The Case for
Marking Public Pension Plan Liabilities to Market

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Working Paper

August 11, 2008

We wish to acknowledge the thoughtful comments offered to us by Lawrence N. Bader, Gordon Enderle, John Haugh and Robert C. North, Jr.

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Abstract

Pension plans covering employees who work for state and local governments in the U.S. hold an estimated $3 trillion in assets. The market value of the assets of such plans is regularly disclosed in the financial statements of the plans and their sponsors. Plan liabilities, however, are routinely reported at actuarial values which may differ substantially from market values. In addition, the disclosed funded ratio is often based on a smoothed value of assets which may differ substantially from market value.

We define a market-based value for plan liabilities (MVL): the present value of accrued benefits discounted at market interest rates for fixed income investments that are, or are nearly, default free. The MVL, viewed in conjunction with the market value of plan assets (MVA), can inform taxpayers, public sector employees, and the agents who make decisions on their behalf (e.g., elected officials, labor representatives, plan administrators, etc.). Lenders (municipal bond buyers) and the rating agencies who serve them will also find value in the transparency represented by the MVL and MVA. Among the questions that these disclosures can help to answer, we include:

1) Will future taxpayers be paying for services provided to current and previous generations of taxpayers? Or might the opposite be true?
2) How does the funding level, and benefit security, of this plan compare to plans in other jurisdictions in the U.S.?
3) What is the market value of benefits being earned by public employees this year? What does this tell us about their total compensation?

These questions cannot generally be answered by reference to the actuarial value of the accrued liability, which is regularly presented in the comprehensive annual financial report (CAFR) of the plan sponsor. Because these important questions deserve answers, we call upon public pension plans to measure and report MVL.

Although accurate measurement of the MVL is best done by plan actuaries who have access to the participant data, we attempt to measure the MVL for an arbitrary sample of public sector pension plans using publicly available information. We comment on the difficulties we and other outsiders have in making such estimates.

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I Introduction

Career employees of state and local governments such as teachers, civil servants, police, fire and sanitation workers are usually covered by defined benefit pension plans, commonly referred to in the U.S. as *public pension plans*. The financial positions of such plans are typically reported in documents called Comprehensive Annual Financial Reports (CAFRs). Public pension plan CAFRs usually include extensive data about plan assets, cash flows, expenses, investment policy and performance, etc. This information is helpful to watchdogs and other parties interested in monitoring the financial integrity of pools of assets that can run into the billions and hundreds of billions of dollars.

Information about plan liabilities, however, is much more sparse. A typical CAFR will disclose the actuarial methods and assumptions, plan provisions, data on participant ages, salaries and service, and *actuarial liabilities*. These actuarial liabilities are highly dependent upon the methods and assumptions chosen by the actuary or contained in local statutes and regulations. The actuarial assumptions are typically consistent with Actuarial Standards of Practice (ASOPs), especially ASOP 4, ASOP 27 (economic assumptions) and ASOP 35 (demographic assumptions). The economic assumptions (expected returns on invested assets, future inflation, and salary increases) are designed to facilitate a long range budgeting process and are not intended to reflect current market conditions. The actuarial liabilities developed in accordance with these long range projections are not well related to economic values and leave several important pension financial questions unanswered. In this paper we identify three such questions:

1) Will future taxpayers be paying for services provided to current and previous generations of taxpayers? Or might the opposite be true?
2) How does the funding level, and benefit security, of this plan compare to plans in other jurisdictions in the U.S.?
3) What is the market value of benefits being earned by public employees this year? What does this tell us about their total compensation?

The 2007 CAFR for the New York City Employees' Retirement System[3] is helpful in that it includes supplementary information. Page 149 of the CAFR shows several measures of plan assets and liabilities. For reasons discussed below, we identify the Market Value of the Accumulated Benefit Obligation (MVABO) shown in the rightmost column as the Market Value of Liabilities (MVL) for the plan. Page 150 of the CAFR shows several measures of the plan's funded ratio (assets divided by liabilities). We believe that the North Ratio (the market value of assets (MVA) divided by the MVABO) is the most useful measure of the plan's financial status. This ratio helps us to answer the three questions shown above.

[3] See http://www.nycers.org/(4pdve4550se2te2d0dytvl45)/Pdf/cafr/2007/NYCERS_final.pdf

The supplementary information provided in the NYCERS CAFR has been developed by Robert C. North, Jr., Chief Actuary, New York City Office of the Actuary. Mr. North provides parallel disclosures in the other NYC Pension CAFRs covering teachers, firepersons, etc. We are not aware of such disclosures by public pension plans in other jurisdictions in the U.S.

In Section II we discuss the importance and relevance of the Market Value of Liabilities. In Section III we examine the ordinary disclosures of several public pension plans and make rough estimates of their MVLs. In Section IV we consider the implications of MVL disclosure. Section V concludes with a call for public plans and their actuaries to provide this information.

II Market Value of Liabilities

In late 2006, the Society of Actuaries and the American Academy of Actuaries jointly issued the Pension Actuary's Guide to Financial Economics[4]. The Guide (Section 6) identifies three liability measures:

1) Market liability is determined by reference to a portfolio of traded securities that matches the benefit stream in amount, timing and probability of payment.
2) Solvency liability is determined by reference to a portfolio of risk free securities that matches the benefit stream in amount and timing.
3) Budget liability is the traditional actuarial accrued liability used to develop a schedule of contributions to be made to the plan over time.

The budget liability depends on choices made by the plan with respect to the actuarial funding method to be used and upon assumptions made in accordance with Actuarial Standards of Practice. Budget liabilities are not marked to market and do not answer our three pension finance questions.

When payment is certain, the market liability equals the solvency liability. In many jurisdictions, pension payments are highly protected by the taxing power of the government sponsor and collateralized by the plan assets. Peskin (1999) observes that, although the primary purpose of pension funding in the private sector is to provide collateral, the primary purpose of public sector funding is to assure intergenerational equity (i.e., each generation of taxpayers pays for the public services it consumes contemporaneously).

Although there are jurisdictions in which benefits may not be perfectly secure, we will deem the MVL to be well-measured assuming that the probability of payment is nearly certain. Robert North's use of Treasury securities to measure NYC's MVL is consistent with this approach.[5]

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[4] Principal authors of the Guide include this paper's authors. The Guide is now part of the syllabus for future Pension Fellows of the Society of Actuaries. http://www.actuary.org/pdf/pension/finguide.pdf

[5] Some have suggested that using a relevant swap curve instead of Treasury rates provides a better market measure of the liability. We take an agnostic view with respect to the technical advantages of one or the other measure and accept either as a useful way to estimate MVL.

The Employment Relationship and the Role of the Pension Plan

Economists distinguish principals from agents. Principals are those with "skin in the game." It is their pocketbooks that will be more or less full as a result of the economic activity in question. Agents are those whose decisions affect the welfare of the principals. In the public plan arena, taxpayers, plan participants (employees, retirees and beneficiaries), and lenders are the principals. There are many agents involved in the process including elected officials, plan trustees, plan administrators and their staffs, investment officers, asset managers, rating agencies, consultants and actuaries.

Governments hire employees to provide services to taxpayers and other residents. These employees are compensated by taxpayers in (at least) two ways: current cash compensation (salaries) and promises of future cash (pensions). Taxpayers, in order neither to burden nor to subsidize the taxpayers who will come after them, should generally expect to pay for today's services today – even though the deferred part of the employees' total compensation may not be received for decades.

A public pension plan is like a reservoir – it allows taxpayers to pay today for benefits that will support retirees tomorrow. Unlike water held in reserve, pension assets earn investment returns over time. Because of these returns and the risks associated with them, a generationally neutral taxpayer/employee compensation system requires sophisticated financial analysis. How much is tomorrow's promise worth today? Who bears what risks along the way?

The balance of this section answers these questions using the tools of financial economics.

Financial Economics and Traditional Actuarial Practice

Financial economists and actuaries use quantitative methods to estimate the value today of money to be paid in the future. Although the root process – discounted cash flow – is common to each discipline, the analysis of risk and who bears it can be quite different. The differences between actuarial and financial techniques have been discussed in the actuarial literature at least since Bühlmann (1987). The theme has been carried forward by D'Arcy (1989) and Hardy (2005) and, into the pension arena, Exley et al (1997), Bader & Gold (2003) and Joint AAA/SOA (2006).

The actuarial process is designed to develop a budget for the inflow of cash into the pension plan such that money will be available to meet benefit promises as they fall due. The process depends on regular budget updates which smoothly adjust incoming cash flows to take account of emerging demographic and financial experience.

Financial economists emphasize market values and are interested in measuring the pension contracts that link employees and taxpayers over time. The three questions asked in this paper typify the concerns of financial economists.

