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The Pension Crisis Revealed

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America is facing a pension crisis that threatens the solvency of our corporations, cities, states and even the federal government. Much of it appears to be the result of poor equity performance in the calendar years 2000 to 2002 for defined benefit pension plans. In this article, we argue that the true cause of this crisis lies within the actuarial practices and accounting rules that apply to defined benefit pension plans.

Asset Allocation

Let's look at the asset/ liability growth differences since Financial Accounting Statement (FAS) 87 was first mandated for corporations after December 15, 1986. We will begin the analysis in 1990 and assume a typical defined benefit pension plan is fully funded (i.e., assets are equal to liabilities) at that time.

First, consider the typical asset mix. *Pension & Investment* surveys the 200 top defined benefit plans and reports their asset allocation. The asset classes included in the survey by *Pension & Investments* for the years covered in this article (1990-2002) are shown in Table 1. We used the annual survey results for our allocation. Table 1 shows the allocations used for each year from 1990 through 2002.

The return for each asset class for each year are shown in Table 2. The benchmark used for each asset class is identified at the bottom of the table. The first row of Table 3 shows the computed return (which we refer to as the asset return) on the portfolio using the weights in Table 1.

To determine the impact on our typical corporate defined benefit plan, we must assume (1) a typical liability structure and (2) discount that liability at an appropriate interest rate or interest rates. As a proxy for the liabilities, we use a generic liability index developed and trademarked by Ryan Labs. The liability index has a 15.5 average duration. This index is based on FAS 87 and market interest rate trends. FAS 87 requires the use of a high-quality zero-coupon yield curve (or an extrapolated coupon yield curve with reinvestment at current levels) to discount liabilities. The Ryan Labs liability index uses the Treasury STRIP curve since it is the only continuous high-quality yield curve of the same issuer. Without a specific plan sponsor's liabilities, the Ryan Labs liability index uses an equal-weighted STRIP curve. Based on industry trends, an average 15.5 duration should be close to the median or average duration of the pension industry.

Using U.S. Treasury zero-coupon securities to value the liabilities, a "liability return" can be computed for each year. This return is computed as follows:

$$\text{Liability return} = \frac{\text{Present value of the liabilities for year } t}{\text{Present value of the liabilities for year } t\text{-}1} - 1$$

The liability return for each year is shown in the second row of Table 3.

Given the portfolio return and the liability return, the net return is computed. The net return is shown in the last row of Table 3. Because we assumed that the initial defined benefit pension plan was fully funded, the net return shows the growth rate of the pension surplus from 1990 to 2002. Figure 1 shows the funding ratio for each year from 1989 (assumed to be 100% on December 31, 1989) through 2002.

From Table 3 and Figure 1, the following observations are noteworthy:

- Asset growth is volatile. Keep this in mind when we discuss the ROA assumption in the next section.
- Liability growth is volatile. This volatility is due to the use of market discount rates that change each year. Despite the fact that using Treasury STRIPS rates is a proper way to value liabilities (conforms to FAS 87 and FAS 106), one can see why pension plans who seek to avoid volatility would prefer to use a higher and more constant discount rate.
- The geometric annual growth of the assets and liabilities from 1990 to 2002 is 9.62%% and 10.42%, respectively. That is, liability growth exceeded asset growth.
- 1994 was the third best year for the surplus (net return of 12.58%), but the asset return was close to zero.
- 1995 was the best year for the asset return (28.70%) but a bad year for the surplus (-12.45% net return).
- 2002 was the worst year for the surplus (net return of -26.02%).
- The funding ratio for the entire period declined from 100% to 91%.

The consistent skewness to an equity-heavy asset allocation bias as shown in Table 2 has crippled most defined benefit pension plans in 2000, 2001 and 2002. Higher contributions, learnings drags, higher variable

Table 1.
Typical Asset Mix*

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Cash	0.08	0.05	0.04	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02
Bonds	0.40	0.39	0.40	0.38	0.36	0.35	0.34	0.31	0.31	0.27	0.27	0.30	0.31
Equity	0.44	0.49	0.49	0.52	0.55	0.58	0.58	0.61	0.46	0.48	0.48	0.44	0.41
Real estate	0.05	0.04	0.04	0.03	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.04	0.05
Intern'l stocks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.14	0.14	0.14	0.14
Intern'l bonds	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.01	0.02
Mortgages	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
GICs+Annuities	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Private Equity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.03	0.04	0.04	0.04
Total	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

