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Pension Scoreboard 2007

The year 2007 was another roller coaster ride as far as the relative growth of pension assets vs. pension liabilities. Based on the static asset allocation shown below, assets underperformed liabilities by **-4.63%** (market) **+2.51%** (IRS) and **-1.64%** (ROA). The **Ryan Letter** (monthly newsletter) monitors the growth of pension assets versus liabilities (measured by the Ryan Liability Index portfolio of Treasury STRIPS). The annual growth difference (market value) started the year with a positive value added of 2.14% in January, fell to a negative difference in February of **-2.48%** then climbed consistently to a positive growth advantage of 7.15% in June before crashing down to a **-4.94%** in November. This volatility in the **Funded Ratio** (Assets/Liabilities) is characteristic of any liability driven objective where the asset allocation does not match or hedge the liabilities. On a cumulative basis, assets have underperformed liabilities (based on the Ryan *generic* Liability Index) by **-77.50%** since 1999! Naturally, we highly recommend our **Custom Liability Index** is used versus the *actual* asset allocation of each pension plan.

Index	Returns 2007	Estimated Weights
Liabilities :		
Market (Tsy STRIPS)	10.99 %	100 %
IRS (Corporates)	3.85	
ROA (8% constant rate)	8.00	
Assets :		
Ryan Cash	5.28 %	5 %
Lehman Aggregate	6.96	30
S&P 500	5.49	60
MSCI EAFE Int'l	11.63	5
Asset Allocation Model	6.36 %	100 %
Assets – Liabilities		
Market	-4.63%	
IRS	2.51	
ROA	-1.64	

Funded Ratio

The best way to judge the success and efficiency of any pension fund is to examine the **Funded Ratio** (Assets / Liabilities) as long as it is based on accurate *market values* for both the asset and liability side. Indeed this has been one of the critical problems in the pension industry. Accounting rules have allowed *smoothing* of assets which distorted the true value of the assets at any given moment. The liability side has been valued at a *single discount rate* rather than a yield curve of rates which better represent the term structure of monthly pension benefit payments that get paid way out into the distant future. Moreover, liabilities are priced at a discount rate that is usually not a market rate but a rate that is significantly higher. In the case of Public Plans they use a rate equal to their return on asset assumption (ROA). Currently, this ROA rate is around 8% for 2007 which was 354 basis points higher than the year ending 30-year Treasury rate (4.46%) and 361 basis points higher than a 10-year Treasury STRIP (4.39% zero-coupon bond). Given a liability duration of 10 years, the ROA discount rate methodology would undervalue liabilities by about 35%. Such a discount rate difference distorts the true economic reality of the Funded Ratio and may lead to inappropriate asset allocation, contribution and benefit decisions.

The Society of Actuaries (SoA) expressed clearly in their 2004 paper “Principles Underlying Asset/Liability Management” that unless a set of *economic books* is created that value assets and liabilities at accurate and frequent market valuations pension plans are in jeopardy of having their assets managed to accounting books. Accounting measures distort economic reality. Consistent ALM can only be achieved for financial objectives. Entities that focus on economic value tend to achieve their financial objectives. Entities who manage their assets based on accounting treatment end up mismatching liabilities.

I have stressed for a very long time that monitoring the market valuation of assets vs. liabilities is critical to managing a pension fund effectively. Since the current accounting rules distort economic reality, it is important for each plan sponsor to find a way to get accurate and frequent economic valuations of their liabilities (i.e. economic books). Ryan ALM has a dedicated index division (**ALM Research Solutions**) whose mission is to create Custom Liability Indexes (CLI) as the proper liability benchmark for every pension and every liability driven objective (i.e. Healthcare, Lotteries, NDT, Insurance, etc.). **Only thru a CLI could a pension plan calculate the true economic Funded Ratio.**

I have monitored Funded Ratios and published much research on the asset/liability mismatch ever since FASB 87 was initiated and became effective as of the end of 1988. My monthly Newsletter (**The Ryan Letter**) tracks the estimated Funded Ratio. Based on a static asset allocation shown in the next pages here is a history of the pension Funded Ratio based on such asset data and the Ryan generic Liability Index (portfolio of U.S. Treasury STRIPS equal weighted from 1.0 years to 29.0 years). For more info on any Ryan index, go to www.RyanIndex.com or www.RyanALM.com and click on Indexes.