What is the Value of the Pension Promise to Employees?

Value When Employment Ends

Employees acquire pension wealth in accordance with the formulas embedded in defined benefit pension plans. When employment ends, the plan participant owns an annuity whose value reflects the probability that the recipient will be alive at each payment date, including ancillary benefits that may entitle beneficiaries to receive payments after the death of the former employee. In the public sector, in contrast to the private, it is common for future benefits to include post-employment cost-of-living increases.

The probabilities of survival might be difficult to estimate and the annuity might be hard to value for an individual, but the law of large numbers allows accurate estimates to be made for annuitant cohorts. The asset pricing models favored by financial economists (e.g., the Capital Asset Pricing Model) imply that the expected cohort cash flows may be valued using rates of return on fixed income securities (the yield curve). Assuming, as we do in this paper, that pension default is unlikely, we can determine the value of benefits that are not inflation protected using the Treasury yield curve and the value of inflation indexed benefits using the Treasury Inflation Protected Securities (TIPS) curve. Practical concerns may refine these measures when default is possible or when, as is frequently the case, inflation protection is limited.

Nominal market rates circa 2008 are almost certainly no greater than 5% annually and real rates are below 2%. This is importantly different from nominal rates used by public pension plan actuaries which are, and have been for many years, in the neighborhood of 8%.

Value During Employment

What is the pension wealth of an employee still working? Clearly it cannot be lower than the value of the benefit promise assuming that the employee quits today. This "walk away" or "exit" value is identified as the *Vested Benefit Obligation* (VBO) by actuaries and accountants in the private sector. A somewhat larger number is identified as the *Accumulated Benefit Obligation* (ABO) which augments the VBO by taking into account the probability that an employee will become eligible for early retirement subsidies or other ancillary rights that will increase the value of the benefits already earned. Neither the VBO nor the ABO attaches any value to benefits based on future service and future pay increases. A measure that does take into account future salary (but not future service) is called the *Projected Benefit Obligation* (PBO). All three measures take into account plan-specified post-retirement cost-of-living increases when these are contractually "owned" by the employee.

Consider an employee who is eligible to retire immediately. She is advised that if she retires today she will receive an annuity of $20,000 annually for life based on her current service and work history. If she works another year, the benefit will be recomputed as, say $22,000, giving her credit for an additional year of service and for her then higher salary. Note that she does not ask, and has no economic interest in, the benefit that might be calculated based upon today's service and tomorrow's salary. That benefit would reflect a PBO value for pension wealth today. The employee rejects that notion and

compares, instead, her accrued benefit today (a $20,000 annuity beginning now) versus her accrued benefit next year (a $22,000 annuity beginning then).

Because the ABO and the VBO are often close in value, we will not examine the differences in order to declare one the preferred measure of pension wealth. We do, however, reject the PBO as a pension wealth measure. For a further discussion of these issues, see Gold (2005).

What is the Value of the Benefit Earned Each Year?

The present value of accrued benefits at market rates may be followed from time t-1 to time t assuming that new benefits (ΔAB_t, with market value $MV\Delta AB_t$) are earned at year end and benefits (P_t) are paid during the year:

$$MVL_{t-1}(1+\tilde{r}) + MV\Delta AB_t - P_t(1+\tilde{r}/2) = MVL_t$$

where $\tilde{r}$ is the total liability rate of return[6]. The $MV\Delta AB_t$ may be computed by the plan's actuary who identifies the changes from t-1 to t in the accrued benefits of active employees and discounts the associated cash flows, applying the same yield curve used to develop MVL_t from AB_t. When an actuary reports the MVL, we can estimate the $MV\Delta AB_t$[7]:

$$MV\Delta AB_t = MVL_t - MVL_{t-1}(1+\tilde{r}) + P_t(1+\tilde{r}/2)$$

The $MV\Delta AB_t$ is an important economic datum whether computed for the retirement system or for individual employees. It is the pension wealth newly acquired by today's employees and it is the cost incurred by today's taxpayers.[8]

What is the Value of the Pension Promise to Taxpayers?

Because the pension plan owes what the participant holds as pension wealth, we can tentatively conclude that the MVL is equal to the MVABO[9] But this measure has not been widely accepted. Actuaries have argued that the actuarial accrued liability (AAL, measured using expected rates of return on plan assets) developed as part of the plan's budgeting process is the best measure of plan liabilities. The Governmental Accounting Standards Board (GASB) which governs reporting in this area agrees. In the private sector, the Financial Accounting Standards Board (FASB) tells businesses to report the PBO as a balance sheet liability.

We defend the MVABO as the most economically relevant measure of taxpayer obligations and compare it to the MVA to assess the financial state of public DB plans. Let us consider arguments that the MVABO is too high or too low a number:

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6 Liability returns are computed analogously to asset returns (Leibowitz, 1987) reflecting both the passage of time and changes in the beginning and ending discount rate curves.

7 This is the traditional unit credit (TUC) Normal Cost computed at market rates.

8 Actuaries, elected officials, and other agents usually assert that the cost of the plan is equal to the actuarially required contributions. Economists, and the markets they defer to, disagree strongly.

9 Earlier we used the term ABO to define the recognized accrual pattern (i.e., a liability that does not anticipate future service or pay increases) Henceforth, we use the term ABO to mean the value of such accrued benefits when discounted using the plan's actuarial assumptions. We use MVABO to mean the value discounted using market rates.

- MVABO is too high because it uses a nearly risk free discount rate while the plan invests in risky assets which are expected to exceed the risk free rate over time. Those who make this argument often accompany it with the assertion that the plan will be around for a long time and is virtually certain to meet all of its obligations when due. In effect, this argument says that riskless benefit promises funded by risky assets can be measured at the expected rate of return on those risky assets. This is a free-lunch argument that implicitly says that $100 worth of risky assets is more valuable today than $100 worth of risk-free assets (see Bader-Gold, 2005). It is a market-defying assertion. It makes no accounting for the risk borne by future taxpayers who must make good on the benefit promises even if the risky assets fail to perform (Gold, 2003).

  The MVL cannot be less than the MVABO. Pension plans are subject to the ordinary rules of the financial markets and cannot magically promise benefits below the value that the capital markets assign to similarly sure securities.

- MVABO is too low because it fails to include future pay increases, strong (often state constitutional) prohibitions of benefit reductions including benefits not yet earned, and valuable options held by employees.

  As it is typically calculated, the MVABO may underestimate the value of some options but it also values some options that are not yet vested (e.g., the right to retire early and receive a particularly valuable early retirement benefit). While these issues may cut both ways, they are technical and computational. In concept the MVABO should include and properly measure all options. With the understanding that the MVABO is not perfect, we accept it as the best practical measure of the MVL for public pension plans.

  In the private sector fairly strong arguments can be made against recognizing future pay increases in today's benefit liabilities (Bulow, 1982, Bodie 1990, Gold 2005, Sohn 2006). A key private sector argument holds that we don't recognize benefits based on future pay increases for the same reason that we don't recognize future pay increases themselves. To wit, future pay rates may be deemed to be subject to market forces and there is no current obligation to pay more in the future than the economic value that the employee will render in the future. This argument is less convincing in the public sector. Benefits and pay are negotiated between the agents of the employees (union representatives) and those of the taxpayers (elected officials). In the private sector, a company that overpays its workers will not be able to compete for customers and capital. The forces that might make this true in the public sector (where taxpayers consume services and provide capital) are not obvious and may not exist.

  Disclosure of the market value of benefit promises and the incremental value associated with each year of employment (the MVΔAB) is a necessary component in the development of negotiating discipline.

How the MVL and MVA Help Answer Questions 1) and 2)

1) Will future taxpayers be paying for services provided to current and previous generations of taxpayers? Or might the opposite be true?

Future taxpayers will have to pay for future benefit promises as these are earned, plus the MVL, less the MVA. If the MVs are equal (i.e., the North Ratio is 100%), future taxpayers will pay for future benefit accruals as these are earned; none of the services they consume will be subsidized by earlier taxpayers nor will they be called upon to pay for benefits already earned. Equality of MVL and MVA defines a system that is fair to future taxpayers. If the plan is in deficit (MVA less than MVL, North Ratio below 100%), taxpayers to date have underpaid; if the plan is in surplus, the opposite is true.

2) How does the funding level, and benefit security, of this plan compare to plans in other jurisdictions in the U.S.?

A comparison of North Ratios between jurisdictions tells us which jurisdiction has been better funded by current and prior taxpayers. The system with the higher North Ratio has paid for more of its earned benefits than has the system with the lower ratio. Any system with a North Ratio greater than 100% may be said to be protecting its participants and treating its future taxpayers well. Although it is unlikely that taxpayers will choose their residences on the basis of public plan financial status, areas with very low funding ratios are likely to face higher taxes in the future. Information about future taxes may affect home prices today.

