Revisiting Pension Actuarial Science:
A Five-Part Series

Part 5
Fair Value of the Liability – Consider the Measurement Purpose

James J. Rizzo, ASA, MAAA
Krzysztof M. Ostaszewski, Ph.D., FSA, CFA, CERA, MAAA
Piotr Krekora, PhD, ASA, MAAA

Abstract for the Series

The current financial model put forth as the market value of public sector pension benefit liabilities is simply the expected cash flows of the accumulated benefit obligation, as defined for current private sector financial reporting, discounted using a risk-free yield curve. This model is in serious need of an overhaul. It fails to faithfully represent the fair value of a currently accrued public sector pension benefit liability in three important ways:

1. Its use of the accumulated benefit obligation cash flows fails to accurately represent the terms of the employment contract which gives rise to the obligation being valued – a violation of labor economics principles.

2. Its use of expected cash flows as if they were fixed fails to recognize the risk premium load, which a fair exit price would include for the potential for adverse cash flow experience – a violation of actuarial finance and pricing principles.

3. Its use of risk-free discount rates fails to adequately reflect the observable and not-so-observable inputs from market participants' behavior – a violation of financial engineering principles.

Parts 1 through 3 in this series propose solutions to these three flaws.

Part 4, "The Residual Benefit Liability," presents an alternate approach to obtaining the fair value of the public sector employer's pension benefit liability. It approaches the task by modeling the real world operation of the pension fund, rather than approaching the task from the perspective of a theoretical construct. This alternate approach dares to model the long-term agency operation of the plan rather than ignoring it in favor of a pass-through approach. The current model ignores the effectiveness (even the existence) of the pension fund itself, while the alternate approach attempts to model the plan's operation in practice over time in order to determine the employer's residual asset or liability.

In spite of these three improvements and the alternate model, we believe the fair value of public sector post-employment benefit liabilities has little to no usefulness in most venues. There are legitimate roles which the market or fair value might play in valuing an individual member's personal wealth, a minor role in the context of certain discussions concerning risk measurement and risk management, and a major role in the context of plan terminations and freezes.

However, for purposes of advance funding, taxpayers, financial reporting, lenders and rating agencies, comparability, and the major part of risk measurement and analysis, the decision-usefulness of market or fair value is negligible, possibly even misleading. Other existing models and methods are far more suitable for these purposes, including conventional actuarial approaches and others that are less conventional or popular, but which should be considered in the actuarial toolbox and have higher decision utility.

Part 5 in this series, "Consider the Measurement Purpose," addresses various purposes for measuring a public sector pension liability and which measures have the most practical usefulness.

Series Outline

Introduction to the Series

A. Measurement Attribute Terminology
B. Improve the Current Model
C. Measure the Employer's Liability
D. Consider the Measurement Purpose

Part 1: Fair Value of the Liability – The Contractual Benefit Obligation

A. Benefit Contract Terms
B. Current Private Sector Treatments
C. Contractual Benefit Obligation (CBO) for Pensions
D. Case Study Plan
E. Contractual Benefit Obligation (CBO) for OPEBs

Part 2: Fair Value of the Liability – Risk-Adjusted CBO Cash Flows

A. Longevity Risks
B. Risk Premium for Error Around the Mean
C. Mortality Tables and Life Expectancy
D. Risk Premium for Error in the Mean
E. Risk Premium for Retirement Rate Risks
F. Summary of Risk-Adjusted Pension Cash Flows
G. Risk-Adjusted OPEB Cash Flows

Part 3: Fair Value of the Liability – A Market-Related Discount Rate

A. Modigliani-Miller Friction
B. Return to Fair Value Definitions
C. Single Premium Group Annuity Market
D. High Quality Corporate Bond Settlement Rates
E. Liquidity Risk
F. Low Percentile in Capital Asset Pricing Model
G. Possible Resolution

Part 4: Fair Value of the Liability – The Residual Benefit Liability

A. Modeling the Real World
B. Pension Fund is Not a Pass Through
C. Modeling Residual Assets and Liabilities

Part 5: Measuring the Liability – Consider the Measurement Purpose

A. Advance Funding
B. Taxpayers
C. Financial Reporting
D. Lenders and Rating Agencies
E. Comparability
F. Risk Measurement and Analysis
G. Personal Wealth
H. Plan Terminations and Freezes

Introduction

The usefulness of actuarial or other types of calculations must take into account their environment, purpose and objectives. Without these considerations, the calculations are useless at best and misleading at worst. In particular, the measurement of costs and liabilities associated with pension and other post-employment benefit programs must consider these three elements.

The Environment

The environment in which public sector employers operate is very different from that of private sector employers: constituency power, governance, transparency, federalism, perpetuity, mission, management, budgeting, purchasing, revenue, financial reporting, taxation, finance, regulation, bankruptcy, and many other factors contribute to this distinction. Quite simply, public sector employers are governments with their own constitutions and their own laws.

The Governmental Accounting Standards Board (GASB) issued a white paper: Why Governmental Accounting and Financial Reporting Is—and Should Be—Different. Certain corporate finance principles applicable in the private sector do, of course, also apply in the public sector environment. However, private sector corporate finance models must not be applied blindly in the public sector environment without careful scrutiny of the relevant environmental considerations.

It should be no surprise that the differences in these two employer environments extend to many aspects of the post-employment benefit plans that they sponsor.

Actuaries advising public sector plans and their sponsors (whether as employees or consultants) concerning pensions and other post-employment benefit programs must consider the environment in which the plan and sponsors function. Otherwise, they will find themselves (and their advice) irrelevant.

There are at least five characteristics of public sector employers and the post-employment benefit plans they sponsor, which are substantively different from private sector employers and their plans. These five environmental differences affect, in substantive ways, the proper choice of pension actuarial measurements.

1. *Perpetual existence.* Few public sector pension plans terminate (requiring plan settlements). Few public sector plans freeze benefits. Few public sector employers ever dissolve or merge with others (requiring plan settlements). Few public sector employers file for bankruptcy (requiring plan settlements). This experience is very different from private sector employers, where these events are relatively common.

2. *No stock value.* In the marketplace, when investors consider buying shares of a company, they want to know, “How much is it worth?” The public sector employer has no financial shareholders. No one is asking that question. It is not for sale and there is no meaningful venue for a discussion of the market price of

the public sector employer. Occasionally, the privatization of certain services raises the value proposition with respect to a specific unit within government. However, the fair value of a governmental entity itself is not a relevant issue.

3. *Unique funding and reporting*. Private sector employers have pension funding requirements imposed by the federal government, which are based upon the objective of achieving 100-percent funded status on a version of an accrued benefit settlement similar (although not identical) to market or fair value of the liability (IRC 430 and 436). Financial reporting standards applicable to private sector employers also impose actuarial calculations based upon another version of an accrued benefit settlement (FASB 87/132r/158). Neither of these is fully consistent with fair value as described in Parts 1 through 4 of this series. However, they are similar and close, numerically and conceptually, to a market or fair or settlement value.

   There are no such federal statutes or rules requiring that public sector pension plans be funded to any particular objective. State and local governments usually have their own funding requirements. In addition, public sector employers have their own GAAP financial reporting standards, which are designed to accommodate the unique characteristics of the public sector environment (GASB white paper).

4. *Budgets.* The budget process and decision-trees for an employer in the public sector is very different from the process and forces at work in the private sector. Public sector pension plans' funding requirements are generally designed to accommodate the employers' objectives for a funding budget that is level as a percent of pay. While seldom achieved exactly or completely, this funding pattern is a desirable objective for predictability and ensures that each generation of taxpayers is paying its fair share of an employee's deferred benefit cost.

   Private sector cash budgeting decisions are often driven by quarterly and annual financial reporting requirements and their effect on the company stock price and by volatile federal annual funding requirements, with less concern (although not entirely absent) for level percent of pay and intergenerational equity over the long term.

5. *Pension plan independence*. As outlined in some detail in Part 4, "Residual Benefit Liability," of this series, the public sector pension fund is very independent from the employer(s). The reader is encouraged to review the relevant sections of Part 4. Technically speaking, the private sector pension fund does have some independence. In law and practice, however, the public sector pension fund is far more independent from the employer than the private sector.

