

## *A Pension Crisis Solution:*

# **The Liability $\beta$ (Beta) Portfolio !**

by  
**Ronald J. Ryan, CFA**  
**CEO of Ryan ALM, Inc.**

America's defined benefit (DB) pensions are faced with huge deficits totaling over \$400 billion for single-employer plans, over \$200 billion for multi-employer plans (both according to the PBGC)<sup>1</sup>, over \$1.5 trillion for Public Plans (according to Morgan Stanley)<sup>2</sup> and over \$4.5 trillion for Social Security (according to Social Security)<sup>3</sup>. This massive underfunding has damaged corporate earnings, corporate solvency and public plans credit ratings. This pension dilemma is most noticeable in higher required contributions which, for many DB plan sponsors, were unbudgetable and even unaffordable. This has led to the issuance of Pension Obligation Bonds (POBs), an acceleration of frozen plans and even plan terminations via bankruptcy for private plans.

To find a cure for DB pension ills, most pension plans have begun an unrelenting search for more and more Alpha. This quest for Alpha has significantly influenced asset allocation to the extent that non-traditional assets (i.e. alternative investments, hedge funds, commodities, etc.) now represent more than 10% of current asset allocations<sup>4</sup>. For many DB plans, these are new investment ventures.

Similar to most home run hitters in baseball, when you swing for the fences you tend to strikeout a lot. Could this Alpha frenzy be unwarranted? Is this the best way out of a most difficult situation? I strongly suggest another way out that is more prudent, more practical and certainly more cost efficient ... the quest for **Liability Beta!**

### **The Rules**

First, let's go over some ground rules so we know what game we are playing in pensions. Unfortunately, the current pension accounting rules and actuarial practices are very confusing and may be the key cause of a misdirection of pension asset allocations. The **Funded Ratio** should play a major role in the asset allocation decision. Logic would suggest that a plan with a surplus should have a radically different asset allocation than a plan with a large deficit. This funded ratio is based on the present value (market value) of plan assets versus the present value of the benefit payment schedule (i.e. liabilities). As a result, how the rules require plans to discount or value their liabilities is a major factor in determining the reported funded ratio. There is much confusion as to how to discount this cash flow schedule to ascertain an accurate measurement of the present value of these liabilities. The FASB, IRS, and ASOP 27 all have different views and

---

<sup>1</sup> PBGC Public Affairs, "PBGC Releases Fiscal Year 2005 Financial Results, *Press Release*, 11/15/05

<sup>2</sup> Morgan Stanley, "Global Economic Forum", page 3, *Press Release*, 10/10/05

<sup>3</sup> Social Security, "2006 Trustees Report", page 2, <http://www.ssa.gov/>, 03/31/06

<sup>4</sup> P&I, "Asset Allocation of top 200 DB Plans", page 26, *P&I*, 01/23/06

rules on how to discount such pension liabilities with the differences as large as 49% versus a proper market value. Assuming that most pensions have a 10-year to 15-year average duration on their liabilities, let's compare the discount rate of these rules to the yields of 10 and 15-year Treasury STRIPS (the bonds used to defease liabilities) :

**Table 1**

Discount Rate Comparisons							
Discount Rate Differences			2002	2003	2004	2005	2006
FASB (Moody's Long AA Corporates)			6.52	6.02	5.66	5.22	5.72
IRS (Weighted Average of Corporates)			7.10	6.50	6.10	5.70	5.78
ASOP 27 (Forecasted ROA)			8.50	8.50	8.00	8.00	8.00
10-year Treasury STRIPS			4.34	4.64	4.49	4.51	4.80
15-year Treasury STRIPS			5.09	5.32	4.97	4.67	5.01
Valuation Differences (%)			2002	2003	2004	2005	2006
FASB	versus	10-year Treasury STRIPS	21.80	13.80	11.70	7.10	9.20
		15-year Treasury STRIPS	21.45	10.50	10.35	8.25	10.65
IRS	versus	10-year Treasury STRIPS	27.60	18.60	16.10	11.90	9.80
		15-year Treasury STRIPS	30.15	17.70	16.95	15.45	11.55
ASOP 27	vs.	10-year Treasury STRIPS	41.60	38.60	35.10	34.90	32.00
		15-year Treasury STRIPS	51.15	47.70	45.45	49.95	44.85