How the MV of the Delta AB Answers Question 3.

3) What is the market value of benefits being earned by public employees this year? What does this tell us about their total compensation?

The $MV\Delta AB_t$ is the market value of benefits being earned by public employees in year t. In recent years, the combination of an aging workforce and low market discount rates (and still high actuarial rates) implies that the $MV\Delta AB_t$ is generally much higher than the actuarially required contribution reported in actuarial reports and CAFRs.

III Estimating a Market Value Liability

Despite the relevance of the MVL and the MVΔAB, these values are rarely calculated and almost never disclosed. Decision makers with responsibility for plan activities (e.g., plan trustees, administrators and elected officials) do not ask their actuaries to calculate market values. Financial analysts (working for rating agencies and bond investors) do not have the necessary tools and information to make independent assessments even if they were inclined to do so.

Although precise measurement of the MVL and the MVΔAB can only be done by actuaries working with reliable plan data, appropriate computer software, and detailed descriptions of the benefits being earned, in this section we attempt to estimate an MVL from publicly available information contained in the CAFRs of four arbitrarily selected plans in the Southeast (SE), Northwest (NW), Northeast (NE) and Midwest (MW). We use the MVL information provided in the NYCERS CAFR to make a crude estimate of the value of benefits newly earned by its members – the MVΔAB.

The roughness of these estimates highlights the importance of additional disclosures which can be made only by actuaries working with accurate plan data.

Estimating MVL

CAFRs commonly disclose the actuarial accrued liability or AAL. We make two adjustments to convert the AAL into an estimated MVL. The first adjustment from AAL to ABO (based on actuarial assumptions) requires a change in accrual pattern. The second adjustment converts the ABO to MVL; this requires a change to market observed discount and inflation rates.

We begin by extracting relevant data from the four CAFRs as shown in Table 1.

Table 1

Data Extract from CAFRs.

($mm for aggregate financial values)

Location of plan[10]	SE	NW	NE	MW
Actuarial accrued liability (AAL)				
- Active member contributions	$58	$1,104	$1,794	$2,616
- Retirees and beneficiaries	55,534	8,667	5,676	12,217
- Active (employer portion)	55,386	3,073	4,160	5,492
Total AAL	$110,978	$12,844	$11,630	$20,325
Actuarial asset value (AAV)	$117,160	$8,443	$8,888	$14,858
Funded ratio (AAV/AAL)	106%	66%	76%	73%
Market value of assets (MVA)	$116,340	$8,591	$9,972	$13,784
Active demographic data				
- Annual payroll	$25,148	$1,513	$1,821	$2,859
- Number of actives (000)	665	34	52	74
- Average annual salary (000)	$38	$45	$35	$39
- Average age	44	45	n/a	n/a
- Average service	10	9	n/a	n/a
Key plan provisions				
- Retirement age[11]	59	60	60	60
- Post-retirement COLA[12]	3.00%	CPI	CPI	1.5%
Key assumptions:				
- Investment return	7.75%	8.25%	7.50%	7.50%
- Salary increase[13]	5.50%	4.50%	5.50%	4.50%
- Inflation assumption	n/a	3.50%	4.00%	4.00%

[10] Some retirement systems comprise several plans, making data collection and judgment difficult.

[11] The approximate age at which the full accrued benefit is payable as a life annuity has a large impact on the factors used to convert the EAN AAL to an estimated ABO. The retirement age drives the "years to retirement" employed in Adjustment 1. The retirement age differs markedly between different types of employees (e.g., uniformed, clerical, teachers, administrators, etc.).

[12] Cost of living adjustments after retirement. The consumer price index (CPI) may be used as an automatic annual benefit increase factor. In the southeast, the plan specifies an annual 3% increase independent of the CPI; in the mid west, the benefit is increased by the lessor of 1.5% or the CPI; for all practical purposes this may be treated as a straight 1.5% annual increase.

[13] Our conversion factors are highly dependent on the assumed rate of salary increase. Most plans assume greater salary increases at younger ages (when employee growth contributes to individual productivity) and report a single compound growth rate which, over an entire career, produces the same expected final salary. But our conversion looks at mid to late career active employees whose future expected increases are smaller. In the southeast, for example, we reduced the compound 6.25% to 5.5% based on additional information contained in the CAFR.

Adjustment 1: AAL → ABO

Because the ABO and AAL are identical for former employees, we need to adjust the accrual pattern for active employees only.

The majority[14] of public pension plans calculate the active AAL using the Entry Age Normal (EAN) actuarial method. The EAN AAL equals the present value of future benefits (PVFB) less the present value of future employer normal costs (PVFNC) less the future employee contributions (PVFEC)[15]:

$$AAL = PVFB - PVFNC$$

where present value is computed using the actuarial discount rate (expected rate of return on plan assets).

Consider a 50 year old employee who has worked for 20 years and is expected to work an additional 10 years. Assuming a simple plan design where the annual accrual is $1,000 (payable at retirement), this employee would have accrued an annual benefit of $20,000 payable at age 60[16]; the projected annual pension at retirement will be $30,000. Typical actuarial assumptions would value this annuity at 300,000[17] at age 60. Discounting this figure at 8.0% for ten years, and assuming no pre-retirement decrements (mortality, early retirement, etc), the PVFB is $138,958.

Under the EAN method, normal cost is the level annual contribution at entry (e.g., age 30) that will accumulate to the present value of $300,000 at retirement. Level annual contributions of $2,648 accumulate with 8% interest to $300,000 over 30 years. The present value of future normal costs from now (age 50) until retirement (age 60) is $17,770[18]. Plugging these figures into the above formula yields:

$$AAL = \$138,958 – 17,770 = \$121,188$$

Our 50 year old has accrued an annual benefit of $20,000 payable at age 60. Multiplying by our age 60 annuity factor and discounting for 10 years at 8%, we calculate the actuarially valued ABO as $92,639.

Figure 1 displays the EAN AAL and the ABO year by year from entry age 30 until retirement at age 60. For our 50 year old, with 10 years left to retirement, the ABO is

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14 Some states and localities (e.g., New York State) use the aggregate actuarial funding method to determine an annual contribution. Under this method the AAL is set equal to the actuarial value of plan assets (leading to the meaningless tautology that the plan is always fully funded). Attempting to estimate an EAN AAL from the aggregate figures would require more in-depth analysis. Fortunately, GASB (2007) requires disclosure of the EAN AAL for all plans using the aggregate funding method.

15 Although most public pension plans require employee contributions, we set the PVFEC to zero to simplify the exposition. This affects the sharing of cost between the employer and the employees but does not change the AAL.

16 Although the typical normal retirement age is 65, we assume the plan provides a full unreduced benefit at age 60 and the employee will retire then.

17 Using the RP2000 Combined Healthy Male mortality table and an assumed interest rate of 8% the non-indexed single life annuity value at age 60 equals 9.9238. We round to 10.0 to simplify the exercise. $300,000 = $30,000 * 10.0

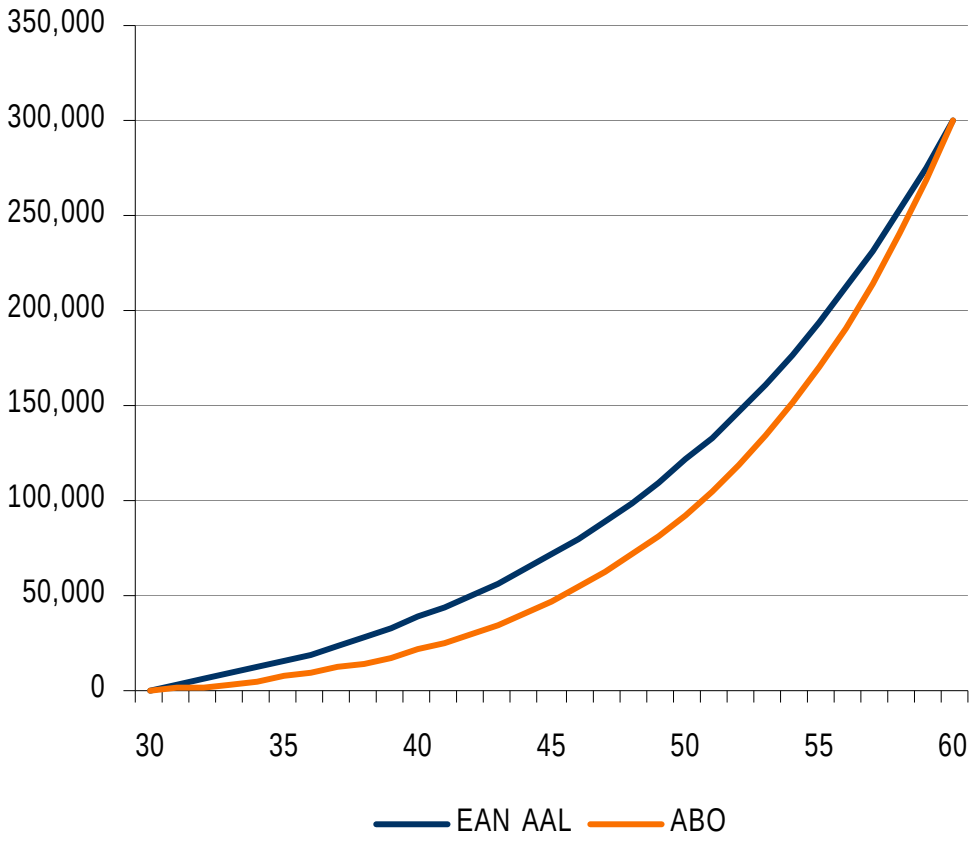
18 Equals $2,648 * 10-year annuity at 8.0%.