*Based on annual survey of Pension & Investments

Table 2.
Asset Class Returns

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Cash	8.73	7.42	4.12	3.51	3.94	7.11	5.59	5.72	5.48	4.24	6.47	4.84	1.75
Bonds	8.96	16.00	7.40	9.75	-2.92	18.47	3.63	9.65	8.69	-0.82	11.63	8.44	10.25
Equity	-3.15	30.45	7.64	10.07	1.29	37.57	22.93	33.34	28.55	21.03	-9.09	-11.86	-22.08
Real Estate	1.30	-4.40	-2.60	0.50	3.70	7.80	8.60	10.90	12.00	13.10	15.00	4.10	3.10
Intern'l stocks	-23.32	12.48	-11.85	32.95	8.06	11.56	6.37	2.08	20.24	27.32	-13.87	-21.11	-15.64
Intern'l bonds	12.70	15.35	4.50	12.31	1.56	20.18	5.12	1.04	15.33	-5.24	1.43	-1.37	19.59
Mortgages+Annuities	10.72	15.72	6.96	6.84	-1.61	16.80	5.35	9.49	6.96	1.86	11.16	8.22	8.75
GICs+Annuities	9.12	8.91	8.70	8.15	7.52	7.19	6.73	6.58	6.57	6.57	6.56	6.61	6.33
Private Equity								24.10	19.80	11.70	79.40	-3.40	20.00*

Asset Class	Years in P&I Survey	Index
Cash	All years	Ryan Labs Cash Index
All Equities (U.S. & International)	1990-2001	S&P 500
U.S. Equities Only	1998-2001	S&P 500
International Equities	1998-2001	Morgan Stanley EAFE Index
All Bonds (U.S. & International)	1990-2001	Lehman U.S. Aggregate Bond Index
U.S. Bond Only	1998-2001	Lehman U.S. Aggregate Bond Index
International Bonds	1998-2001	Lehman Global Bond Index
Real Estate	All years	PPR Private Equity Index*
Mortgages	All years	Lehman Mortgage Index
Private Equity	1997-2001	Financial Venture Economics
GICs and Annuities	1990-1994	Ryan 5-Year GIC Master Index

*Return not available for full year; used 20% as an estimate based on 1998.

Table 3.
Portfolio Return and Liability Return

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Portfolio return	3.23	21.78	6.98	9.31	-0.02	28.70	15.13	24.24	19.69	14.44	0.61	-5.30	-6.55
Liability return	3.23	19.26	7.87	22.46	-12.60	41.16	-3.70	19.63	16.23	-12.77	25.68	3.08	19.47
Net return	0.00	2.52	-0.89	-13.15	12.58	-12.46	18.83	4.61	3.46	27.21	-25.07	-8.38	-26.02

Geometric mean return 1990-2002: Portfolio: 9.62% (asset return)
Liability: 10.42%

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PBGC premiums, lower credit ratings are all visible consequences of this severe under performance. As is demonstrated, there is no proof that equities outperform bonds (i.e. long Treasury STRIPS that match the duration of liabilities) over this 13-year period. What is not obvious is that the equity bias is based more on GAAP than any belief that equities are a core asset class (see Bodie and Gold, 2001).