Pension Objective

The true objective of any pension is to fund their benefit payments (i.e. liabilities) at the lowest cost to the plan with the least amount of Funded Ratio volatility (i.e. risk). Indeed, this is written in many state constitutions and pension investment policies. Such an objective would mandate that the Funded Ratio be managed in such a way as to enhance the ratio to a full funded goal while reducing its volatility. This will afford the plan lower costs (i.e. Contributions) over time.

Funded Ratio History

Attached are tables that illustrate the history of pension Funded Ratios based upon the data shown in my monthly newsletter. There are many surprising observations and mind boggling statistics. If we stay focused on what a pension is all about, this data should shock and, hopefully, awaken most pension plans.

Assets vs. Liabilities *(Annual Returns)*

Index	Weight	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99
Ryan Cash	5%	9.34	8.73	7.42	4.12	3.51	3.94	7.11	5.59	5.72	5.48	4.24
LB Aggregate	30%	14.53	8.96	16.00	7.40	9.75	-2.92	18.47	3.63	9.65	8.69	-0.82
S&P 500	60%	31.68	-3.15	30.45	7.64	10.07	1.29	37.57	22.93	33.34	28.55	21.03
MSCI EAFE	5%	10.80	-23.32	12.48	-11.85	32.95	8.06	11.56	6.37	2.08	20.24	27.32
Assets	100%	24.31	0.16	24.13	6.44	10.79	0.55	28.67	15.21	22.98	21.37	13.69
Ryan Liabilities	100%	25.40	3.23	19.26	7.87	22.46	-12.60	41.16	-3.70	19.63	16.23	-12.70
Assets - Liabilities		-1.12	-3.07	4.87	-1.43	-11.67	13.15	-12.49	18.91	3.35	5.14	26.39
Cumulative		-1.12	-4.98	0.13	-2.14	-21.89	-4.84	-16.06	29.15	43.97	68.28	166.66
Funded Ratio		99.1	96.2	100.1	98.7	89.3	102.7	93.6	112.0	115.2	120.2	156.6

Index	Weight	'00	'01	'02	'03	'04	'05	'06	'07	08	'09
Ryan Cash	5%	6.49	4.97	1.75	1.04	1.25	3.09	4.92	5.28		
LB Aggregate	30%	11.63	8.44	10.25	4.10	4.34	2.43	4.34	6.96		
S&P 500	60%	-9.09	-11.86	-22.08	28.69	10.87	4.89	15.80	5.49		
MSCI EAFE	5%	-13.87	-21.11	-15.64	39.17	20.70	14.02	26.86	11.63		
Assets	100%	-2.50	-5.40	-11.41	20.04	8.92	4.43	12.25	6.36		
Ryan Liabilities	100%	25.96	3.08	19.47	1.96	9.35	8.87	0.81	10.99		
Assets - Liabilities		-28.46	-8.48	-30.89	18.08	-0.43	-4.44	11.44	-4.63		
Cumulative		78.66	42.98	-79.98	-13.48	-16.69	-40.08	18.47	-6.25		
Funded Ratio		121.2	111.2	82.5	97.1	96.7	92.8	103.3	99.00		

% Weight = Static Asset Allocation for Each Asset Class

Source: Ryan ALM, Lehman Brothers, Standard & Poor's, Morgan Stanley

The volatility in the Funded Ratio is extreme as explained by the **Assets – Liabilities** line for each year. The annual differences ran from asset growth outperforming liability growth by **18.91%** (1996) to underperforming liabilities by **-30.89%** (2002). If you make asset and liability growth an index series starting at 100.00 in 1988 then the cumulative difference from 1988 is only **-6.25%** based on compounded returns. However, the volatility of this cumulative difference is acute peaking at **166.61%** in 1999 and dropping to **-79.98%** in 2002. As my monthly newsletter (The Ryan Letter) monitors, the cumulative growth difference from 1999 to 2007 is about **-77.50%** which would lower the Funded Ratio by about **-36.80%**. This type of Funded Ratio volatility is not financially healthy and leads to Contribution volatility (higher costs) which threatens the solvency of many pension plans if not the plan sponsor itself. Unfortunately, many pension plans increased benefits over the 1989 thru 2007 period especially after the large surpluses of the late 1990s (i.e. Public Plans). Moreover, as interest rates went down pension plans shifted more assets to equities and non-bonds making the mismatch of assets vs. liabilities more serious (especially in the last 10 years). Both of these events damaged the Funded Ratio and put pressure on additional contributions to makeup any deficits.