estimated to be 76% (92,639/121,188) of the EAN AAL. Table 2 provides sample conversion factors at various ages for our (flat dollar) plan.[19]

Figure 1

Comparison of EAN liabilities to ABO liabilities

Formula: 1% * final salary * years of service. Assumed salary scale: 0%.



[19] The benefit payable at 60 under this plan is the same as under a plan specifying 1% of final salary for each year of service where the final pay is $100,000 (i.e., 1%*100,000*30= $30,000).

Table 2

Factors to convert EAN AAL to ABO

Formula: 1% * final salary * years of service. Assumed salary scale: 0%.

This table develops for one employee, hired at age 30, retired at age 60, benefits begin at age 65, with constant salary throughout his career, the entry age normal liability accrual (EAN AAL) and the ABO. The ratio (conversion factor) may be applied to a published EAN AAL to derive an ABO. To do so, however, for all the active employees in a plan, one must judge how the range (30 to 60) should be modified and which row (age) is representative of the active employee population. If, for example, the full range were deemed appropriate and the liability-weighted average employee were deemed to be age 52, the conversion factor would be 81%.

Age	PVFB	Salary	Normal Cost	PVFNC	EAN Accrued Actuarial Liability	Accrued Benefit Payable at age 60	ABO	Conversion Factor
30	**29,813**	**100,000**	**2,648**	**29,813**	**0**	**0**	**0**	
35	**43,805**	100,000	2,648	28,269	**15,536**	5,000	**7,301**	**47%**
40	**64,364**	100,000	2,648	26,001	**38,364**	10,000	**21,455**	**56%**
41	69,514	100,000	2,648	25,433	44,081	11,000	25,488	58%
42	75,075	100,000	2,648	24,819	50,256	12,000	30,030	60%
43	81,081	100,000	2,648	24,156	56,924	13,000	35,135	62%
44	87,567	100,000	2,648	23,440	64,127	14,000	40,865	64%
45	**94,573**	100,000	2,648	22,667	**71,905**	15,000	**47,286**	**66%**
46	102,138	100,000	2,648	21,833	80,306	16,000	54,474	68%
47	110,309	100,000	2,648	20,931	89,378	17,000	62,509	70%
48	119,134	100,000	2,648	19,957	99,177	18,000	71,480	72%
49	128,665	100,000	2,648	18,906	109,759	19,000	81,488	74%
50	**138,958**	100,000	2,648	17,770	**121,188**	20,000	**92,639**	**76%**
51	150,075	100,000	2,648	16,543	133,531	21,000	105,052	79%
52	162,081	100,000	2,648	15,218	146,862	22,000	118,859	81%
53	175,047	100,000	2,648	13,788	161,259	23,000	134,203	83%
54	189,051	100,000	2,648	12,242	176,808	24,000	151,241	86%
55	**204,175**	100,000	2,648	10,574	**193,601**	25,000	**170,146**	**88%**
56	220,509	100,000	2,648	8,771	211,738	26,000	191,108	90%
57	238,150	100,000	2,648	6,825	231,325	27,000	214,335	93%
58	257,202	100,000	2,648	4,722	252,479	28,000	240,055	95%
59	277,778	100,000	2,648	2,452	275,326	29,000	268,519	98%
60	**300,000**	100,000	2,648	0	**300,000**	30,000	**300,000**	**100%**

Most public plans, however, compute pensions as a percentage of final average pay. For such plans, the entry age normal cost is expressed as a percentage of each year's pay. Table 3 calculates sample conversion factors where the actuary has assumed a 5% salary

increase at every age.[20] For our 50 year old, with 10 years left to retirement, the ABO is estimated to be 54% (56,872/104,917) of the EAN AAL. We see (Table 4) that conversion factors decrease as the salary assumption increases. Figure 2 displays the EAN AAL and the ABO year by year from entry age 30 until retirement at age 60 with an assumed 5% salary increase.

Table 3

Factors to convert EAN liabilities to ABO liabilities

Formula: 1% * final salary * years of service. Assumed salary scale: 5%.

This table develops for one employee, hired at age 30, retired at age 60, benefits begin at age 65, with salary increasing 5% annually throughout his career, the entry age normal liability accrual (EAN AAL) and the ABO. The ratio (conversion factor) may be applied to a published EAN AAL to derive an ABO. To do so, however, for all the active employees in a plan, one must judge how the range (30 to 60) should be modified and which row (age) is representative of the active employee population. If, for example, the full range were deemed appropriate and the liability-weighted average employee were deemed to be age 53, the conversion factor would be 65%.

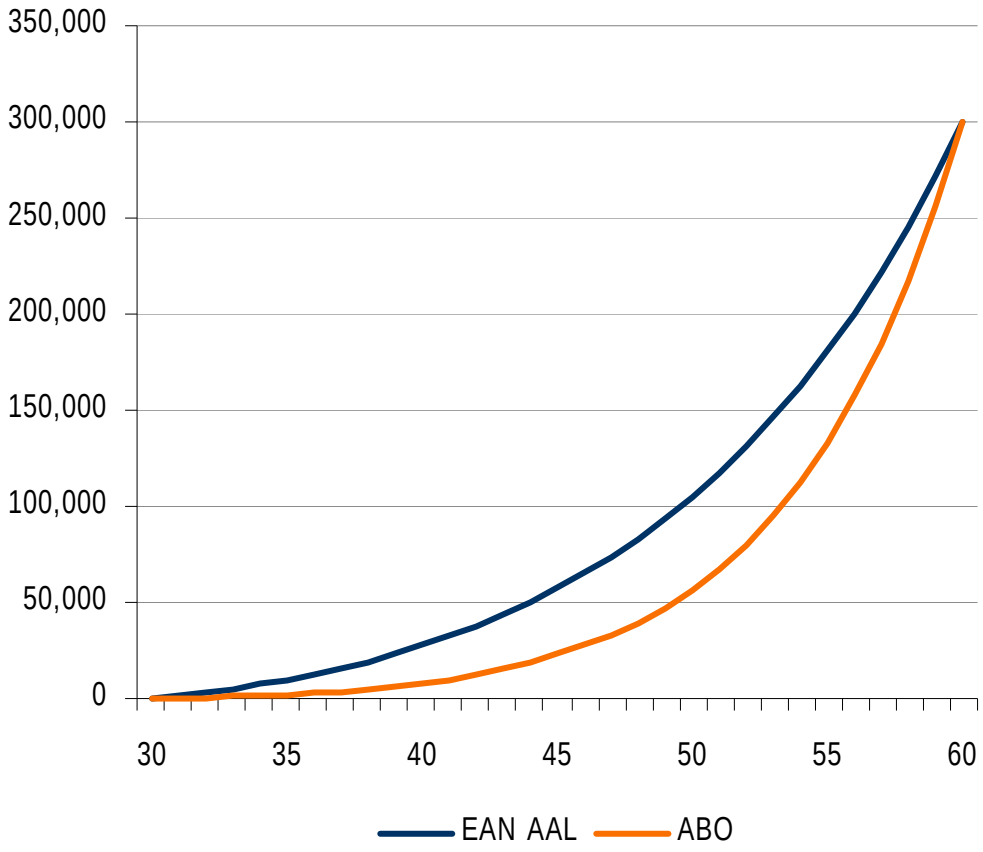
Age	PVFB	Salary	Normal Cost	PVFNC	EAN Accrued Actuarial Liability	Accrued Benefit Payable at age 60	ABO	Conversion Factor
30	**29,813**	**23,138**	**1,493**	**29,813**	**0**	**0**	**0**	
35	**43,805**	29,530	1,906	33,717	**10,088**	1,477	**2,156**	**21%**
40	**64,364**	37,689	2,432	36,666	**27,698**	3,769	**8,086**	**29%**
41	69,514	39,573	2,554	37,046	32,468	4,353	10,087	31%
42	75,075	41,552	2,681	37,328	37,747	4,986	12,478	33%
43	81,081	43,630	2,815	37,499	43,582	5,672	15,329	35%
44	87,567	45,811	2,956	37,542	50,025	6,414	18,721	37%
45	**94,573**	48,102	3,104	37,442	**57,131**	7,215	**22,745**	**40%**
46	102,138	50,507	3,259	37,178	64,961	8,081	27,513	42%
47	110,309	53,032	3,422	36,730	73,580	9,015	33,150	45%
48	119,134	55,684	3,593	36,075	83,059	10,023	39,803	48%
49	128,665	58,468	3,773	35,188	93,477	11,109	47,644	51%
50	**138,958**	61,391	3,962	34,041	**104,917**	12,278	**56,872**	**54%**
51	150,075	64,461	4,160	32,605	117,470	13,537	67,718	58%
52	162,081	67,684	4,368	30,845	131,235	14,890	80,449	61%
53	175,047	71,068	4,586	28,727	146,320	16,346	95,375	65%
54	189,051	74,622	4,815	26,210	162,841	17,909	112,858	69%
55	**204,175**	78,353	5,056	23,250	**180,925**	19,588	**133,314**	**74%**
56	220,509	82,270	5,309	19,802	200,707	21,390	157,225	78%
57	238,150	86,384	5,574	15,811	222,338	23,324	185,150	83%
58	257,202	90,703	5,853	11,223	245,979	25,397	217,737	89%
59	277,778	95,238	6,146	5,975	271,803	27,619	255,732	94%
60	**300,000**	100,000	6,453	0	**300,000**	30,000	**300,000**	**100%**