Return on Asset Assumption

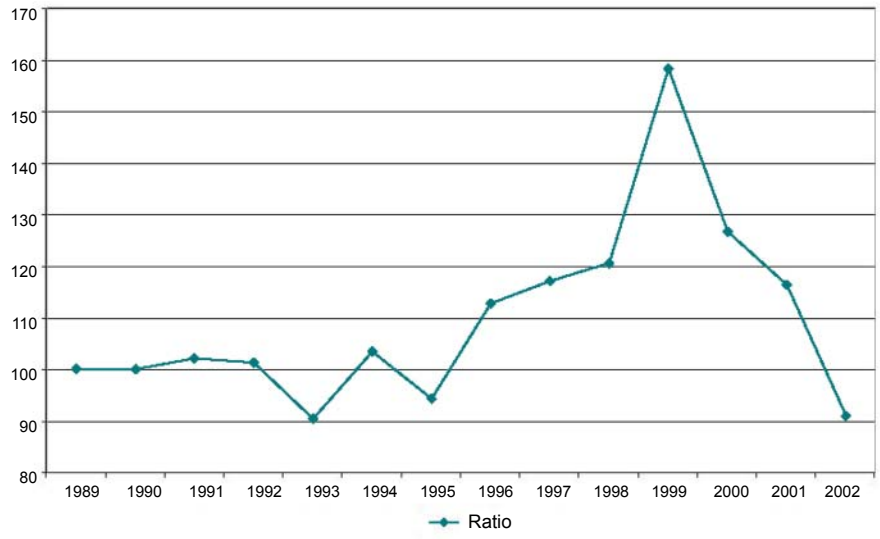
The *return on asset assumption* (ROA) is an actuarial/accounting assumption that forecasts the long-term growth rate of each asset class weighted to form a total asset growth rate estimate. Is it hard to believe that pension plans allow for a forecast of the returns of each asset class to be the primary driver of the pension asset allocation process? Who could possibly forecast with any accuracy the annual return of any asset class one year in advance? Advocates of the use of the ROA assumption assert that that is a long-term growth rate for fund assets. What is even more difficult to accept is how could these growth rates be so stable and always exhibit a positive return? That is certainly not the historical return behavior of any of these asset classes as can be seen in Table 1.

Here is how the ROA affects the entire pension game. For corporations, the ROA is the major offset to the pension cost affecting earnings. As a result, the higher the ROA the lower pension costs and the higher earnings, all else being stable. Accordingly, a policy pursued by most corporate pension plans is not to alter or reduce the ROA if they can.

Well, now comes the auditor who must qualify these assumptions. The firm's accountants work with the plan's actuary who uses some unclear historical return behavior to justify each asset class return assumption. For bonds, the actuary uses a forecasted return equal only to the prevailing market yields. As such, a bull market in bonds (i.e., a decline in market yields) would lower the expected return of bonds each year at a time when bonds are producing their best growth for the assets. This is inconsistent with bonds' historical return behavior.

The current ROA assumptions for the 380 defined benefit plans in the S&P 500 have been steady at around 9% for the last three years.[1] A level estimate of growth was the mandate. Corporations don't like volatility on their financials. As a result, pensions go through several accounting techniques to reduce any volatility on earnings and eliminate pension contributions. Comparing the standard ROA forecast of 9% to reality shows the enormous tracking error (i.e., difference between the 9% ROA and the actual asset return from Table 3)[2] of such a methodology:

Figure 1.
Funding Ratio



Year	2000	2001	2002
Assumed ROA	9.00%	9.00%	9.00%
Actual ROA	0.61%	-5.30%	-6.55%
Tracking error	8.39%	14.30%	15.55%
Cumulative		22.69%	38.24%

On a conservative basis, the average tracking error was about 12.75% over the last three calendar years in this study. To prevent such volatility from hitting the financial statements, this error is merged into the actuarial gains and losses on liabilities and is amortized over the life of the pension fund (at 15 years). Pension funds are now being burdened with this loss amortization that will remain on their books for the next 15 years. Moreover, if assets recover and produce returns well above the ROA, they too are amortized over 15 years. Given the magnitude of the actuarial gain/loss over the last three calendar years, it is clear that the current pension crisis cannot be resolved (nor even fully revealed) quickly.

As can be seen from Table 3, it is true that the period 1995 to 1999 produced large actuarial gains over the ROA and is still in the amortization process. Many corporations reported significant earnings growth from pensions due to this extra growth. However, this trend has now reversed, and pensions are now experiencing an "earnings drag." The difference here is on the order of a 25% earnings drag according to recent S&P estimates for the S&P 500. Until assets and liabilities are marked-to-market, pension plans will never know the true economic relative growth of their plans.

Discount Rate

Similar to the ROA methodology, accountants and actuaries price liabilities at a forecasted growth rate or interest rate. Some say it is a long-term growth rate assumption. For corporations, they tend to use the highest yield they can find that is a quoted rate. Typically, this is the Moody's AA Corporate yield.[3] This yield belongs in a financial museum not to determine values for GAAP purposes.