These five differences (among others) have profound effects on actuarial calculations if the intention is to be consistent with the environment. Many actuarial and economic concepts applicable to pensions in the private sector environment are rendered inapplicable in the public sector environment because of one or more of these five characteristics.

Concepts that are applicable in the private sector environment or of purely theoretical interest cannot be blindly ported over to the public sector environment.

The Purpose

There are various purposes for which pension values might be needed. Any time we make a calculation, it is important to ask, "What is the purpose?" In addition to the environment, the purpose of the calculation drives the methodology and assumptions employed. The methods and assumptions must result in useful and relevant numbers for the purpose at hand.

In this, Part 5 of the series, "Consider the Measurement Purpose," we will examine which measures of pension costs and liabilities are most appropriate in the public sector environment for various purposes, or venues of usefulness:

A. Advance funding
B. Taxpayers
C. Financial reporting
D. Lenders and rating agencies
E. Comparability
F. Risk measurement and analysis
G. Personal wealth
H. Plan terminations and freezes

The Objectives

Different objectives for a given environment and a given purpose also give rise to differences in calculations. As long as actuarial and intellectual integrity are maintained, alongside compliance with the Code of Professional Conduct and relevant Actuarial Standards of Practice, different objectives will legitimately influence actuarial calculations. We must consider the objectives.

Some declare that one size fits all; that there is only one true value of a pension obligation, namely, the market or fair value of the liability. However, in actuarial matters there is seldom one answer. Certainly, there cannot be one method for all environments and all purposes without regard to the objectives.

As we examine each of these purposes, giving full consideration to the environment and objectives, we will find that the market or fair value of public sector pension and OPEB liabilities have limited usefulness for most real life purposes, while other methods and assumptions are consistent with the public sector environment and satisfy common objectives for the purposes at hand.

Case Study Plan

The same case study plan utilized in Parts 1 through 4 of this series will be used here in Part 5, "Consider the Measurement Purpose" This section documents the plan provisions, valuation and asset information and methodology used.

Figure 19

Summary of Case Study Plan Provisions	
Normal (unreduced) Retirement Date (NRD) Eligibility	Age 60 with five years of service, or 30 years of service regardless of age. No DROP provisions.
Normal (unreduced) Retirement Date (NRD) Benefit	2 percent of final average pay; slightly different from the backloaded formula shown in Part 1.
Early (reduced) Retirement Eligibility	Age 50 with 15 years of service
Early (reduced) Retirement Reduction	3 percent for each year by which actual retirement precedes NRD
Vesting Eligibility	Five-year cliff vesting
Vesting Benefit	Accrued benefit payable at NRD, or a refund of contributions with interest
Nonduty Disability Eligibility	10 years of service
Nonduty Disability Benefit	The greater of accrued benefit or 25 percent of pay, payable immediately
Duty Disability Eligibility	From date of hire.
Duty Disability Benefit	The greater of accrued benefit or 42 percent of pay, payable immediately.
Nonduty Death Eligibility	10 years of service
Nonduty Death Benefit	Accrued benefit payable immediately to beneficiary.
Duty Death Eligibility	From date of hire.
Duty Death Benefit	The greater of accrued benefit or 50 percent of pay, payable immediately to beneficiary
Cost of Living Increase	Increase in Consumer Price Index, not to exceed 3 percent per year
Member Contributions	8.5 percent of pensionable pay

Figure 20

Summary of Relevant Valuation Information	
For Market Value of Liability Measures	
Discount Rate	The single discount rate equivalent to the Treasury STRIPS yield curve assumed to be observed on the valuation dates.
Mortality Table	RP2000 combined healthy table, with generational projections using Scale AA.
Retirement Rates	24 percent at age 50, then, 7 percent, 7 percent, 7 percent, 11 percent, 11 percent, 11 percent, 11 percent, 8 percent, 8 percent, then 60 percent at age 60, then 30 percent for each year through age 69, then 100 percent at age 70; also 100 percent at 35 years of service regardless of age
Benefits Valued	The accumulated benefit obligation (ABO; per FASB Statement No. 87) cash flows
For Fair Value of Liability Measures	
Discount Rate	The single discount rate equivalent to the CitiGroup Pension Discount Curve assumed to be observed on the valuation dates.
Mortality Table	RP2000 combined healthy table (with loads as per Part 2 of this series), with generational projections using Scale AA (with loads as per Part 2 of this series).
Retirement Rates	Risk-free rates; most valuable retirement age.
Benefits Valued	The risk-adjusted contractual benefit Obligation (R-A CBO; per Parts 1 and 2 of this series) cash flows
For Entry Age Normal Liability Measures	
Discount Rate	7.6 percent, long-term (50^{th} percentile) return expected on a balanced portfolio
Mortality Table	RP2000 combined healthy table, with generational projections using Scale AA.
Retirement Rates	24 percent at age 50, then, 7 percent, 7 percent, 7 percent, 11 percent, 11 percent, 11 percent, 11 percent, 8 percent, 8 percent, then 60 percent at age 60, then 30 percent for each year through age 69, then 100 percent at age 70; also 100 percent at 35 years of service regardless of age
Benefits Valued	Projected benefits expected at time of decrement, including salary increases
Common to All Three Liability Measures	
Turnover and Disability Rates	Based on a recent experience study
Price Inflation	3.0 percent per year compounded annually
Salary Increases	Service-based, from 14 percent to 4 percent annual increases
Pension Fund Annual Rate of Investment Return	7.6 percent each year.

Figure 21

Summary of Relevant Asset Information	
Asset Valuation Method for MVL and FVL	Market value of assets
Market Value of Plan Assets at 12/31/2008	$ 380,717,255
Actuarial Value of Assets for EAN at 12/31/08	$ 456,860,706
Asset Valuation Method for EAN	Five-year straight-line recognition of difference between actual and expected asset value, with a corridor of 20 percent around market value.

Valuation results presented herein are serial open group forecast valuations performed as of each future annual valuation date, i.e., each January 1 in the future.

These open group forecast valuations assume that the size of the active workforce in each future year is the same as the size on January 1, 2009, (with new hires replacing those exiting the group). The valuation horizon for our open group forecast valuations is 35 years. In other words, open group forecast valuations were produced for each of the next 35 years. This process takes a peek into the next 35 years of valuations, utilizing three different measures of the pension liability under study: the current so-called market value of liability model, the fair value of the liability as described in Parts 1 through 3 of this series, and the entry age normal liability method.

The market value of liability (MVL) method is basically the traditional (unprojected) unit credit cost method, using a different discount rate every year in each of the future forecasted valuations as described in the table above. The fair value of liability (FVL) method is a variation of the traditional unit credit cost method as outlined in Parts 1 through 3 of this series with risk-adjusted CBO cash flows discounted using a different discount rate every year in each of the future forecasted valuations as described in the table above and with ancillary benefits (death and disability) funded using one-year term costs. The entry age normal (EAN) liability method is the conventional method most commonly employed in public sector pension valuations, using a fixed discount rate every year in each of the future forecasted valuations as described in the table above.

Each set of 35 forecasted future valuations for each of the three methods use projected rates of investment return for the next 35 years to model the pension fund's growth.

Since the MVL and FVL methods vary their valuation discount rates every year in the future, the open group forecast valuations for these methods use projected yield curves and their single equivalent discount rates for each of the next 35 years. The EAN method uses a single actuarial valuation discount rate assumption of 7.6 percent per annum.

In our open group forecast valuations, we examine the next 35 years of forecasted employer contribution rates, unfunded actuarial accrued liabilities, and funded ratios, all under

the three different measures of the pension liability for our case study plan. The intent is to compare the three methods to assess which methods are most appropriate for the environment, purpose and objectives at hand.

Forecast valuations can be deterministic or stochastic. Deterministic open group forecast valuations assume a given set of assumptions used in each successive valuation, producing a single set of future results for each future year's valuation (35 in our case). Stochastic valuations provide much useful information about risk and the future. However, for our case study plan, we will present only the results of a deterministic valuation.