Best Pension Years in Performance

According to our data above, the best years for relative performance (Assets – Liabilities) were :

1999 = 26.38%
1996 = 18.91%
2003 = 18.08%
1994 = 13.15%

The years 1999, 1996 and 2003 were good years for assets showing strong positive growth (**13.69%**, **15.21%** and **20.04%**). The surprise is 1994 where assets only grew **0.55%**. Given an asset allocation shown on the first page, the market indexes for these asset classes in 1994 calculated growth as:

Ryan Cash Index	3.94%
Lehman Aggregate	-2.92
S&P 500	1.29
MS EAFE	8.06

Thanks to a spike up in interest rates in 1994, liabilities produced a negative present value growth of **-12.60%**. With asset growth of only **0.55%**, assets outgrew liabilities by **13.15%** making 1994 a very good *relative* performance year. Most journalists reported what a sluggish year 1994 was and saw no redeeming values. Indeed, the Lehman Aggregate reported its first negative return for a calendar year. But just like in sports, the pension game is a relative return contest between two opposing teams. Asset returns alone do not communicate enough to know if you won or lost. Can you imagine any sport that does not communicate the score of one of the teams until the game is over. Well that is what the pension industry lives with as liability growth is seldom known until well after year end (months delinquent). Can you imagine any sport where they publish the wrong scores for each of the opponents. Well that is what the pension industry lives with as assets are reported on a smoothed value basis and liabilities are priced at a discount rate that is smoothed over several years and is not a market rate but an accounting rate

(i.e. ROA). No wonder pensions are confused over the appropriate asset allocation strategy to play the pension game.

Worst Pension Years in Performance

According to our data on the two historical tables, the worst years for relative performance were:

2002 = -30.89%
1995 = -12.49
1993 = -11.67

The year 2002 was the final blow of the infamous perfect storm period of 2000 thru 2002 when assets went way down in present value growth and liabilities went way up three years in a row. In those three torturous years pension assets lost to pension liabilities by about **-73.40%** :

Asset growth = -18.29%
- Ryan Liability Index = 55.11%
Difference = -73.40%

Accordingly, Funded Ratios took a severe nose dive causing severe pension contribution spikes that crushed public plans budgets and corporate financial statements ... even causing bankruptcies. In such bankruptcies the corporate pensions were turned over to the PBGC who now had the obligation to fund. This created a PBGC deficit which was in turn funded by the American taxpayer.

The year 1995 was a mystery to many pension plan sponsors as assets performed very well on an absolute basis with an asset allocation return of about 28.67%. But due to a sharp decline in interest rates, liabilities grew by about 41.16% causing a Funded Ratio gap of **-12.49%**.

1995 Assets – Liabilities Growth

Ryan Cash Index	7.11%
Lehman Aggregate	18.47
S&P 500	37.57
MS EAFE	<u>11.56</u>
Total Assets	28.67%

Ryan Liability Index 41.16%

Assets – Liabilities -12.49%

Moral of the Pension Story

As hopefully apparent from the historical data reported, until assets are managed with a goal of matching and fully funding liabilities then pensions will live in a mismatched ALM world that leads to a roller coaster ride in their Funded Ratios. This mismatched asset allocation leads to financial trouble as history has taught us. Amazingly, most states (about 37 states) have lotteries which by law require a matching of assets to liabilities using only Government zero-coupon

bonds. Moreover, insurance companies are mandated by insurance rules to hold bonds as the core asset (@80%) to fund liabilities. So why did pensions stray away from these fundamental ALM principles. In the late 1970s and early 1980s dedication and immunization strategies were certainly in vogue. Then as interest rates went down a new strategy of pension surplus optimization replaced matching liabilities as the primary pension objective. As we have witnessed, this was a critical mistake.

Solutions

Yes, there are solutions to this pension volatility disaster. It starts with understanding the behavior of liabilities and building an asset strategy that behaves in a way to enhance the Funded Ratio over time without creating much volatility and risk.