[20] The model was built to produce the same $30,000 pension irrespective of salary increase assumption.

Figure 2

Comparison of EAN liabilities to ABO liabilities

Formula: 1% * final salary * years of service. Assumed salary scale: 5%.



Based on the data in Table 1 and the factors in Table 4, the analyst uses judgment and experience to choose a conversion factor. Although many considerations could impact the \choice of a conversion factor, the most important is the number of years left until retirement. We estimated the liability-weighted average number of years to retirement after reviewing plan provisions, actuarial assumptions and summary member data disclosed in the respective CAFRs.

Table 4

Factors to convert EAN liabilities to ABO liabilities

Formula: 1% * final salary * years of service. Various salary assumptions.

Conversion factors are shown based on years to retirement and various assumed salary increases. Factors based on 5% (bold) come from Table 3.

Years to	Salary Scale Assumption			
Ret Age	0%	4.50%	**5.00%**	5.50%
25	47%	23%	**21%**	20%
20	56%	31%	**29%**	28%
15	66%	42%	**40%**	38%
10	76%	56%	**54%**	53%
5	88%	75%	**74%**	73%
0	100%	100%	**100%**	100%

Applying this approach to our four public plans we develop the relationship of the ABO to the AAL shown in Table 5. Although the NE plan's CAFR did not provide an average age (an important element in our estimate of years to retirement), it did disclose an ABO-like value in accordance with FAS 35[21]. For the other three plans we assume a 65% conversion factor. If the plan provisions and demographics in combination with the actuarial assumptions differ significantly from the four samples provided here, the conversion factor will be different.[22]

Table 5

Adjustment #1: Convert AAL to ABO

Factor of 65% based on Table 4 with about 7 liability-weighted years to retirement.

Location of plan	SE	NW	NE	MW
1. Active AAL	$55,444	$4,177	$5,954	$8,108
2. Conversion Factor	65%	65%	n/a	65%
3. Active ABO [(1)*(2)]	$36,039	$2,715	$3,873	$5,270
4. Retired & Beneficiaries	55,534	8,667	5,676	12,217
Total ABO [(3)+(4)]	$91,574	$11,383	$9,549	$17,488

[21] FASB (1980).

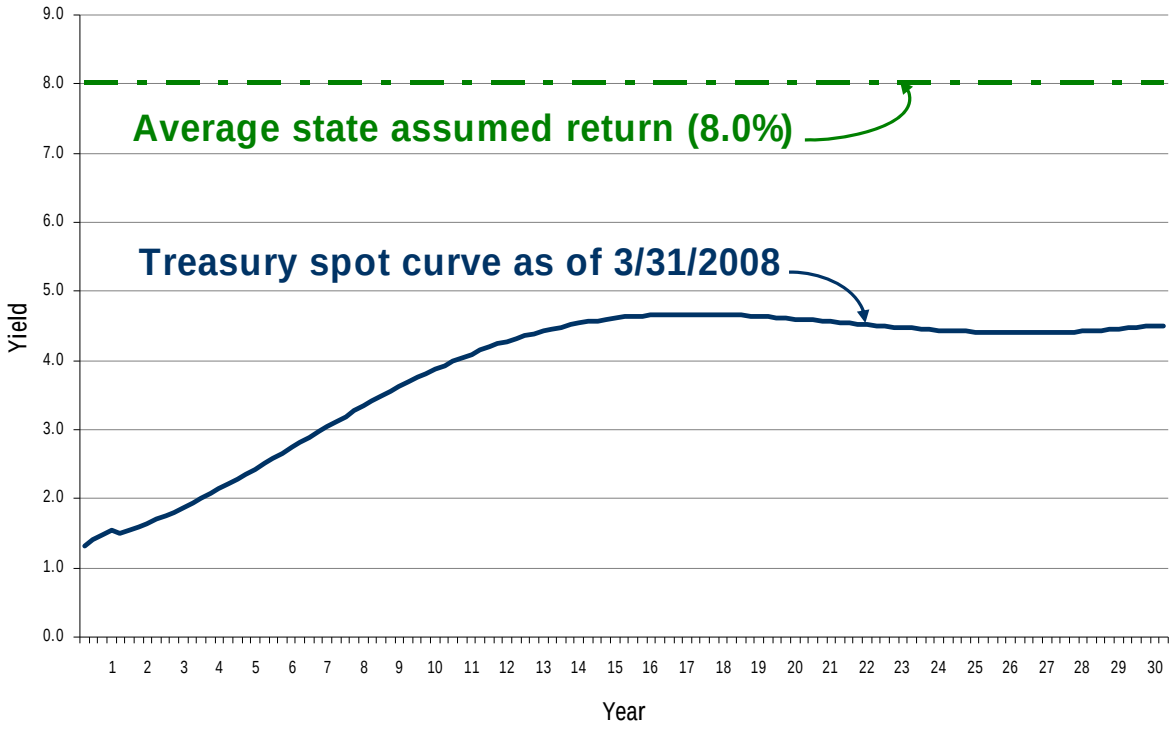
[22] In most jurisdictions separate plans are established for uniformed (or safety) employees. Such plans provide for much lower retirement ages. A common provision allows retirement at any age after 20 or 25 years of service. Many police and firefighters retire in their mid 40's.

Adjustment 2: ABO → MVL

Latter (2007) reports that the average actuarial discount rate for the two largest plans in each of the 50 United States is 8.0%. Figure 3 shows that this assumed return is significantly higher than the Treasury spot curve at March 31, 2008.

Figure 3

Nominal rates: Actuarial versus market



Actuaries who perform valuations for public plans can readily develop the cash flows that underlie the ABO. Because these underlying cash flows are not presented in CAFRs, we adjust these cash flows for cost-of-living provisions and then value them twice – using the plan actuary's assumptions and market assumptions. The ratio of these values for the hypothetical population is then applied to the ABOs developed in Adjustment 1. For technical reasons, we make these calculations separately for retired and active populations.

The SE plan specifies that benefits will increase 3% annually after retirement regardless of the actual inflation rate. The actuarial valuation already embeds these increases and we need only adjust for the difference between the nominal actuarial discount rate (7.75%) and the Treasury spot curve. As shown in Table 6, our hypothetical population liabilities increase by factors of 1.3366 (retirees) and 1.9506 (actives). We apply these to the retiree and active ABOs brought forward from Table 5 to estimate an MVL of $144,528 million.