One form of deterministic forecasting is similar to back-testing, except in reverse. We assume the next 35 years will turn out the same as the last 35. We chose 35 years because it is long enough to include several business cycles, long enough to include the run up and down in spot yield curves, and the commencement point of the last 35 years (1974) is similar to 2009 in that it followed a year of significant stock market losses and was a loss year itself. Of course we are all hoping that 2009 is not another loss year.

The MVL and FVL measurement methods use spot yields observed as of each valuation date (actually the day before) to discount their respective cash flows. In our deterministic forecast valuations using these two methods, we assume the spot yield curves observed as of each future January 1 (beginning Jan. 1, 2010), are the same as those observed or estimated as of each prior January 1 (beginning Jan. 1, 1975).

For the MVL method, the risk-free spot yield curves for each of the prior 35 years (Dec. 31, 1974, through Dec. 31, 2008) were derived based on the actual Treasury STRIPS yield curves for each Dec. 31 from Dec. 31, 1989, through Dec. 31, 2008, obtained from Ryan Labs, Inc. Years 1989 through 2008 were used without change. For years from 1974 through 1988, spot yields for each maturity were approximated by adjusting and interpolating the Treasury Constant Maturity Yields for such years based on the relationship between such Yields and the Treasury STRIPS Yields for the years 1989 through 2008.

Equivalent single discount rates were obtained on the basis of the expected ABO benefit cash flow of the case study plan from the Jan. 1, 2009 valuation. The same 95-year cash flow was used to obtain the equivalent single discount rate for each year's risk-free spot yield curve. Thus, the same duration and convexity were used to derive the equivalent single discount rate for each year's curve. Risk-free spot yields for maturities above 30 were assumed to be the same as the 30-year risk-free spot yield. Equivalent single discount rates assumed for the Jan. 1, 2010 and 2011 valuations (4.00 percent and 5.50 percent) were revised from the original rates for Dec. 31, 1974, and 1975 (7.84 percent and 8.06 percent), respectively, in order to make for a better expected and autocorrelated fit with Dec. 31, 2008 (2.82 percent).

For the FVL method, the high-quality corporate spot yield curves for each of the prior 14 years (Dec. 31, 1995, through Dec. 31, 2008) were equated to the pension discount curves for those same years obtained from CitiGroup.

For Dec. 31, 2008, back to Dec. 31, 1995, equivalent single discount rates were obtained on the basis of the risk-adjusted CBO benefit cash flow of the case study plan from the Jan. 1, 2009, valuation. Again, the same 95-year cash flow was used to obtain the equivalent single discount rate for each year's high-quality corporate spot yield curve. For 1994 back to 1974, the equivalent single discount rate for FVL purposes was assumed to be approximately 109 basis points higher than the risk-free equivalent single discount rates for those years. This spread was based on observed average spreads between the equivalent single discount rates matching the actual Treasury STRIPS yield curve and the single rates matching the CitiGroup pension discount curve for their common years. High-quality corporate spot yields for maturities above 30 were assumed to be the same as the 30-year high-quality corporate spot yield. Rates assumed for the Jan. 1, 2010, and 2011 valuations (7.00 percent and 7.50 percent) were revised from the original rates for Dec. 31, 1974, and 1975 (9.00 percent and 9.18 percent), respectively, in order to make for a better expected and autocorrelated fit with Dec. 31, 2008 (6.07 percent).

While these two forecast valuations (for MVL and FVL) utilize only one possible outcome for yield curves for the future, they are indeed real outcomes which actually did occur during the last 35 years. So they are not just theoretical and hypothetical and are certainly unbiased.

Figure 22

Basic Economic Assumptions used in the Deterministic Forecast (MVL)								
Observed On December 31	Risk-free Spot Yields On Selected Maturities (%)						Equivalent Single Discount Rate (%)	Assumed Applicable To January 1 Valuation Dates
	1	3	5	10	20	30		
2008	0.27	0.66	1.66	2.99	3.19	2.62	2.83	2009
1974	7.43	7.45	7.48	7.81	8.26	8.05	4.00	2010
1975	6.23	7.21	7.62	8.19	8.37	8.00	5.50	2011
1976	4.91	5.79	6.23	7.19	7.47	7.09	7.08	2012
1977	7.05	7.47	7.67	8.21	8.31	7.94	8.08	2013
1978	10.68	9.74	9.47	9.65	9.36	8.86	9.38	2014
1979	11.82	10.78	10.55	10.90	10.58	10.00	10.61	2015
1980	14.01	13.05	12.80	13.11	12.59	11.85	12.76	2016
1981	13.49	14.20	14.20	14.75	14.62	13.50	14.42	2017
1982	8.77	9.89	10.26	10.93	11.06	10.31	10.70	2018
1983	10.19	11.30	11.76	12.47	12.47	11.74	12.19	2019
1984	9.32	10.68	11.26	12.19	12.18	11.41	11.87	2020
1985	7.68	8.35	8.63	9.50	9.89	9.17	9.37	2021
1986	6.01	6.66	6.92	7.63	7.69	7.41	7.50	2022
1987	7.18	8.16	8.47	9.32	9.32	8.85	9.09	2023
1988	9.12	9.32	9.27	9.22	9.22	8.90	9.15	2024
1989	7.91	7.94	7.89	8.12	8.04	7.65	7.99	2025
1990	7.03	7.55	7.89	8.39	8.51	7.48	8.12	2026
1991	4.28	5.37	6.24	7.29	7.89	7.32	7.47	2027
1992	3.89	5.04	6.25	7.23	7.89	7.15	7.38	2028
1993	3.79	5.30	5.32	6.17	6.96	6.99	6.75	2029
1994	7.06	5.57	7.82	7.95	8.11	6.82	7.55	2030
1995	6.39	5.83	5.40	5.77	6.28	6.66	6.34	2031
1996	5.68	6.09	6.18	6.56	6.90	6.46	6.68	2032
1997	5.59	5.67	5.72	5.91	6.08	5.98	6.00	2033
1998	4.57	4.68	4.68	5.05	5.63	5.44	5.40	2034
1999	6.08	6.40	6.58	6.81	6.87	6.61	6.72	2035
2000	4.91	5.04	5.08	5.34	5.75	5.08	5.45	2036
2001	2.28	3.87	4.60	5.58	6.04	5.25	5.62	2037
2002	1.04	2.12	2.94	4.33	5.34	5.14	4.95	2038
2003	1.22	2.51	3.40	4.62	5.55	5.30	5.16	2039
2004	2.73	3.21	3.71	4.50	5.15	5.04	4.91	2040
2005	4.28	4.35	4.35	4.53	4.68	4.56	4.59	2041
2006	5.01	4.71	4.24	4.80	4.95	4.76	4.84	2042
2007	3.22	3.12	3.45	4.30	4.66	4.46	4.47	2043
2008	0.27	0.66	1.66	2.99	3.19	2.62	2.83	2044

Figure 23

Basic Economic Assumptions used in the Deterministic Forecast (FVL)								
Observed On	High-Quality Corporate Spot Yields On Selected Maturities (%)						Equivalent Single Discount	Assumed Applicable To January 1
December 31	1	3	5	10	20	30	Rate (%)	Valuation Dates
2008	4.90	5.36	5.42	6.37	7.22	5.03	6.07	2009
1974							7.00	2010
1975							7.50	2011
1976							8.18	2012
1977							9.17	2013
1978							10.50	2014
1979							11.72	2015
1980							13.88	2016
1981							15.51	2017
1982							11.78	2018
1983							13.27	2019
1984							12.94	2020
1985							10.44	2021
1986							8.59	2022
1987							10.17	2023
1988							10.26	2024
1989							9.09	2025
1990							9.21	2026
1991							8.53	2027
1992							8.44	2028
1993							7.82	2029
1994							8.63	2030
1995	5.62	5.71	5.94	6.35	7.07	6.79	6.71	2031
1996	5.99	6.49	6.74	7.16	7.65	7.64	7.43	2032
1997	6.10	6.21	6.32	6.60	6.86	6.82	6.75	2033
1998	5.44	5.50	5.60	5.87	6.69	6.81	6.46	2034
1999	6.90	7.16	7.39	7.77	8.06	8.11	7.93	2035
2000	6.59	6.01	6.25	6.79	7.40	7.44	7.18	2036
2001	2.70	4.59	5.58	6.71	7.09	6.97	6.85	2037
2002	1.77	2.67	3.58	5.15	6.31	6.48	5.88	2038
2003	1.63	2.84	3.89	5.17	6.41	6.29	5.86	2039
2004	3.09	3.64	4.12	4.94	5.98	5.86	5.58	2040
2005	4.89	4.88	4.97	5.12	5.69	5.65	5.50	2041
2006	5.46	5.19	5.28	5.53	5.99	6.01	5.85	2042
2007	4.81	4.68	5.26	6.02	6.64	6.65	6.41	2043
2008	4.90	5.36	5.42	6.37	7.22	5.03	6.07	2044

The MVL, FVL and EAN methods were applied to our case study plan in open group deterministic forecast valuations over the next 35 years, using the assumptions and methods described above.