This discount rate jabberwocky basically “**undervalued**” liabilities making the funded ratio appear more solvent than the economic reality. This led many plan sponsors (especially Public Plans under ASOP 27 since their valuation of liabilities was the most skewed) to make inappropriate contribution decisions, inappropriate benefit decisions and inappropriate asset allocation decisions. Fortunately, the SoA (Society of Actuaries) in their October 2004 white paper “Principles Underlying Asset Liability Management”<sup>5</sup> made it clear that until pension plans create a set of “**economic books**” (market value of assets vs. liabilities) assets can not be managed effectively versus the liability valuations currently used. The SoA emphasized that these current rules distort the real economic reality and mislead assets on the true funded ratio. Moreover, the SoA cited that a consistent ALM structure can only be achieved for economic objectives. Entities that focus on economic values tend to achieve their financial objectives while entities that focus on accounting values usually don't.

Prominent actuary Kenneth Buffin, PhD., FSA in his July 2005 newsletter<sup>6</sup> said “asset managers ... are failing to recognize the significance of liabilities and the need to manage assets and liabilities in an integrated manner. Unfortunately, most published pension plans' funded ratios are not based on true economic valuations but on **overstated** 'smoothed' asset values typically over five years and on **understated** liability values”.

In conformity with the SoA and Buffin's research, each benefit payment should be marked-to-market correctly as a yield curve portfolio where each payment is priced as a zero-coupon bond surrogate such that the plan sponsor could defease or settle the benefit

<sup>5</sup> Society of Actuaries, “Principles Underlying Asset Liability Management”, III A, October 12, 2004

<sup>6</sup> Kenneth Buffin, PhD., FSA, “Liability Driven Investment Strategies”, *Commentary*, July 2005

payments with these rates (risk-free or with certainty). Since we don't know the future value of most assets (only with zero-coupon bonds and annuities) the present value of assets versus liabilities is monitored to determine if assets are on track to fund the benefit payment with sufficient funds. Such a comparison of present values determines the minimum contribution and the funded ratio. Without a proper market valuation through a zero-coupon yield curve pricing it is difficult for asset/liability management (ALM) to function efficiently. **This is best accomplished through a Custom Liability Index that accurately calculates the present value (i.e. market value) of benefit payments frequently.** Pension plan cash flow schedules are like snowflakes ... you never find two alike. Until the liability present value is calculated and monitored as a Custom Liability Index, the asset side has a difficult time understanding the size, shape and risk/reward behavior of each plan sponsor's unique benefit payment schedule.

### Objective

**The objective of a pension plan should be to fund the benefit payments at the lowest cost to the plan taking prudent risks.** Cost here is defined as contributions or the extra funds that have to be provided to pay current and future benefit payments. Risk is defined as the return and volatility of returns for each asset class versus the return (growth rate) and volatility of returns for the present value of liabilities. Each asset class should be compared to the liability area they are funding (i.e. short, intermediate, long). This risk-adjusted return is best measured as the **Information Ratio versus liabilities** (Custom Liability Index). Bill Sharpe promotes this concept and ratio in his paper "The Sharpe Ratio"<sup>7</sup> suggesting that volatility alone is not the true measurement of risk. Given any index benchmark as the objective, the lowest risk asset is the asset that matches the index objective behavior with certainty. Given the S&P 500 as the objective, then the S&P 500 as an index fund or ETF would be the low risk asset portfolio. The three-month T-Bill would be a high risk asset as its risk/reward behavior is very different (negative correlation) to the S&P 500 index behavior. Same is true for a liability objective. The low risk asset here would be the asset portfolio that most matches or correlates to the risk/reward behavior of the liabilities present value growth. **By definition, the low risk portfolio for a liability driven objective is a Liability Index Fund (i.e. the Liability Beta Portfolio).** This requires a Custom Liability Index to build and maintain such a low risk portfolio.

### Strategy

What is a prudent strategy to employ that will help DB plans recover from any pension deficit and the pension crisis now facing America? Similar to a doctor – patient relationship, until proper tests are done the doctor does not prescribe a cure. The same situation should exist with pensions ... until a Custom Liability Index (economic books) is created and comparisons of assets vs. liabilities market values are performed, it is inappropriate to prescribe a cure. Once we know the true economic valuation of liabilities (market value) through a Custom Liability Index, we can now assess the true economic funded ratio and create a strategy that reaches full funding in a cost effective and timely manner. A pension plan with a 40% deficit would have a different strategy

---

<sup>7</sup> William F. Sharpe, "The Sharpe Ratio", *The Journal of Portfolio Management*, Fall 1994

(cure) than a plan with a 15% deficit or a surplus. The pension crisis cure can be found in a **Portable Alpha** asset allocation strategy.

