.4**	0.75%	Yield
30-Year Treas Strips	**0.0%**	**30**	0.25%	**4.40%**
Liabilities		***14***	*0.25%*	
Portfolio Duration		**3.1**		

	Market Value Over Time					
Portfolio	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5
Global Equities	6,000,000,000	6,456,667,500	6,948,092,534	7,608,161,325	8,330,936,651	9,122,375,633
Core Fixed Income	4,000,000,000	3,868,000,000	3,898,573,059	4,092,721,997	4,296,539,553	4,510,507,222
30-Year Treas. Strips	-	-	-	-	-	-
Total	**10,000,000,000**	**10,324,667,500**	**10,846,665,593**	**11,700,883,322**	**12,627,476,203**	**13,632,882,855**
PBO	**13,000,000,000**	13,172,250,000	13,346,782,313	14,014,121,428	14,714,827,500	15,450,568,875
Funded / (Underfunded)	**(3,000,000,000)**	**(2,847,582,500)**	**(2,500,116,719)**	**(2,313,238,106)**	**(2,087,351,296)**	**(1,817,686,019)**
Funded Ratio	**77%**	**78%**	**81%**	**83%**	**86%**	**88%**

Variation 5 - Utilize 60/40 allocation, EXCLUDE 30-Year Treasury Strips, rates RISE across curve, corp. spreads unchanged

Asset Allocation		Duration	Rates Rise in Year 1 and 2 By	
Global Equities	**60.0%**	**2.3**	0.75%	
Core Fixed Income	**40.0%**	**4.4**	0.75%	Yield
30-Year Treas Strips	**0.0%**	**30**	0.75%	**4.40%**
Liabilities		***14***	*0.75%*	
Portfolio Duration		**3.1**		

	Market Value Over Time					
Portfolio	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5
Global Equities	6,000,000,000	6,456,667,500	6,948,092,534	7,608,161,325	8,330,936,651	9,122,375,633
Core Fixed Income	4,000,000,000	3,868,000,000	3,898,573,059	4,092,721,997	4,296,539,553	4,510,507,222
30-Year Treas. Strips	-	-	-	-	-	-
Total	**10,000,000,000**	**10,324,667,500**	**10,846,665,593**	**11,700,883,322**	**12,627,476,203**	**13,632,882,855**
PBO	**13,000,000,000**	12,216,750,000	11,480,690,813	12,054,725,353	12,657,461,621	13,290,334,702
Funded / (Underfunded)	**(3,000,000,000)**	**(1,892,082,500)**	**(634,025,219)**	**(353,842,031)**	**(29,985,417)**	**342,548,153**
Funded Ratio	**77%**	**85%**	**94%**	**97%**	**100%**	**103%**