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The Moody's AA Corporate Index was designed in 1929 and only consists of long maturity industrials and utilities. There are numerous problems with this index. First, there is no yield curve and, as a result, it cannot value liabilities accurately. Second, the index does not have zero-coupon bonds in its composition. This is inconsistent or less appropriate under FAS 106, paragraph 186, for pricing liabilities. FAS 106 does permit the use of coupon bonds but requires that reinvestment rates be assumed, making the implementation more complex. Third, the index is not representative of the corporate bond market because it does not include the finance sector which dominates the corporate bond market values. Fourth, the yield quoted is an average for the month and not a month-end rate. Fifth, the index is equally weighted for nine industrial issues to form an industrial average, and then equally weighted on seven utility issues to form a utility average. Moody's then equally weights the industrial average yield and the utility average yield to form a AA Corporate average yield, giving utilities the same weight as industrials with fewer issues.

In a 1993 letter to FASB, the SEC suggested that the guidance provided in paragraph 186 of FAS 106 is an appropriate guideline for discounting pension liabilities. This paragraph states: "... the objective of selecting assumed discount rates is to measure the single amount that, if invested at the measurement date in a portfolio of high-quality debt instruments, would provide the necessary future cash flows to pay the accumulated benefits when due. Notionally, that single amount ... would equal the current market value of a portfolio of high-quality, zero-coupon bonds whose maturity dates and amounts would be the same as the timing and amount of the expected future benefit payments."

The SEC is clear that zero-coupon bonds are the proper, if not preferred, discount rate methodology. However, the SEC qualified high-quality to include AA and AAA Corporates. Since zero-coupon Corporates do not exist, and since the longest duration on Corporate coupon bonds is around 15, the SEC permits an extrapolated yield curve, provided it is based on current interest rate levels.

To provide assistance in pricing here, Ryan Labs created a corporate bond yield curve series which includes all corporate bonds $150 million and greater in size by rating group. As of December 2002, the Ryan Labs AA Corporate yield curve ranged from 2.12% (two year) to 6.10% (30-year). Using 6.10% as the yield for durations beyond 15 (flat tail) and weighting this yield curve by the liability schedule, most pension plans would have a weighted AA Corporate discount rate below 5.50%. This is well below the Moody's AA Corporate yield of 6.52% and most average discount rates surveyed.

Based on studies by two top pension consultant firms, here are their calculations of the average or most widely used discount rates by pensions:

	2001	2002
Mercer	7.25%	6.75%
Watson Wyatt	7.21%	6.77%
Moody's AA Corp	7.08%	6.52%
Ryan Labs AA Corp (30 yr)	6.78%	6.10%
Treasury 30 year	5.47%	4.79%

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Because the plan liabilities are bond-like, their true growth rate is no more stable than is a long bond portfolio. Year-to-year liability fluctuations can easily amount to double-digit growth rates. But most of these fluctuations do not get reported in the current year's pension expenses. Only the amount attributable to the discount rate (e.g., 7% on last year's liabilities) is recognized. The growth in liabilities attributable to changes in the level of interest rates and the shape of the yield curve is hidden in an amortization account (identified as "actuarial gains and losses") where it is amortized versus earnings over many years (average life of the plan).

Naturally, the higher the discount rate used to discount liabilities, the lower the present value of the liabilities. But using an incorrect interest rate will produce the wrong risk/reward behaviors. How could all liabilities be priced at one interest rate? Until real market rates are used that reflect the true cost to a pension plan to defease the liabilities, there will be inaccuracies. By definition, only zero-coupon bonds could be used since no coupon bonds have a duration greater than 15. The confusion here comes from FASB allowing annuities to price liabilities which are quoted as a single rate pricing methodology. But, they are truly a negotiated rate and certainly not available freely to all pension plans nor quoted as a daily transparent market rate. A $200 million plan would certainly get a preferred rate to a $5 million plan. However, pension plans above $1 billion may find it impossible to get any annuity rate for that size (none recorded yet). Since the top 100 defined benefit plans are all above $1 billion, we are talking about most pension plan dollars.