One area lacking in the literature on MVL is how its proponents might suggest accounting and funding treatments for the initial unfunded liability and for the annual actuarial gains and losses. MVL argues that the value of the benefit accruing for each individual for the year should be expensed and funded in that very same year (or the next year at the latest) in order to achieve a pure and true matching of the value received (services) from the employee and the value expensed/paid by the employer.

This implies that the entire amount of each year's actuarial gains or losses should be recognized along with the normal cost, all in one year, essentially a one-year amortization of gains and losses.

Actuarial gains and losses arise from three broad sources. All three methods have demographic and asset sources. Another source of gains and losses unique to MVL and FVL arise from each year's change in the valuation discount rate required by these two methods. To make matters worse, MVL and FVL also argue for the use of the market value of assets, with no smoothing, to determine the amount of the unfunded liability. EAN methods typically smooth the assets and amortize any actuarial gains or losses over time (often 30 years).

In our comparison of forecasted results under the three methods, we assume the emerging demographic and asset experience over time matches the assumptions exactly. There are no actuarial gains or losses arising from those two sources under any of the three methods. The purpose of this is to isolate the qualities of MVL and FVL that differentiate them from EAN. All three are treated the same with respect to those two sources of gain and loss. Thus, there is no bias in this comparison. When it is shown that MVL and FVL are unsuitable, it will not be on account of a bias in the comparison; it will be on account of the inherent nature of MVL and FVL themselves.

If we were to build a one year amortization of each year's gain or loss arising from the annual change in valuation discount rates for MVL and FVL into our comparison (as their proponents advocate), it would make MVL and FVL look even worse. That would be the most unbiased of comparisons.

However, we will give the MVL and FVL methods a handicap in the comparison. We will build into the annual employer contribution rate calculation a 30-year amortization of MVL and FVL's gain or loss arising from the annual change in valuation discount rate. This is, essentially, putting our thumb on the scale to help MVL and FVL in the comparison of their resulting contribution rates to EAN's rates. Furthermore, we will also amortize the initial, unfunded liability of all three methods over 30 years. These amortizations will all be calculated as a level percent of pay (a 4-percent payroll growth rate is assumed), as is permitted under GAAP standards for public sector pension and OPEB accounting.

With all these preliminaries and valuation details out of the way, the following are various purposes for which actuarial calculations are required for public sector pension liabilities.

A. Advance Funding

Advance funding is mostly about budgeting and intergenerational equity. Indeed, there are a host of other serious funding implications such as sustainability, collective bargaining, moral hazard, accountability, taxation, bond ratings, benefit security, etc. Still, the two important and rudimentary considerations for advance funding are budgeting and intergenerational equity. We will address these two considerations in this section.

Budgeting

Budgeting is among the most important activities undertaken by governments. The National Advisory Council on State and Local Budgeting[1] states that a good budget process incorporates a long-term perspective and that "the budget process is not simply an exercise in balancing revenues and expenditures one year at a time, but is strategic in nature, encompassing a multi- year financial and operating plan that allocates resources on the basis of identified goals." This perspective on public sector budgeting derives from the perpetual existence of state and local governments. This long-term perspective is particularly important in the public sector environment.

Predictability is an ever-present objective in budgeting. Funding with the intent of achieving a level percent of pay contribution rate is a worthy, even necessary, objective for budgeting and sustainability. Given the nature of a defined benefit promise with its actuarial gain and losses, it is not possible to actually achieve truly level percents of pay over time. However, the methods and assumptions should be designed to achieve that goal.

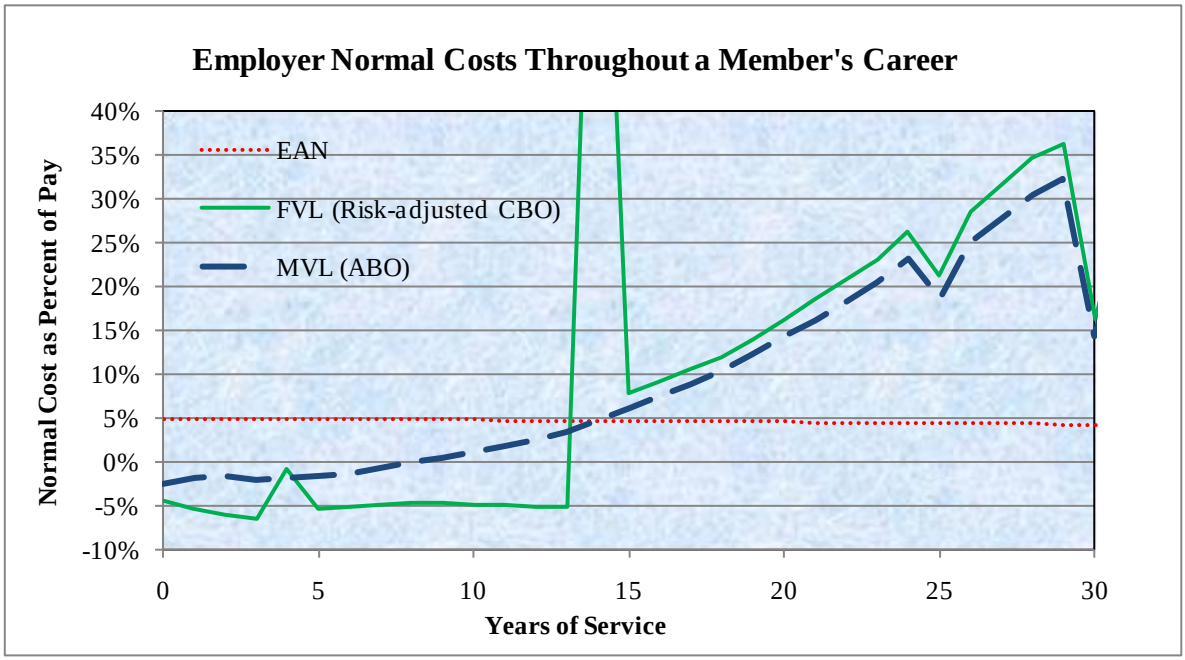
Government budget directors are used to operating under a level percent of pay for all pay-related benefits and taxes, including retirement, unemployment taxes, workers compensation, and Social Security. Even Medicare contributions are designed to be level as a percent of pay, in spite of the fact that its benefits are not pay-related. Defined contribution plans with a flat percent of pay or matching contribution are also designed with contributions that are level as a percent of pay.

From the perspective of an individual employee, the EAN method does a better job of allocating costs that are level as a percentage of pay than does the MVL or the FVL methods. The EAN cost method and several other conventional cost methods (including frozen entry age normal and aggregate) are specifically designed to allocate costs as a level percent of pay over time.

[1] Recommended Budget Practices, published by the Government Finance Officers Association.

The figure below presents the EAN, FVL and MVL normal costs, as forecasted throughout an individual employee's career (from age 25 to retirement at age 55) and expressed as a percent of pay. In order not to obscure the focus of this graph, normal costs for all three methods were calculated based on an interest discount rate assumption of 7.6 percent. These are kept constant over time to remove the white noise of the discount rate volatility inherent in MVL and FVL.