Table 6

Adjustment #2: Convert ABO to MVL

Location of plan	SE	NW	NE	MW
Plan Economic Assumptions				
- Nominal discount rate	7.75%	8.25%	7.50%	7.50%
- Inflation (COLA) assumption	n/a	3.50%	4.00%	n/a
- Real discount rate	n/a	4.59%	3.37%	n/a
PV of hypothetical plan Retirees:				
1. Plan nominal discount rate	$72,200	$69,834	$73,435	$73,435
2. Treasury yield curve	96,505	96,505	96,505	96,505
3. Plan real discount rate	#N/A	90,936	100,444	#N/A
4. TIPS yield curve	119,568	119,568	119,568	119,568
5. Adjustment factor (2/1 or 4/3)	1.3366	1.3149	1.1904	1.3142
PV of hypothetical plan Actives:				
1. Plan nominal discount rate	$86,008	$78,447	$90,135	$90,135
2. Treasury yield curve	167,770	167,770	167,770	167,770
3. Plan real discount rate	#N/A	127,657	162,672	#N/A
4. TIPS yield curve	266,675	266,675	266,675	266,675
5. Adjustment factor (2/1 or 4/3)	1.9506	2.0890	1.6393	1.8613
Conversion of ABO to MVL				
1. Retiree ABO	$55,534	$8,667	$5,676	$12,217
2. Adjustment factor	1.3366	1.3149	1.1904	1.3142
3. Retiree MVL [(1)*(2)]	74,229	11,396	6,757	16,055
4. Active ABO	36,039	2,715	3,873	5,270
5. Adjustment factor	1.9506	2.0890	1.6393	1.8613
6. Active MVL [(4)*(5)]	70,299	5,672	6,349	9,809
7. Total MVL [(3)+(6)]	$144,528	$17,067	$13,106	$25,864

The MW plan provides post-retirement benefit increases equal to the lesser of CPI and 1.5%. In theory, a capped CPI formula requires an option model. This would be especially true if the cap were, say, 4% and would be likely to apply in some years and not in others. As a practical matter, the 1.5% cap is likely to apply in every year and thus we proceed as if the MW plan, like the SE plan, specified a fixed benefit increase rate. We use our hypothetical population to derive factors of 1.3142 (retirees) and 1.8613 (actives). Our MVL is estimated to be $25,864 million.

Because many public plans provide a COLA, we need to adjust for the difference between actuarial and market real returns. Latter (2007) reports that the average inflation assumption for the two largest plans in each of the 50 United States is 3.5%. Figure 4 shows that this average assumed real return of 4.35% (1.08/1.035 – 1) is significantly higher than the TIPS spot curve at March 31, 2008. Figure 5 compares the Treasury Spot

curve (from Figure 3) to the to TIPS curve (from Figure 4) as of March 31, 2008. The inflation curve represents to difference in these two curves.

Figure 4

Real rates: Actuarial versus market

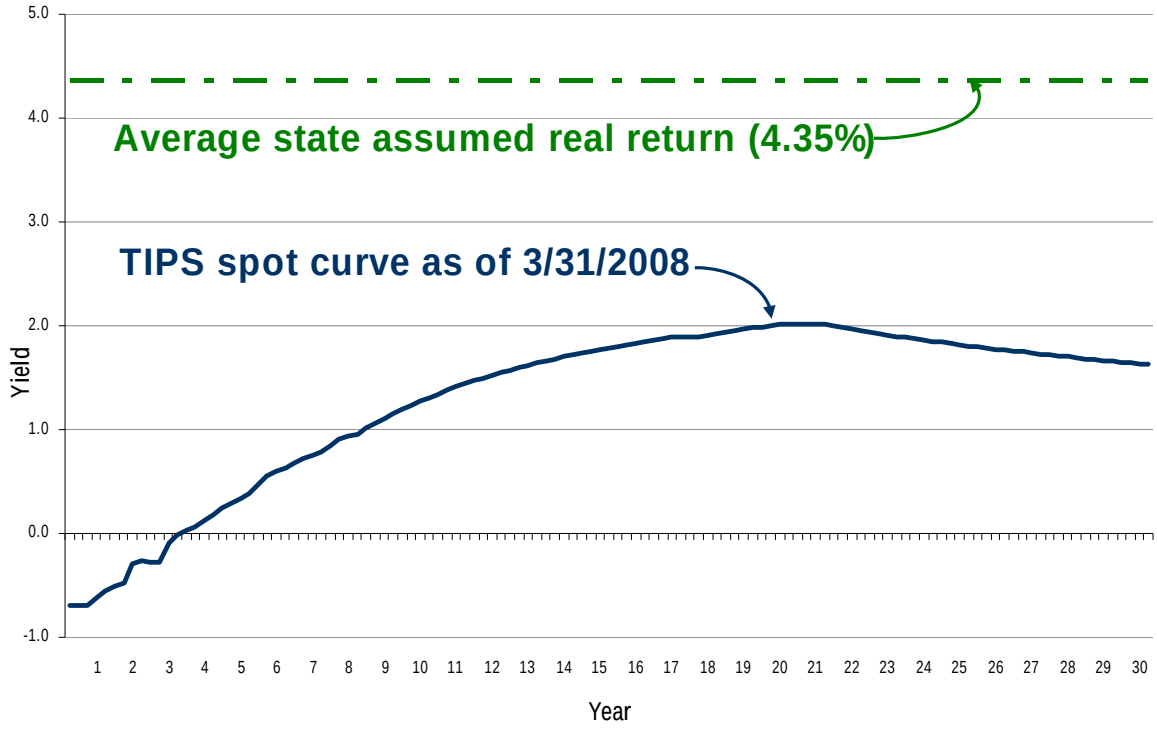


Figure 5

Treasury, real and break-even inflation rates at 3/31/2008

The NW and NE plans provide for full CPI indexing after retirement. Table 6 shows assumed nominal discount rates of 8.25% and 7.50% and inflation rates of 3.5% and 4.0% for these plans. We use our hypothetical populations to estimate the impact of replacing these actuarial assumptions with market rates of discount and inflation. Benefits that will grow at the full CPI may be estimated by discounting non-inflated cash flows using real rates of return. We compute the values of the retiree cash flows discounting at the actuarially assumed real rates (4.59% for the NW and 3.37% for the NE) and then repeat the calculation using the market's real rates found in the TIPs curve. We take the ratio of the market value to the actuarial values (119,568/90,936 = 1.3149 and 119,568/100,444 = 1.1904 respectively) and, in the last panel of Table 6, we apply these to the retiree ABOs determined in adjustment 1.

For active lives, the ABO benefits are indexed only after the employee retires. During the period between now and benefit commencement, we need to discount benefits at nominal rates. Real rates are used thereafter. This calculation leads to multipliers for the active members of the NW and NE plans of 2.0890 and 1.6393, respectively. The multipliers are higher for actives than for retirees primarily because the benefits will be paid for longer periods, thereby growing more with inflation. For both actives and retirees, the NW plan multipliers are higher than those for the NE because the NE actuary has been much more conservative (and thus closer to the market).

In the final panel of Table 6 we apply all of our respective multipliers to the active and retired lives ABOs determined by Adjustment 1 producing our final estimate of MVL on line 7. Table 7 compares the actuarial funded status to our crude mark to market funded status. In this market environment (figures 3 and 4), one would anticipate lower market funded ratios after applying the adjustments. Indeed, in three cases (SE, NW and MW) the market funded status is lower than the actuarial funded status. The funded status for the NE plan is unchanged since the actuarial economic assumptions are relatively conservative and the MVA is higher than the AAV.

Table 7

Comparison of funded status: Actuarial vs. Market

Location of plan	SE	NW	NE	MW
Actuarial Accrued Liability (AAL)	110,978	12,844	11,630	20,325
Actuarial asset value (AAV)	117,160	8,443	8,888	14,858
Funded status	106%	66%	76%	73%
Market Value of Liability (MVL)	144,528	17,067	13,106	25,864
Market Value of Assets (MVA)	116,340	8,591	9,972	13,784
Funded status	80%	50%	76%	53%

Estimating MVΔAB

Re-visiting our formula:

$$MV\Delta AB_t = MVL_t - MVL_{t-1}(1+\tilde{r}) + P_t(1+\tilde{r}/2)$$

and applying it to the detailed MVL information provided in the NYCERS CAFR, we make a crude estimate of the benefits newly earned by its members – the MVΔAB. At time t-1, the market value, duration and implied market interest rate are $55.4 bn, 12.7 years and 4.2%, respectively. At time t, the market value, duration and implied market interest rate are $49.8 bn, 11.7 years and 5.4%, respectively. From page 64 of the CAFR we see the annual pension payments are $3.0 bn. From this information we estimate a liability return ($\tilde{r}$) of –9.5%. Plugging these figures into our formula results in ($bn):

$$MV\Delta AB = 49.8 - 55.4 * (1 - .095) + 3.0 * (1 - .095/2) = 2.5$$

IV Implications

This paper advocates the calculation and disclosure of the market value of liabilities (MVL) and the annual equivalent compensation cost (MVΔAB) for public sector pension plans. We have asked three questions whose answers should be important to principals (public employees, taxpayers and lenders) and their decision making agents.