Solution: Custom Liability Index (CLI)

As the Society of Actuaries presented in their October 2004 paper, until a set of economic books are created, it is difficult for assets to be managed versus current accounting books. Until liabilities are marked to market accurately and frequently as an index benchmark portfolio of Treasury zero-coupon bonds (STRIPS) that match the future value of each liability payment the asset side will always be confused on the true risk/reward behavior of liabilities. Moreover, the economic Funded Ratio will be reported erroneously. This could lead to inappropriate asset allocation, benefit and contribution decisions. Just like a sports team the relative score versus your opponent usually dictates how you play the game. If the scoreboard reports inaccurate information you may play the game incorrectly (i.e. too conservative or too risky). Most institutional assets today are managed versus some index benchmark which tends to dictate the type of risk/reward behavior of that asset class. Indeed this index data is how the asset allocation model picks its asset class allocations. Without a Liability Index customized to each plan sponsor's unique benefit payment schedule how could the asset side function correctly on asset allocation, asset management and performance measurement. Just like snowflakes you will never find two liability schedules alike. **Only a custom liability index is the proper pension benchmark.**

Solution: Liability Index Fund (Liability Beta Portfolio)

The best way to match an index is through an index fund. Accordingly, the best way to match liabilities is through a liability index fund ... only if it is based on a custom liability index that correctly matches the benefit payment schedule. Index funds are extremely popular throughout the financial world because they represent a low risk, low cost portfolio that best matches the client objective. **The pension objective is best achieved through a custom Liability Index Fund** such that the cost and risk of the plan is reduced by achieving a fully funded and matched liability objective with the least volatility in the Funded Ratio. Such a portfolio may be better named as the *Liability Beta Portfolio*. If the beta portfolio is the portfolio that matches the client objective and if the true pension objective is to fund liabilities then the portfolio that matches liabilities should be the true economic beta portfolio. Since liabilities behave like zero-coupon bonds, then the liability beta portfolio should be a government zero-coupon bond portfolio (defeasance portfolio). Only zero-coupon bonds have a certain future value. Only Treasury zero-coupon bonds (STRIPS) could be the *risk-free* liability matched portfolio **The Lehman Aggregate (and any generic bond market index) certainly does not represent or behave like pension liabilities.** This generic bond market index has a short average duration (@ 4 to 5 years

usually) plus has no duration longer than 16 years since it has no zero-coupon bonds in the index. Amazingly, this index composite of Treasury, Agency, Corporate and Mortgage-backed securities underperformed the Ryan Treasury 5-year index by **-3.27%** in 2007 (6.96% vs. 10.23%) and underperformed the Ryan 4-year STRIPS index by **-3.69%** in 2007 (6.96% vs. 10.65%). Whether it is a bond index fund or any other asset class as an index fund ...**matching a generic market index is not a beta portfolio for a pension plan!** Assets that do not match liabilities will always be an alpha portfolio no matter what form the assets are in ... even an index fund. In case you missed it, the Ryan Treasury indexes posted some of the best returns for an asset class in 2007 with most maturities of the yield curve showing 10% + returns.

Solution: Liability Alpha

If alpha is the excess growth above the objective then alpha for a liability objective must be the excess asset growth above liability growth provided both are measured as market value growth. To calculate liability alpha requires a Custom Liability Index. **If any asset class outperforms its market index but loses to the true pension objective (best measured as a custom liability index) ... the pension plan loses!** Given that many plans have a pension deficit then they cannot afford to fully fund liabilities. This requires assets to outperform liabilities and makeup this deficit over some well defined time horizon. The new PPA legislation gives corporations seven years to overcome these deficits. Most public plans believe they have up to 30 years to recover from this pension shortfall. Whatever horizon is picked allows the asset side to calculate the amount of annual alpha needed to become fully funded over the time horizon chosen or mandated (i.e. 21% deficit requires 3% annual alpha over a seven year horizon and 0.7% alpha over a 30-year period). Since bonds are best as the matching liability portfolio (beta portfolio) they should not be used as an alpha generator or part of the liability alpha portfolio. Given the ROA of non-bond assets (@ 9%) and the yield of the CLI (@ 4.5%) should provide proper information to set up the initial percent allocation to liability alpha portfolios and the liability beta portfolio. The true alpha earned going forward will be the actual growth of assets versus the actual present value of liabilities (as measured by a CLI).

Solution: Portable Alpha

Based on the annual liability alpha needed to reach full funding within the investment horizon, any excess growth (alpha) should be ported over to the liability beta portfolio. Through time as the alpha portfolios outperform liability growth, porting this excess growth will enhance the Funded Ratio and reduce its volatility as assets become more and more matched to liabilities. This should also reduce the cost of contributions as the plan reaches a full funded status. Had pensions employed this strategy when they had surpluses in the late 1990s they would not have been hard hit by the equity correction and perfect storm of 2000 thru 2002 since they would have ported their victories over to the liability beta portfolio thereby reducing their allocation to equities. Portable Alpha is the appropriate and key strategy for a pension plan with a deficit.

“All’s well that ends well”
Shakespeare

Happy and Prosperous New Year !

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