Figure 24



It is interesting to note that under the MVL and FVL, the employer's normal costs in the first several years of the employee's career are zero (less than zero actually). This occurs because the employee's contribution to the plan is level as a percent of pay, but the total normal cost under MVL and FVL are not. This creates a mismatch, resulting in negative normal cost for the employer. This is, in itself, an undesirable feature of MVL and FVL. For an employee's own personal budget, it is a desirable objective to have pension contributions that are level as a percent of pay. So it is with the public sector employer's budget as well.

The most obvious message of this graph is that the EAN method produces an employer-normal cost, which is level percent of pay for an individual, while MVL and FVL have grossly backloaded normal cost patterns.

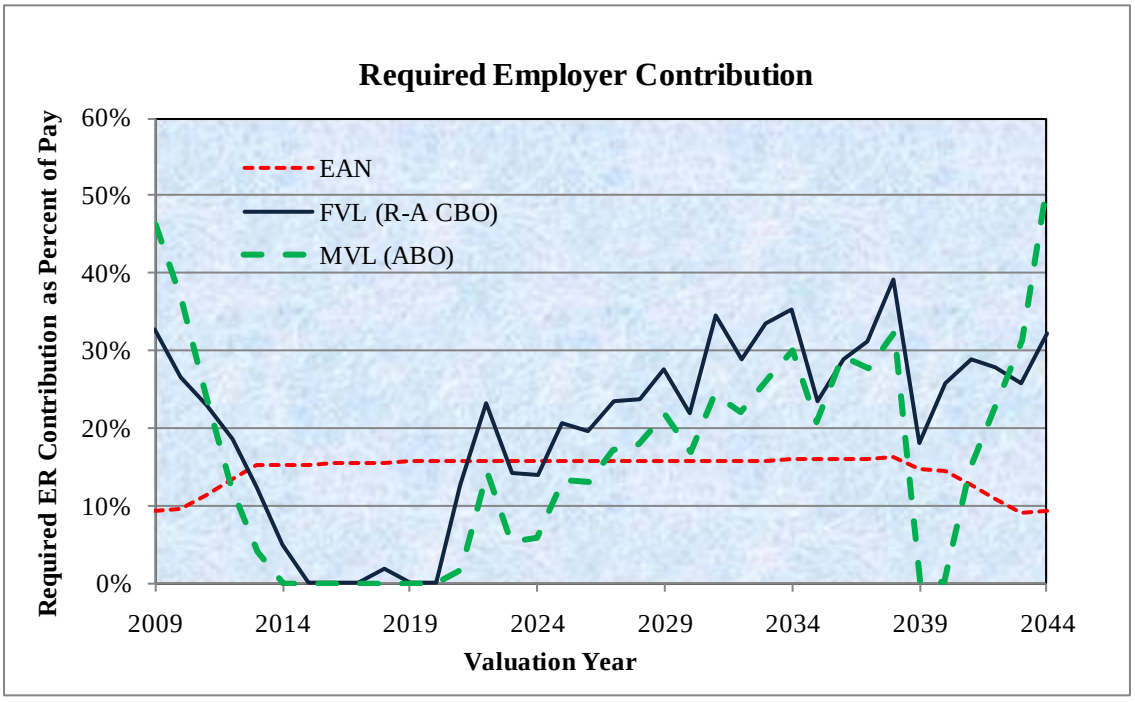
This failure of MVL and FVL to produce employer-normal costs that are level percents of pay for individuals arises from the very nature of the traditional unit credit cost method, upon which both MVL and FVL are based. EAN produces employer normal costs that are *designed* to be level as a percent of pay for the individual employee.

From the perspective of the *group*, the disparity is equally wide. MVL and FVL insist on valuing the benefits using a different discount rate every year, depending on the fixed income

yields in the market at each measurement/valuation date. This creates employer-normal costs and contribution rates which are volatile, unpredictable and certainly not level as a percent of pay.

To illustrate the combined effect of these two features of MVL and FVL, while comparing them with EAN, we performed an open group forecast valuation in accordance with the assumptions and methods described previously.

Figure 25[2]



If you were the budget director of a state or local government entity, which cost method would you prefer? Imagine how much more volatile the MVL and FVL graph would look if we required one year amortization of actuarial gains and losses, like MVL advocates say should be done.

These two features of MVL and FVL (backloaded traditional unit credit cost method and volatile valuation discount rates) disqualify MVL and FVL from serving the budgeting and funding purposes of public sector pension funds. They fail to satisfy the basic budgeting and funding objective of a level percent of pay.

Certainly, the EAN method is demonstrated herein to be superior in satisfying the budgeting and funding objective of a level percent of pay, on an individual basis and on a group

[2] The required employer contributions under EAN are expected to rise over the next few years because of some legacy losses from prior years working their way through the asset-smoothing method. These actuarial losses are amortized over 30 years each. Toward the end of the forecast, the required employer contributions drop back down after each 30-year amortization base is paid off.

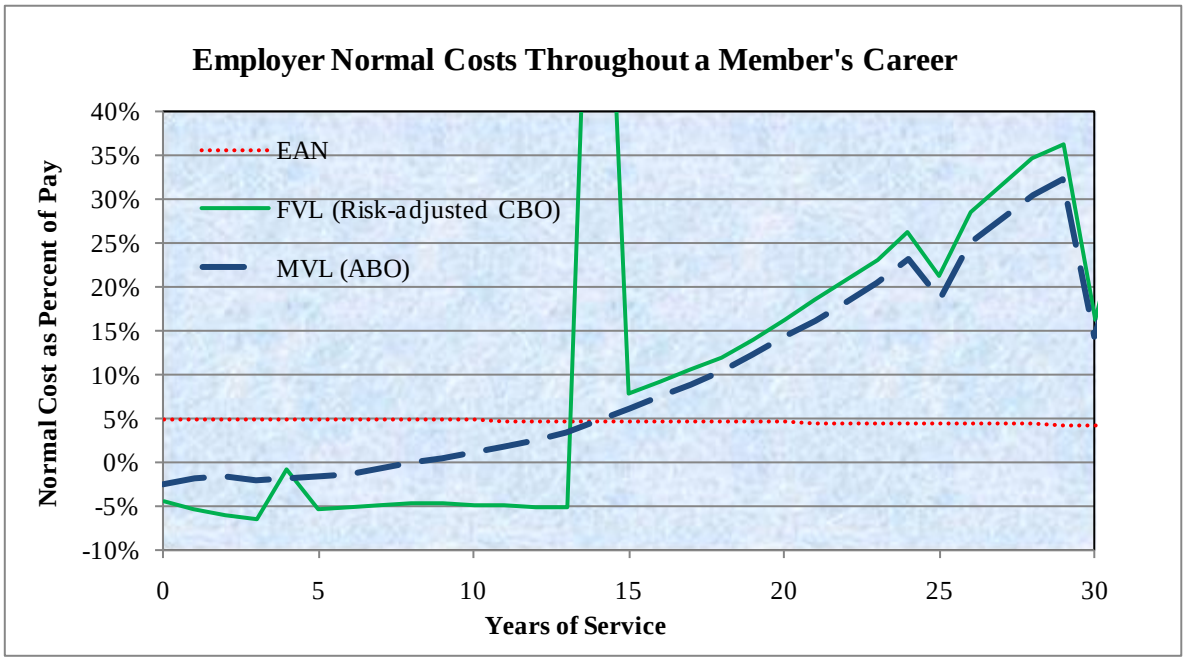
basis. Other conventional actuarial cost methods also satisfy this objective, e.g., the aggregate cost method and frozen entry age normal cost method.

Intergenerational Equity

A level percent of pay EAN approach does a better job of approaching intergenerational equity than do MVL or FVL, particularly for final pay plans. No method will ever produce complete intergenerational equity exactly for any defined benefit pension plan. But the EAN method produces closer results.