In 2008, within the community of public plan agents including plan administrators, trustees, union officials and actuaries, our advocacy is met with resistance. This opposition takes two forms:

- disagreement about the applicability of market economics in the public sector;
- concern that market disclosures threaten the continued existence of public sector defined benefit plans.

This paper also sketches out approaches to estimating the MVL and MVΔAB from information contained within public plan CAFRs. Our methods are rough and some may question the quality of our estimates.

In this section we address these concerns.

Applicability of Market Economics to Public Pension Plans

Many in the public plan community believe that differences between the private (corporate) sector and the public sector are sufficient to exempt public plans from the market discipline that constrains corporate plans. This view has been espoused by the GASB (2006) which contrasts the valuation (and investor) focus of private sector accounting with the accountability (for the use of resources) focus applicable to public financial reporting. This and other distinctions justify financial reporting in the public sector different from that in private enterprise. When it comes to pensions, GASB says:

> "The longer term view of operations of government is consistent with focusing on trends in operations, rather than on short-term fluctuations, such as in fair values of certain assets and liabilities. Immediate recognition of changes in fair values of assets set aside in employee benefit plans is appropriate accountability reporting in the employee benefit plans that hold those assets. However, it is not appropriate for government employers to immediately recognize those fair value changes or changes in accrued actuarial liabilities resulting from a change in benefit plan terms. These short-term fluctuations could produce a measurement of the period's employee benefit costs, which are included in cost of services, that may be less decision-useful for governmental financial report users."

While we respect the distinction between valuation and accountability between the private and public sectors, we disagree with how this difference is applied to public pension plans. The conclusion – that recognition of the value of changes in benefit terms is less decision-useful – is not supported by the distinctions made between private and public accounting objectives. The decision to modify plan terms cannot be well made in the absence of market values for the very benefit changes being considered. The public

plan community uses the GASB's lack of recognition requirement to justify non-disclosure of MVL, annual MVΔAB, and MVΔAB attributable to plan amendments.

We agree that governments are not the same as corporations. But what is a defined benefit plan? And what about the nature of the sponsor should influence plan financial reporting? A public defined benefit plan is a financial institution. In this sense it has more in common with insurance companies and private sector pension plans than it has with either a government or a corporation.

Insurance companies and defined benefit plans make long term promises in exchange for current cash. The long term "reservoir" aspect of these institutions implies that they have high ratios of assets on hand to benefits currently being paid. Many opponents of market disclosure use the long-term nature of the commitments to justify discounting future promises using the expected return on plan assets. Long term nature is also used to justify the amortization of liabilities that are created instantly (upon plan amendment) over long periods (usually as a constant percentage of payrolls that are assumed to rise perpetually). We believe that ignorance of the market values of current liabilities and reporting that defers recognition of significant increases in current liabilities attributable to plan amendments is no more justified for a government sponsored defined benefit plan than it is for a corporate defined benefit plan than it is for an insurance company. The different nature of the sponsor does not port down to the plan nor does it reduce the decision usefulness of market values. For more, see Gold (2003).

Actuaries generally, and in recent years public plan actuaries particularly, have argued that the long-term nature of pension plans allows risk sharing across generations with benefits for all. This is not an argument that survives serious scrutiny. Especially suspect is the argument that returns from risky investing can be front loaded for the benefit of today's taxpayers and public employees without injury to future generations of taxpayers. If future taxpayers bear all the risks, why are they not entitled to all the rewards? If the current generation gets rewards without risks, should future taxpayers settle for rewards that are below those available to other market participants exposed to the same risks? Bader & Gold (2003) warn that benefits are conferred upon today's employees at the expense of tomorrow's taxpayers.

It is worth noting that Cui et al (2007) make a well-articulated argument that risk sharing across generations, although it cannot add value, can enhance welfare (utility) across generations. Their argument postulates fairly valued trades (intergenerational commitment contracts) between generations implemented by adjustment technologies that can be modeled as the trading of contingent claims across generations. Gains and losses on risky investments incurred by one generation are passed on to future generations in accordance with these commitments. History, however, suggests that each current generation is more willing to pass on losses than gains. This raises serious governance questions that remain to be addressed.

Actuarial opponents of the application of market economics to public plans argue that the MVL reflects a termination concept and the ongoing nature of public plans renders the MVL irrelevant. A distinction, they say, between corporate and public plans is that corporate plans terminate and thus the MVL measures an improbable event in the public sector. On the contrary, the MVL measures accrued pension wealth (independent of plan

termination) which is a standard concept in labor economics. Similarly, the MVΔAB measures changes in pension wealth, an important component of total employee compensation.

It is frequently argued that the MVL cannot be measured as well for public plans as for private sector plans because the employment contracts are different. We acknowledge that contractual differences exist but note that failing to measure the MVL makes it difficult to make good decisions about public sector employment contracts and total compensation. The lack of information about market values leads to many of the very contract provisions that are then cited as the reason why market value cannot be reliably measured. Unfortunately, societal interests are not well served by such circular reasoning and argument.

Threats to the Existence of Public Pension Plans

Agents in the public pension community argue that the disclosure of market-based information about plan liabilities will be used by various opponents of defined benefit plans. As evidenced by proposals in California and elsewhere[23], there are those in the political arena who do oppose public defined benefit plans and they are likely to use information that reveals the financial cost and volatility of riskily invested defined benefit plans in their efforts.

The opponents of defined benefit plans want states and localities to switch to defined contribution plans because such plans have a more certain, and usually lower, cost than current plans. They point to the private sector to show that the trend to defined contribution plans is the way of the future. Those in the current system who resist MVL disclosures say that similar disclosures (e.g., elements of FAS 87 reporting) have led the corporate sector astray. Thus MVL threatens the existence of defined benefit plans.

We share the concerns of the public pension community and we believe that defined contribution plans are less able than defined benefit plans to provide lifetime income to retired civil employees. Nonetheless, we also believe that defined benefit plans will be strengthened by pertinent market value information. In the financial security arena, market values are key to rational decision making.

Under today's economic conditions, traditional actuarial methods and assumptions tend to understate the cost and volatility of defined benefit plans. In the period from 1975 to 1985, however, these same methods and assumptions substantially overstated benefit values and cost. Good decision making should not rely on the pretense that overstating costs for a decade or more is balanced by understatement for another decade or more.

The lesson that should be taken from the disclosure today of the MVL and MVΔAB is that it costs more to provide a given level of retirement income in times of low interest rates (real and nominal as appropriate) than it does in times of high rates. A sensible system, supported by honest reporting of market values, would recognize that more of today's total compensation needs to be set aside in low interest rate periods. While the converse, that less needs to be set aside when rates are high, might be a welcome message

[23] 2005 California proposal reported by Delsey and Hill (2005), dropped by Gov. Schwarzenegger (Gledhill, 2005).

when applicable, our message today is not very welcome. More of today's total compensation needs to be deferred.

Defined contribution advocates simply want to set aside smaller amounts in a fashion that is less risky to government employers (and thus future taxpayers) even if those savings eventually prove to be inadequate to protect retirees. It is critical to acknowledge that good pensions are more costly today than they were in the early 1980's. Continuing to assume 8% returns keeps apparent costs down. The disclosure of MVL makes it possible for taxpayers and their employees to make better choices. Pension costs are higher than they look; pension funding has to increase; risky investments do not produce free lunches (somebody – future taxpayers in this case – bears the risk); benefits may have to be less generous than they have been to date. Bitter pills, all. It is not surprising that defined contribution advocates are gaining traction and that the pension community feels threatened.

Unintended consequences

The threat to public pensions above is real. It is not, however, a by-product of additional measurement and reporting. No sector of our economy can escape the hard rules of the capital markets. Trends around the world make this more true today than ever before. Alternatives to wasteful deployment of resources arise everywhere. The public plan sector with an estimated $3 trillion in assets and perhaps as much as $4 trillion in MVL is no exception. The economics that rules the other roughly $120 trillion[24] of capital assets and financial institutions will prevail in the public pension arena.

Ignoring the market realities and hoping for the best might, in the short run, prolong the life of plans that may (in today's interest rate environment) be more generous than affordable. But those who wish to perpetuate and enjoy the benefits of defined benefit pension plans should welcome the disclosure of these important numbers as part of a sustainable long term strategy.