Public plans have adopted an accounting practice (GASB 25 and GASB 27) where the discount rate chosen matches the ROA assumption supposedly to avoid arbitrage. This argument makes no economic sense. For example, assume that a $1 billion pension plan prices liabilities at 9.00% instead of a market rate for the Treasury STRIP curve of, say, 5.00% (probably lower). They are 400 basis points too high with their discount rate. Using an average duration of 10-15 on the liabilities, this means that the liabilities are underpriced by 40% to 60%. If they thought the plan was fully funded (funding ratio of 100%), the actual funding ratio would be 60% or 40%. Unfortunately, this is the norm and not an isolated situation Throughout public pension land pension liabilities are much higher than thought, yet pension plans continue to raise benefits when they cannot afford to do so. This process leads to generous pension promises for today's civil servants that will burden unsuspecting future taxpayers (see Gold, 2002).

Many pension plan sponsors have been misled to believe that the discount rate on liabilities is their hurdle rate. If asset returns outperform this rate, it is believed that a surplus will be created. Not true! As Table 3 indicates, liability growth is volatile and can be quite high (25.96% in 2000, for example) or can be negative (-12.70% in 1999, for example). Until liabilities are priced at the market frequently, pension plan sponsors will never know their true economic return behavior.

IT SHOULD BE CLEAR THAT UNTIL PENSIONS PRICE THEIR ASSETS AND LIABILITIES AT THE MARKET FREQUENTLY, THEY ARE IN GREAT DANGER OF AN ASSET/LIABILITY DISCONNECT

Contributions

No pension plan wants to make a contribution. So the pension pencil gets a workout trying to figure how to minimize or eliminate contributions. The Internal Revenue Service (IRS) monitors the process. IRS regulations require pricing the liabilities off the 30-year Treasury on a weighted rolling average basis. Specifically, letting y_t denote the Treasury yield for year t, then weighted rolling average for year *t* is:

$$40\% \, xy_t + 30\% \, xy_{t-1} + 20\% \, xy_{t-2} + 10\% \, xy_{t-3}$$

Since interest rates are quite volatile, this concoction could never represent accurate pricing of liabilities. In a bull market trend, this blended formula would always be too high a rate and vice versa in a prolonged bear market.

Moreover, corridors (i.e., a range of 90% to 120% of weighted average Treasury rate) are used to protect the plan, suggesting that the plan has to be seriously underfunded to face a higher contribution. That seems to be the current environment. Even the great pension pencils cannot prevent higher contributions.

With the absence of the 30-year Treasury, it remains to be seen how the IRS will adjust this unusual formula.

Conclusions

It should be clear that until pensions price their assets and liabilities at the market frequently, they are in great danger of an asset/liability disconnect. Financial Reporting Standards 17 issued by the United Kingdom's Accounting Standards Board is a step in the right direction, removing the amortization and smoothing processes that disguise and delay the economic truth. U.S. pension plans desperately need an economic reporting system (i.e., pension economic books). Shareholders of several major companies seem to have taken matters into their own hands. They have created a proxy battle soliciting investors to vote for a resolution separating executive compensation from earnings that have been boosted by pension credits. ■

Notes

1. A Credit Suisse First Boston (2002, p. 12) study found an average ROA assumption of 9.20%; an average ROA of 9.25% was found in a Bear Stearns by McConnell, Pegg, and Zion (2001, p.16) study.
2. Tracking error as defined here is simply the difference between two returns. Tracking error in performance measurement is defined differently. It is the standard deviation of the deviation of the portfolio return from the benchmark.
3. This is virtually mandated by the SEC (see Schuetze, 1993).

References

Actuarial Standards Board, Actuarial Standards of Practice No. 27 "Selection of Economic

Assumptions for Measuring Pension Obligations," December 1996.

Zvi Bodie, Jeremy Gold, and Ethan Kra, "Does an Actuarial Bias Lead to Equity Investment?" Session 37, Society of Actuaries Dallas Spring Meeting, 2000.

Credit Suisse First Boston, "The Magic of Pension Accounting," September 27, 2002.

Jeremy Gold, "Accounting/Actuarial Bias Enables Equity Investment by Defined Benefit Pension Plans," Pension Research Council, Working Paper, http://rider.wharton.upenn.edu/~prc/PRC/WP/wp2001-5.pdf, July 2002.

Pat McConnell, Janet Pegg, and David Zion, "Pension and Other Retirement Benefits II: Forecasting 2002 Cost (Income)," Bear Stearns & Co., November 2001.

W. Schuetze, Letter from SEC to FASB Emerging Issues Tax Force, September 22, 1993.

Notes

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