### **Portable Alpha**

The pension cure can be found in a Portable Alpha strategy if the correct definition and methodology of Liability Beta and Liability Alpha are understood and used appropriately for a pension objective. **Portable Alpha is the synergy of a Beta portfolio working in harmony with a series of Alpha portfolios. The liability Beta portfolio mission is to ultimately match and fund the pension benefit payments. The liability Alpha portfolios mission is to makeup any economic deficit over a reasonable time horizon (i.e. before the average duration of liabilities).** As the Alpha portfolios outgrow liabilities in present value they earn Alpha (excess return of asset growth above liability present value growth). This excess return should be ported over (transferred) to the Beta portfolio to secure a better funded ratio thereby reducing the volatility and level of contributions. As a result, **the goal of Portable Alpha should be to erase the pension deficit in a timely and prudent manner and port over to the liability Beta portfolio all excess returns (Alpha) thereby increasing the allocation to the liability Beta portfolio.** If Portable Alpha is successful, the liability Beta portfolio should become the “*core portfolio*” that fully funds pension benefit payments. Any surplus left over should be isolated as the remaining liability Alpha portfolio. The quest in pensions should be to fund the benefit payments at the lowest cost to the plan sponsor while reducing risk over a long term horizon. **The pension quest should be ... to grow the Liability Beta portfolio!** To do this requires help and synergy with the liability Alpha portfolios. To do this requires the porting of Alpha (excess returns) whenever it happens, a true tactical asset allocation based upon true economic values.

There are basically four ways to cure a pension deficit :

1. **Liability Alpha portfolios** outgrow liabilities present values sufficiently
2. **Liabilities** present values go down due to higher discount rates
3. Increase in **Contributions**
4. All of the above

For the first six months of 2006, liabilities decreased in present value around -8.00% (based on the Ryan Liability Index). This provided much liability Alpha. Even a mattress as an asset class (i.e. Serta) would have earned Alpha with a zero return. If interest rates could rise over the next three years by just 50 basis points per year, pension plans would have a great window of opportunity to recover quickly from deep deficits. This interest rate scenario would cause pension liability present values to post zero to negative growth. If the liability Alpha portfolios (no bonds) would post just normal ROA (@8.0%), funded ratios could improve dramatically. This would be an ideal environment to port Alpha and secure reduced costs and risks.

Portable Alpha has become the hottest trend in asset management throughout the world. If done correctly, this is truly the most prudent and effective way to manage assets versus any objective ... but certainly a **liability driven objective**. The problem, as usual, is the

finance industry clings to **asset driven** strategies and ends up with the wrong risk/reward behavior due to the wrong index objective.

### Liability Alpha

Alpha is defined as the excess return above a benchmark. Unfortunately, the finance industry is brainwashed into using the wrong benchmarks for liability driven objectives. As Confucius may have once said :

*Given the wrong benchmark index ... you will get the wrong risk/reward !*

How true these words now haunt pension funds and other liability driven objectives. The objective of a pension is to fund the benefit payments at the lowest cost to the plan taking prudent risks. It follows that if you outperform any generic index (i.e. S&P 500) but lose to liabilities ... **you lose!** The correction period of 2000 – 2002 for equities was a frightening example of the disconnect and risk between the S&P 500 and liabilities. In those three years, liabilities outgrew the S&P 500 by 92% to 101% using the Ryan Liability Index and the Ryan 15 and 20-year STRIPS Indexes. Based upon the 21 year history of STRIPS Indexes, the S&P 500 consistently behaves (volatility) like a 15 to 20 year STRIPS:

**Table 2**

Absolute Total Return Comparisons				
Index	2000	2001	2002	Cumulative
S&P 500	-9.09	-11.86	-22.08	-37.57%
Ryan Liability Index	25.96	3.08	19.47	55.12%
Ryan 15 year STRIPS	28.24	1.22	24.04	61.01%
Ryan 20 year STRIPS	32.54	0.66	22.77	63.79%

Just like the scoreboard in sports regulates your strategy, so should the pension scoreboard. If you are way behind (deficit) you will behave differently than if you are way ahead (surplus). Without a Custom Liability Index, you can't understand the score and ... you can't play the pension game efficiently.