Intended consequences

Today's relatively low interest rates dictate that MVΔABs are much higher than the actuarial costs and actuarially required contributions specified for almost all public sector pension plans even, as we have estimated in Section III, for the NYC plans where the MVLs are measured and reported.

Full identification and recognition of MVΔABs (combined with MVAs and MVLs that reveal existing funding shortfalls) could shock the system if released in today's interest rate environment. The consequences will not occur at one moment in time, however, and some adjustment period will be necessary (perhaps more than a decade). But the first response should be that pressure is increased on state and local governments to get their fiscal houses in order.

This additional information should make it easier for elected officials to negotiate future total compensation that is more affordable and sustainable. Employees will be able to compare funding levels and benefit security between their plan and those in other

[24] The latest US only figure from the Fed Flow of Funds was $61.984 trillion. Non-US figures are assumed to be at least as great as the US figure.

jurisdictions. Employees with better funded plans can anticipate less pressure on their future benefits and wages than employees with poorly funded plans.

Some governmental employers will follow the private sector into the seemingly safer defined contribution arena. Alaska PERS has done this for public employees hired on or after July 1, 2006.

Pushback by privately employed taxpayers

Public employees today enjoy generally better pension benefits than their private sector counterparts and the disparity is increasing even as, in many areas, public employees' wages are catching or have caught up to private wages of those in similar positions.

Many private sector employees have jobs that are comparable to those held by public employees (e.g., office workers, private carters, private school teachers). Disclosure of the annual equivalent compensation cost (MVΔAB) will facilitate comparison of total compensation between sectors.

From the U.S. Department of Labor's Bureau of Labor Statistics, we see that since 1950 public employees have grown in number relative to the private sector and their importance as voters has grown as well. When this voting power is used skillfully by those who negotiate wages and benefits on their behalf, it has become easy and routine for elected officials to grant benefit improvements, especially when the costs are systematically understated.

Market value disclosures will exert some countervailing pressure on public officials and strengthen the hand of those who represent taxpayers. This additional information may lead to better decision making and a new balance of interests between taxpayers and public employees.

Quality of Estimates

Our estimation process adjusted first for the pattern of accrual (AAL → ABO) and second for the difference between actuarial assumptions and market observations of discount and inflation rates (ABO → MVL). Each of these adjustments depends on many moving parts and the standard CAFR actuarial disclosures are not designed to facilitate such re-estimation. It is possible that our MVL estimates might be off as much as 20% – not a trivial matter. The most uncertain part of our process is the estimation of the AAL/ABO relationships illustrated in Figures 1 and 2 and the selection of the number of years to retirement which we use to choose our conversion factor (Table 4). We are more confident about Adjustment 2 where we are less dependent on the behind-the-curtain actuarial machinery.

Despite our concerns over the reliability of our estimates, we believe that we are better prepared to attempt this analysis than are most financial analysts who look at public pension plan financials. Our actuarial training and years of experience performing actuarial valuations allow us to consider the dynamics of our estimation process in conjunction with the traditional actuarial methods. We recognize that an over- or under-estimate in one place will be partially offset elsewhere.

We have in recent months seen several studies that consider one part of the adjustment process (e.g., the accrual pattern) while ignoring another (the discount or inflation rate). Some studies simply accept numbers culled from CAFRs and report on summary statistics, concluding that public plans are well-funded.

Consider the conclusions that we and others might have reached in another era, say the early 1980's, when market discount and inflation rates were much higher than today but assumed actuarial rates were lower. In that era, studies that did not make all of the necessary adjustments might have concluded that public plans were generally poorly funded when, using market measures, many were much better funded than they are today.

Comparative statics (interest rate sensitivity)

Economists often look at partial derivatives of decision measures in order to assess the impact of small changes in the inputs used to compute those measures. Actuaries often do a similar analysis that they call sensitivity analysis. Interest rates are frequently the subject of such analyses.

The funding ratios measured using common actuarial methods and assumptions look very stable. In the extreme case – aggregate funding – the funding ratio is always 100%. Funding ratios measured at market can be quite volatile primarily because of asset/liability mismatches.

Despite our reservations about the accuracy of our estimates, we are quite confident that comparative statics done using our measures will be quite good. If, for example, TIPS rates change and we are looking at retiree liabilities for a fully indexed plan, our re-estimate of the retiree MVL: will be very consistent with our first estimate. We will get the sensitivity right.

MVΔAB

For the year ended June 30, 2006, employers participating in NYCERS and its employees contributed less than $1.4 bn to the plan. Because the plan's AAL is virtually identical to its AAV, no contributions are made with respect to unfunded past service costs and the entire $1.4 bn represents normal cost.

In the same fiscal year, we have estimated the MVΔAB to be $2.5 bn. This is the value of future benefits newly acquired by active employees and it represents the normal cost using the traditional unit credit actuarial cost method combined with market rates of discount. In fiscal 2006, therefore, NYC contributed substantially less to the plan than the new pension wealth acquired by its employees. As we measure it, approximately $1 bn in value received by today's employees will be paid by future taxpayers.

At June 30, 2006, the NYCERS plan MVA and MVL were $37.3 bn and $49.8 bn respectively, a market deficit of $12.5 bn. None of this deficit is recognized in the cost calculations under the traditional actuarial methods and all of it, plus interest, will have to be paid for by future taxpayers.

Future taxpayers will pay for the existing $12.5 bn shortfall including the newly added $1 bn either in cash or by taking uncompensated market risk (Gold, 2003).

V Conclusion

We have defined a market value of public pension plan liabilities which, in conjunction with the available market value of plan assets, has the potential to shine a light in an arena where principals (employees, taxpayers and lenders) do not have the necessary tools and information to make independent assessments. Precise measurement of the MVL and the MVΔAB can only be done by actuaries working with reliable plan data, appropriate computer software, and detailed descriptions of the benefits being earned. We call on plan actuaries to make these additional disclosures.

We have highlighted three important questions which can only be answered with a liability measure such as ours.

We have attempted to educe the market value of plan liabilities from available information for several plans. The information we used is prepared in the routine performance of plan actuarial valuations. Despite our actuarial and financial experience, we must concede that our estimates might be substantially different from the much more accurate calculations that could be easily computed by the actuaries who perform the regular plan valuations. To our knowledge, only the New York City plan actuary makes these computations and discloses the results.

We arbitrarily selected four plans and made two adjustments to convert the disclosed budget liability or AAL into an estimated MVL. The first adjustment (AAL→ABO) recognizes a change in the accrual pattern based on the same actuarial assumptions. At this point we note that the ABO liability is lower than the original AAL. The second adjustment (ABO→MVL) reflects a change in market observed discount and inflation rates. In today's market environment (ca. 2008, with market interest rates well below typical actuarial discount rates), this adjustment produces a lower market funded status (versus actuarial) for three plans.

Most public sector defined benefit plans report in accordance with GASB Standards 25 and 27 (GASB 1994a&b). A white paper, GASB (2006), discusses the distinction between accounting for private enterprises (where the emphasis is on financial valuation) and accounting for public sector activities (where the emphasis is accountability and the husbandry of scarce resources). Although this distinction is important and appropriate, we believe that the actuarial values disclosed in accordance with GASB 25 and 27 do not serve accountability as well as they would if they were to include the MVL and the MVΔAB. Because taxpayers owe and transfer these amounts to their employees, and because agents (elected officials, trustees, employee representatives) make decisions about these transfers, market-based information about the value of pension benefits is vital to sound governance and the very accountability that GASB endorses.

Advocates of status quo argue that the MVL is a concept that appears in private sector accounting (the ABO defined by FASB 87) because private plans can terminate whereas, they assert, public plans have an "infinite horizon."[25] This misses the more general

[25] Findlay (2008). But Revell (2008) reports the latest example of a governmental plan sponsor declaring bankruptcy – in this case citing unaffordable pension and health care costs for its employees. The seeming permanence of public plans is often cited as a reason to discount liabilities at rates reflecting expected returns on risky assets but Kohn (2008) asserts "The only appropriate way to calculate the present value of a very-low-risk liability is to use a very-low-risk discount rate."

economic importance of the MVL as a measure of wealth held by employees and owed by taxpayers. It is this property of the MVL that makes it appropriate to all defined benefit plans, to decision making about these plans, and to answering the three questions raised herein.

Similarly, status quo advocates contend that market-based calculations inject spurious volatility into funding ratios and plan costs. The volatility, however, is real. The cost of providing benefits when market interest rates are 4% is significantly greater than when rates are 12%. Market-based information is important input for those who wish to make fiscally responsible decisions.

In light of the importance of questions that can be answered only when MVL and MVΔAB are available to public pension plan decision makers, we call upon actuaries to compute and upon accountants, plan administrators and elected officials to disclose market values for public pension plan liabilities.

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