Let us return to the graph presented earlier in this section, illustrating the pattern of an individual's employer normal cost over his career. Again, the discount rates for these employer normal cost patterns are kept constant over time (7.6 percent). This focuses our attention on the nature of the unit credit cost method and how it fails to approximate intergenerational equity.

Figure 26 (same as Figure 24)



Under MVL and FVL the taxpayers served by this employee during his last 10 years of employment pay far more than the taxpayers in his first 10 years, for essentially the same 20 percent of final pay of benefits earned. Taxpayers at the end of his career should not be required to finance such a disproportionate amount of his pension as compared to taxpayers at the beginning of his career.

This graph demonstrates that the MVL and FVL methods (based upon variants of the traditional unit credit normal cost method), by their very nature, have a backloaded valuation pattern which saddles later taxpayers with a disproportionate share of the cost of services rendered. Again, the same level percent of pay objective for budgeting also serves to approximate intergenerational equity.

To conclude the matter of funding, while MVL and FVL may be of theoretical interest to some, they are poor candidates for real life funding purposes as compared to EAN or other such conventional methods designed to produce employer contribution rates which are level as a percent of pay.

B. Taxpayers

Taxpayers' interests include services provided and the costs thereof (taxes and user fees paid). Almost all of us are taxpayers, of one sort or another. A variety of state and local taxes accumulate to significant amounts paid out of our personal budgets (directly and indirectly).

While the cost of services does not always equal the taxes collected, there is a strong connection between the two. Thus, taxpayers have a keen interest in how government officials spend the taxes they collect. In other words, the cost of services is important to taxpayers. This obvious point is relevant to our discussion of what measure of pension benefit liability is appropriate for taxpayers' interests.

Price vs. Cost

MVL and FVL do not measure actual long-term costs to the taxpayers, or actual short-term costs for that matter. However, they do attempt to include in their calculations the "cost of investment risk." The market or fair value of a pension liability is about point-in-time pricing, not about the long-term costs collected from taxpayers to finance the long-term pension promise.

Under MVL and FVL the value of the pension benefit liability is measured on the basis of what the market price would be to discharge or settle the pension benefit liability, which had been accrued or earned by the employees (and retirees) as of a given measurement date. Never mind that there is no actual intention of settling the liability in the marketplace. Never mind that there is no marketplace in which to settle the pension liability. An MVL or FVL is a theoretical construct to calculate a reasonable price at which the employer *could* settle the liability *if* it wanted to and *if* there were a marketplace for settlements. As discussed in the introduction to this series, this is a fair-value measurement attribute.

The feature that makes MVL and FVL focus on *price* rather than *cost* is their insistence on discounting the future benefit cash flow using risk-free or market-related yield curves as observed in the market on the measurement date.

This method for selecting the discount rate(s) bears little to no relationship to what taxpayers of the future will actually have to pay for financing the pension promise. On any given measurement date, the values of the MVL and FVL are not affected by whether the pension or OPEB promise is unfunded or advance-funded. Their values are not affected by how the pension fund is invested.

If a pension fund were invested entirely in 90-day Treasuries for the entirety of its existence, its MVL and FVL as of every measurement date throughout that existence would not be any different than if it were invested in a balanced portfolio with 60 percent in equities and 40

percent in intermediate bonds. MVL and FVL values are unaffected by such matters. They "price" the liability (i.e., discount their respective cash flows) based on the fixed income yield curve observed in the marketplace on each measurement date, regardless of actual or expected long-term costs to the taxpayers. However, there is not much dispute that a plan invested entirely in 90-day Treasuries will cost the taxpayers more over the long term than if it were invested in a 60-40 balanced portfolio (at least matching the index performances).

MVL and FVL treat the pension fund as if it were a mere pass-through, completely ignoring the investment policy and operation of the fund. Again, MVL and FVL are pricing the settlement value (or something similar) as a market value or fair value price.

Taxpayers are more practical than that. Taxpayers are seldom interested in the prior year's government-wide financial statements, although many would argue they should be. More often, those taxpayers who take any interest at all are more interested in last year's government funds financial statement and in the next year's budget because those relate to costs. And costs drive taxes.

Past and Future Costs

Taxpayers are interested in knowing how their elected officials and management spent their taxes in the past, i.e., what it actually cost to provide last year's services. This is generally found in the governmental funds financial statement. In addition, taxpayers are interested in knowing how their elected officials and management intend to spend future taxes, i.e., how much services will cost in the future. This is generally found in the budget.

Taxpayers are practical. Among other matters relating to the government's pension plan (such as comparability), they want to know how much the government pension plan will cost them over time, i.e., how much in taxes they will have to pay over time to finance the pension promise. If there is no talk of settling the pension liability, it is of little to no interest to them what the market or fair value price would be. Serious consideration of settling the liability, however, would make the dialogue move from a theoretical price to a real cost.

The actual amount taxpayers will pay in pension costs (through taxes) over time depends in large part on how much investment return is generated over time. Pension promises are being advance-funded for a few reasons. A major one is that it costs taxpayers less over the long term than if the promise were satisfied by mere pay-as-you-go. The investment return helps pay the promised benefits, instead of the taxpayers footing the entire bill.

Any measure of the liability that would be useful to taxpayers would recognize the long-term cost expected to be borne by them. A market or fair value *price* in today's market might have some curiosity interest, but is not something that would interest taxpayers.

If a current *benefit* liability were to be of interest to taxpayers, it would be one that tells the expected long-term *cost* in a present value. This can be accomplished by discounting the expected CBO cash flow using the average annual rate of return expected from the pension fund.

It would represent the expected future cost of benefits earned to date in present value form. However, the government will not be paying the benefits. The pension fund will be paying them.

An expression of the *funding* liability may speak more about the future cost paid by taxpayers. The taxes paid to the government for the next 20 years will provide the government with the resources needed to pay its cash *funding* obligation to the pension fund for the next 20 years. The taxes paid to the government over the next 20 years will not be used to pay the pension *benefits* over the next 20 years. With rare exceptions, the employer's pension contribution cash flow (not benefits paid cash flow) is financed by taxes collected. MVL and FVL are poor representations of the cost to taxpayers.

The EAN's unfunded actuarial accrued liability (UAAL) is a good measure of the *funding* liability scheduled for payoff over time, with taxes collected. Whichever actuarial cost method is selected by the plan and agreed upon by the employer is an appropriate basis for measuring the cost to taxpayers. After all, with respect to the transaction between the employer and the plan, the restructured debt owed by the employer to the plan (converted from the initial debt owed by the employer to the member) represents the true basis on which the employer will need to go to the taxpayers to fund the contributions demands made upon it by the plan. MVL and FVL have never been used by the plan to require contributions from the employer (and therefore taxes from taxpayers).

While a homeowner might have some interest in the market price of his house (an asset), he has little to no interest in the market value of his mortgage (a liability). He is interested in the long-term *cost*, not the current market *price* of the liability. The outstanding balance and the scheduled amortization payments are real costs to the homeowner.

This discussion of taxpayers' interests is framed mostly for sole and agent government employers (as defined by GASB standards) and those who pay taxes to them. Treatment of this topic in the context of cost-sharing employers and their taxpayers would be slightly different due to the pooling nature of cost-sharing plans. The pension costs paid by cost-sharing employers cannot be traced directly back to their own employees and retirees for the services they rendered to that cost-sharing employer.

C. Financial Reporting

Not a Pass-Through

Cash with a fiscal agent and other such constructs are properly treated as pass-through, even if they are held as trusts for specific purposes and even if they are irrevocable. However, pension funds are different. We spent a good amount of time in Part 4 of this series, "The Residual Benefit Liability," demonstrating that the public sector pension fund is a separate legal entity and sufficiently independent to be treated as such in financial reporting. The reader is directed to Part 4 to review the case made for not treating the public sector pension fund as a mere pass-through. While the arguments were presented Part 4 in the context of legal purposes and financial pricing purposes, they are equally applicable for the purpose of financial reporting.