**Alpha needs to be redefined as the excess return above the client's true objective (i.e. liabilities).** Based upon a Custom Liability Index, liability Alpha is the excess return of asset growth above liability present value growth. Since liabilities are bond-like, in order to earn liability Alpha these portfolios should be primarily, if not exclusively, non-bond assets (exception high yield bonds since they are more equity-like in their behavior). Each non-bond asset class is a liability Alpha portfolio. Based upon the size of the deficit and the true economic funded ratio, an asset allocation decision would be made as to the most prudent allocation to a series of liability Alpha portfolios that has a high probability to meet the target ROA that will provide a fully funded plan over a time horizon equal to the average duration of the liability schedule.

### Liability Beta

Beta is defined as the *single* portfolio that matches the objective with some certainty. Since most objectives are defined by an index benchmark, the Beta portfolio is an index

fund by definition. If the pension objective is liability driven, then **Beta for pensions must be the portfolio that matches the cash flow schedule of pensions**. This is better described and managed as a **Liability Index Fund**. Unlike immunization, which was focused on matching just the average duration of the liabilities, the liability Beta portfolio (i.e. Liability Index Fund) must match each benefit payment; it must maintain the same yield curve shape or term structure. Since contributions and the funded ratio are based on present value calculations, it is essential that the liability Beta portfolio match the interest rate sensitivity of the liabilities that it is funding. This requires a Custom Liability Index to provide the present value weights (term structure) so the Beta portfolio knows how to model itself. Moreover, the Custom Liability Index provides daily liability growth calculations so the plan can constantly monitor that the liability Beta portfolio is on track (matched portfolio).

This liability Beta portfolio is where the investment grade bonds should be placed in asset allocation. The best fit or match to a liability objective would be zero-coupon bonds (*risk free* assets since they match liability payments with certainty). Coupon bonds are not risk free since they have reinvestment. Moreover, coupon bond durations are a function of interest rates and currently peak out around 16 years (i.e. in 1981 the longest durations were only around eight years) so only zero-coupon bonds can be used to fund or match liability payments longer than 16 years. Mortgage-backed securities should never be used to match liabilities due to their negative convexity and uncertain cash flows.

I designed most of the Lehman bond indexes as their former Director of Research in the 1970's and early 1980's. These indexes are the best representation of the investment grade bond markets but they have nothing to do with liabilities. Generic market indexes help you understand the risk/reward behavior of a specific market or asset class but have no relationship to the unique term structure of a pension plan. Again, pension cash flow schedules are like snowflakes, no two are alike. Each pension has a distinct labor force with different mortality, salary structure, plan amendments, etc.... The duration and term structure of a pension is unique to the plan; you will never find a generic index with this structure.

Generic indexes may, in fact, force you into a contradictory growth rate and volatility behavior versus the behavior of liabilities. The Lehman Aggregate should behave like its average duration (@ 4.5 to 5 years) suggesting its cash flow schedule looks nothing like most pension plans cash flow schedules whose average durations are @ 10 to 15 years. As of December 31, 2006 here is the estimated cash flow structure of the Lehman Aggregate index:

**Table 3**

<b>Lehman Aggregate Cash Flow Structure (12/31/06)</b>		
<b>1 - 3 years</b>	<b>=</b>	<b>24.58%</b>
<b>3 - 5 years</b>	<b>=</b>	<b>30.46%</b>
<b>5 - 7 years</b>	<b>=</b>	<b>27.09%</b>
<b>7 - 10 years</b>	<b>=</b>	<b>8.91%</b>
<b>10 + years</b>	<b>=</b>	<b>8.96%</b>

Hard to believe that any pension fund has a liability term structure this heavily skewed to very short payment dates with over 55% due in five years and 24% due in less than three years. The Lehman Aggregate is not a good proxy or index benchmark to represent pension liabilities.