As rare an event as it may be, when a government files for bankruptcy under Chapter 9, the pension fund that had assumed all responsibilities for paying pension benefits for the government's employees and retirees continues to operate without itself filing for bankruptcy. The pension fund is usually far more solvent than its creator. While the government's employees and retirees may earn status as a creditor in the process, pension assets remain the property of the pension trust, separate from the employer.

Objectives

GASB's Concepts Statement 1, *Objectives of Financial Reporting*, identifies accountability, decision usefulness and interperiod equity as worthy objectives. The standards-setters for governmental GAAP will judge what measures of pension liabilities are most appropriate for the purposes of governmental financial statements—not actuaries. Nevertheless, we offer our opinions and judgment.

Accountability. The expense, liability and other pension information reported in the basic financial statements and in the notes and RSI of governmental employers should be measured and presented in a manner that holds elected officials and management accountable for their funding of this long-term obligation. The pension information provided in the government's financial statements should serve as a benchmark for performance with respect to funding. How people are measured often determines their behavior. Pension fund management and government management will be held accountable for their pension funding in large part based upon the funded ratios presented in the respective plan's and government's financial statements.

Having wide movement in funded ratios and contribution requirements caused by MVL and FVL is a poor benchmark for performance. If management were held accountable for its performance based on an MVL or FVL benchmark, they might well take serious and irrevocable actions based on volatile and temporary swings in liability measures, in asset measures, in funded ratios and in resulting expense numbers. Such a benchmark for the public sector could realistically result in benefit improvements while funded ratios are temporarily high and contributions low, or result in mass plan terminations or freezes while funded ratios are temporarily low and contributions high -- just like we have seen in the private sector.

The EAN or other actuarial cost method with asset smoothing serves the accountability objective more reasonably. The following figure compares the unfunded actuarial accrued liabilities of the EAN, MVL and FVL for our open group forecast valuations for the next 35 years. The succeeding graph compares the funded ratios. Keep in mind that these two graphs did not even introduce any volatility in asset returns; both assumed a constant 7.6-percent investment return each year. Even holding that variable constant in all three methods, the volatility of MVL and FVL make them poor benchmarks for accountability.

Figure 27

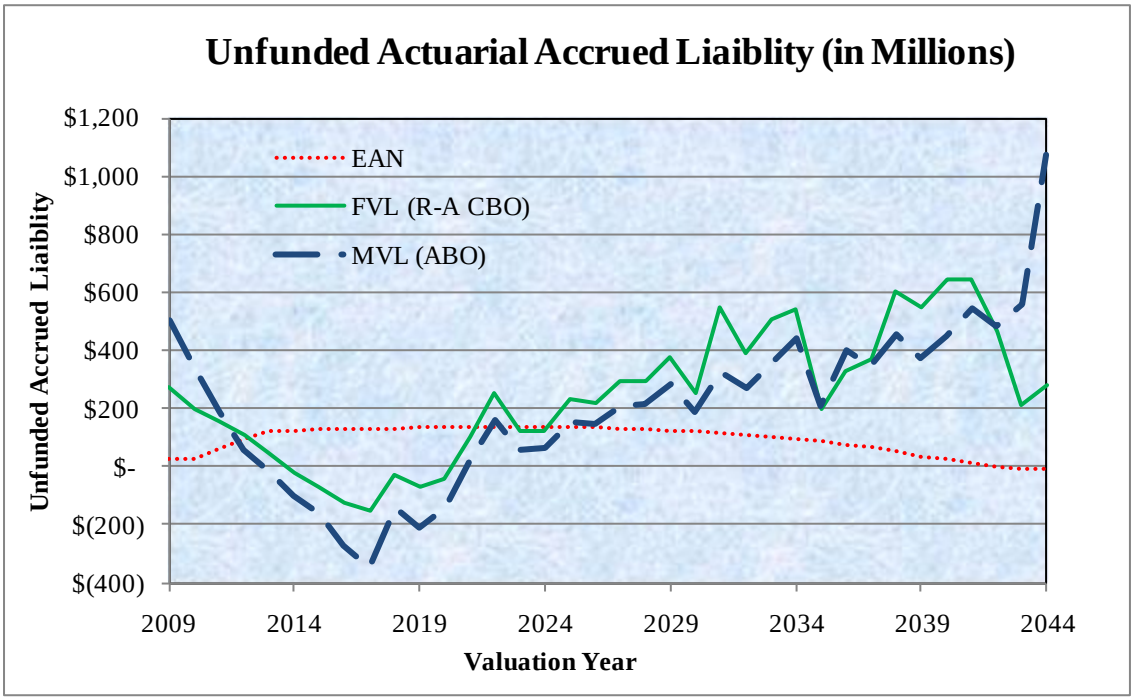


Figure 28

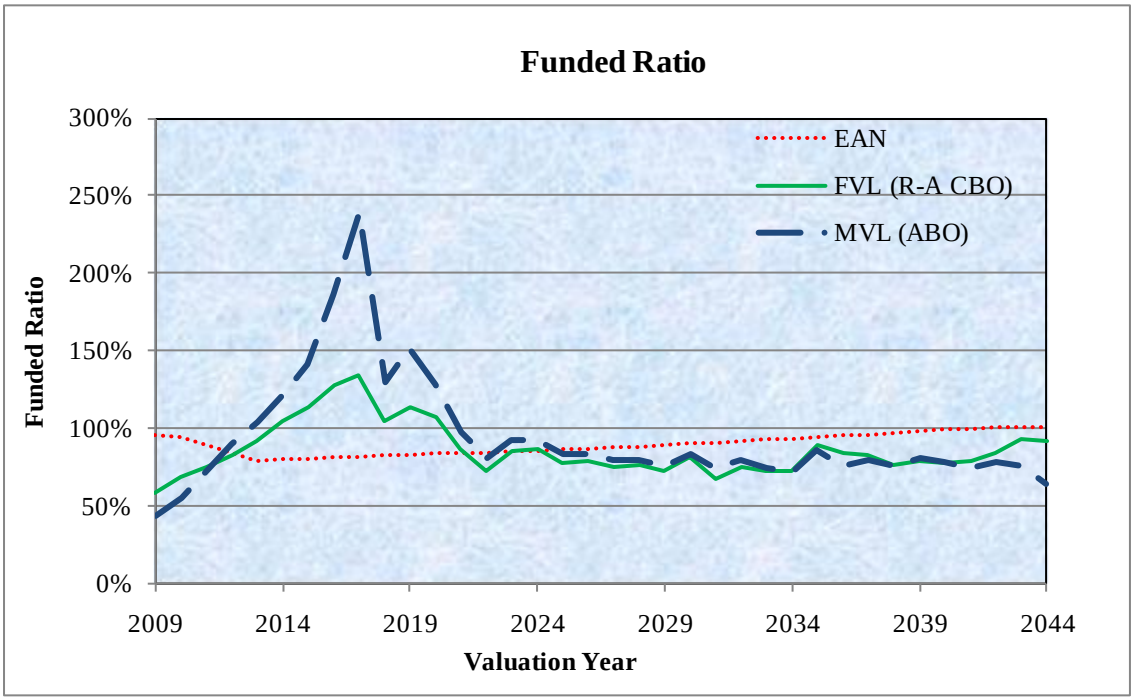
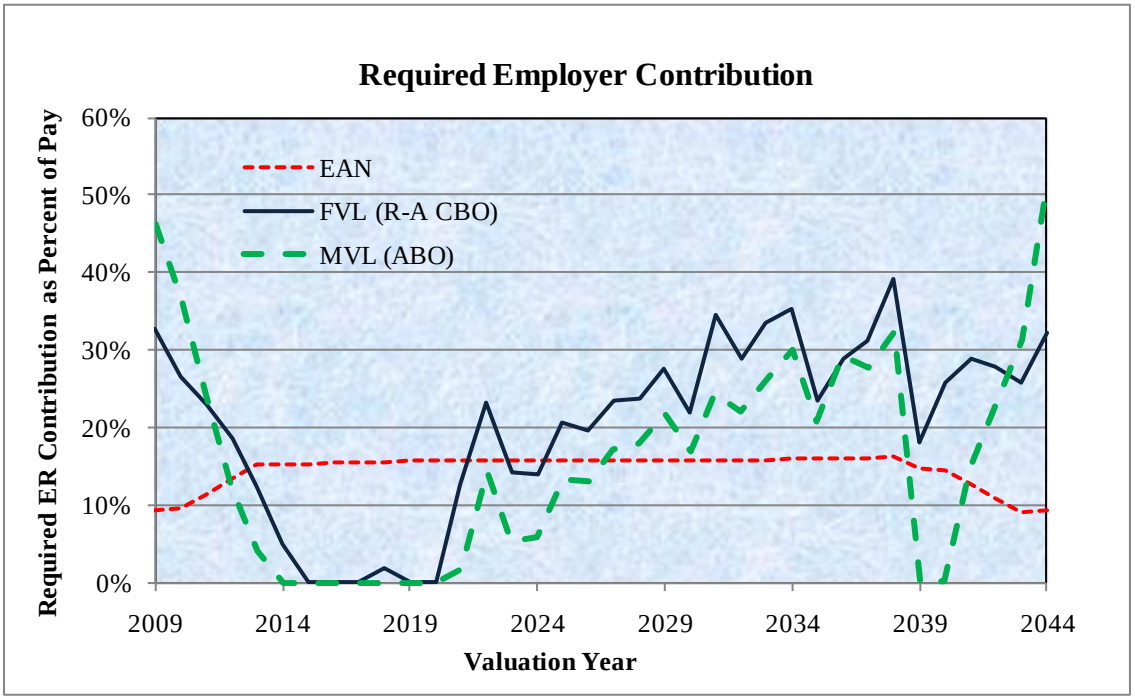