Although heavily weighted to non-Treasury securities, the Lehman Aggregate has underperformed the 5-year Ryan STRIPS Index by 17 basis points annually for the last 10 years and by 22 basis points annually for the last 20 years with a tracking error of 48 basis points per month (i.e. does **not** track STRIPS or liabilities well) :

**Table 4**

<b>Comparison of Lehman Aggregate versus Ryan 5-year Strips Index</b>		
	<b>12/31/96 to 12/31/06</b>	<b>12/31/86 to 12/31/06</b>
	<b>Annual Return</b>	<b>Annual Return</b>
<b>Lehman Aggregate</b>	<b>6.24%</b>	<b>7.35%</b>
<b>Ryan 5 year STRIPS</b>	<b>6.41%</b>	<b>7.58%</b>
<b>Difference</b>	<b>-0.17%</b>	<b>-0.22%</b>

This supports the fact and research of Ryan ALM that there is no or little Alpha in bonds.<sup>8</sup> **The value of an investment grade bond portfolio is ... Beta not Alpha.** Bonds are best as the matching portfolio versus a liability driven objective. However, in order to qualify as a proper liability Beta portfolio this bond portfolio must match the unique term structure of each client’s liability cash flow schedule and never that of a generic market index like the Lehman Aggregate. This liability Beta bond portfolio should be zero-coupon dominate.

**Asset Allocation**

The intent of asset allocation is to create a synergy among asset classes that meets the client objective with prudent risk. This is still ideal. What is missing is the client objective as a custom index and the discipline to shift funds to a less risky allocation when you win the game (surplus). Portable Alpha (Tactical asset Allocation) can now solve this methodology deficiency.

Once a Custom Liability Index (CLI) is installed as the true client objective and benchmark for asset allocation, Portable Alpha can begin. **The CLI will determine the true economic funded ratio of the pension and the accurate measurement of the economic deficit or surplus. It will also determine the hurdle rate that the liability Alpha portfolios must beat (outgrow) to earn Alpha.** The size of the deficit (or surplus) will determine the allocation to the liability Beta and Alpha portfolios.

A prudent deficit reduction strategy today is to “buy time” by moving the deficit to longer liabilities. A proper way to buy time is to asset allocate to the liability Beta portfolio enough funds (including contributions) to match and fully fund liabilities equal to the time needed. For example, a 30% deficit may be viewed as needing 10 years to

---

<sup>8</sup> Ronald J. Ryan, “No Alpha in Bonds”, www.RyanALM.com, January 27, 2006

cure. By building a liability Beta Portfolio that matches the first 10 years of liabilities (net of contributions) you have moved the deficit out past 10 years. Note that contributions are part of the liability Beta portfolio as a future asset used to fund benefit payments. Contributions can also be viewed as a reduction of liabilities so the liability Beta portfolio is funding net liabilities. This liability Beta portfolio allocation allows the liability Alpha portfolios time to perform. History has taught us that most non-bond asset classes (the Alpha portfolios) outperform bonds if given time especially at today's yield levels.

Now comes Portable Alpha. As the liability Alpha portfolios perform by outgrowing the present value growth of liabilities on a cumulative return basis, this excess return (Alpha) should be "ported over" to the liability Beta portfolio on a timely basis (monthly or quarterly) as the excess is earned. The liability Beta portfolio will reinvest these proceeds **chronologically** to match the next liability. Through time as the Alpha portfolios win (growth rate exceeds liability growth rate) and excess returns are ported, the liability Beta portfolio grows and grows thereby shifting the asset allocation dynamically (tactical asset allocation) towards the liability Beta portfolio. The resulting benefits are in harmony with the true pension plan objective as costs (contributions) and risks (interest rate sensitivity) are gradually reduced. Through porting Alpha, the liability Beta portfolio will now match more and more of the liability portfolio. This coordination and synergy of the liability Alpha portfolios and the Beta portfolio is what asset allocation was intended to do. Portable Alpha now accomplishes this tactical asset allocation mission. **Portable Alpha is best redefined as ... the synergy of transferring excess returns (asset growth – liability growth) from the liability Alpha portfolios to a liability matching Beta portfolio based upon a Custom Liability Index that best represents the pension objective.**

### **Insurance Company Model**

Pension funds should be regulated in the same manner Life Insurance companies are guided. This would require pension assets to be managed in a way that is in the best interests of the true objective of the pension plan. Stringent insurance regulations require an **ALM focus using bonds as the core asset (matching or funding asset)**. **Any surplus is usually isolated as a distinct portfolio with a distinct objective (target growth rate) managed as an asset allocation to non-bonds. Escrow funds are also created for contingencies or errors that may arise.** In pension land, escrow funds could be established for mortality and inflation errors since they are so hard to estimate with any precision over long horizons. Perhaps, if pension plans were managed and regulated like insurance companies we could resolve the pension crisis of America.

*The way you react to adversity is the key to success.*

Tom Landry