Figure 29 (same as Figure 25)



These graphs demonstrate that MVL and FVL make poor benchmarks for *accountability* and poor guides for behavior. Stakeholders would not want their plan and government management to be held to the standards of these two methods. EAN makes a much better benchmark for *accountability*.

Decision-Usefulness. MVL and FVL are totally bereft of any decision-usefulness for the purposes of annual financial reporting (unless settlement of the plan liabilities is under serious consideration). MVL and FVL are more prone to moral hazard than EAN because, with their greater volatility, there would be a greater tendency to rush to benefit increases during short periods of high funded ratios and low expense or funding levels.

If a balance sheet liability means anything, it should reflect the present value of future costs to taxpayers. Measuring the pension benefit liability at different risk-free or market-related fixed income discount rates every year is not reflective of what taxpayers are expected to pay for the obligation. They will pay a cost that is offset (in large part) by investment earnings of the trust fund. That net cost is not reflected if risk-free or market-related fixed income discount rates are used That would overstate the true cost to taxpayers, making MVL and FVL poor representations of what should appear in the government's financial statement.

MVL and FVL reporting would be tantamount to adopting a fair value measurement attribute, which is remeasured every year. The employer has no means of benefiting from the remeasurement gains (or vice versa), for a pension liability because it is not for sale or exchange.

EAN expenses and liabilities are already in wide use and have gained broad acceptance among governmental employers and their plans. Changes in actuarial assumptions, changes in

benefits, and actuarial gains or losses can all be reported separately under EAN. Funded ratios can be reported easily. Some advocate the use of EAN for note disclosures regardless of the method employed for expense and liability reporting so that plans and employers can compare their funded ratios more easily. Refer to the section on comparability for more on this topic.

Interperiod Equity. As mentioned earlier, interperiod equity cannot be completely and exactly achieved with defined benefit pension and OPEB plans. However, as demonstrated in the funding objective of intergenerational equity, MVL and FVL fail because of their two disqualifying features. They fail the test of interperiod equity because of their reliance on the traditional unit credit cost method, which grossly backloads the costs for any given individual. They also fail the test of interperiod equity because their reliance on varying annual discount rates fails to achieve anything close to level percent of pay cost patterns.

The EAN method is designed for interperiod equity, with a level percent of pay objective.

Definition of a Liability

GASB's Concepts Statement No. 4, "Elements of Financial Statements" states in paragraph 17, "Liabilities are present obligations to sacrifice resources that the government has little or no discretion to avoid." Paragraph 18 expands on that definition, "An obligation is a social, legal or moral requirement, such as a duty, contract, or promise that compels one to follow or avoid a particular course of action.[3] A present obligation that is a liability is a duty or responsibility to sacrifice resources that the government has little or no discretion to avoid. The reason that many liabilities cannot be avoided is that they are legally enforceable, meaning that a court could compel the government to fulfill the obligation. Generally, legally enforceable liabilities arise from legislation of other levels of government or contractual relationships, which may be written or oral.

The terms (whether implicit or explicit) of the contract between an employer and the plan have a "put" of the pension *benefit* obligation from the employer to the plan and an retaining of a *funding* obligation upon the employer to the plan. As demonstrated at length in Part 4 of this series, "*The Residual Benefit Liability*," the employer has no practical or legal *benefit* liability, but a serious *funding* liability. This exchange between the employer and plan exists regardless of whether the employer is a cost-sharing employer of a sole or agent employer. This recognition of contract law is another subject, which was developed thoroughly in Part 4.

Clearly, the employer has some sort of pension liability that should be presented somewhere in its financial statements. If the employer is a debtor for pensions, who is the debt owed to? If there is a debt to pay by the employer, who is the creditor? The transaction between the employer and the pension fund is a real one. The debt owed by the employer is not a *benefit* liability (owed to plan members) but a *funding* liability (owed to the pension trust). The employer owes payments to the pension fund, not to the employees (except for a potential residual benefit liability in the unlikely event of plan insolvency). The reader is encouraged to

[3] Quoted by GASB from *The American Heritage Dictionary of the English Language*. 4th ed. New York: Houghton Mifflin Company, 2000.

review the relevant sections of Part 4 of this series, relating to this exchange transaction and the independence of the plan.

Whether the pension funding liability should appear on the government-wide statement of net assets or solely in the notes and required supplementary information is a matter for GASB standards-setters to decide. In our opinion that decision turns on the degree of consistency in reporting standards, which GASB board members would require to exist between cost-sharing employers and sole and agent employers. More on this topic follows.

In any event, viewing the employer's pension liability as a *funding* liability is truer to the nature of the exchange transactions and the contracts in place. The only *benefit* liability that the employer owes is a residual benefit liability, discussed in Part 4. However, the employer (especially a sole or agent employer) does owe a measureable *funding* liability to the plan.

OPEB obligations (or components thereof) may be considered nonexchange transactions, to the extent that the employer reserves the right to change the terms of the benefits. But that notion would need to be balanced against the concept of the substantantive plan in place on the measurement date.

Consistency Among Reporting Entities

The *funding* obligation that a cost-sharing employer has to the cost-sharing multiple employer plan is fundamentally different from the one that the sole or agent employer has with their respective plans. The pooling arrangement is, essentially, an agreement with all other contributing employers in the cost-sharing plan to share the *funding* obligations ratably.

The pooling nature of the cost-sharing arrangement makes it impossible to measure the *funding* obligation borne by each individual cost-sharing employer as derived from the "put" of the *benefit* obligation upon the plan. The demographics of the individual cost-sharing employer's covered membership bear no relationship to the funding requirements imposed upon it by the cost-sharing plan. This, of course, is not true of sole or agent employer plans.

Therefore, the cost-sharing employer cannot measure a *funding* obligation of its own for its own financial reporting purposes. Other useful information concerning the cost-sharing plan should be included in the notes and RSI, but nothing that is unique to that employer's own *funding* liability can be measured. No value of assets held for its retirees and employees. No actuarial accrued liability for amortization *funding*. Certainly, such an employer cannot report a *benefit* liability for its own retirees and employees since that liability has been "put" to the cost-sharing plan.

Cost-sharing employers should continue to expense the contractually required contribution. If they continue to pay that amount each year, there should be no balance sheet liability remaining.

The contract between the sole or agent employer and its respective plan is just as real. Sole and agent employers have "put" their long-term *benefit* liability to their plan in exchange

for a long-term *funding* liability. The pooling nature of the cost-sharing plan simply rendered the *funding* obligation unmeasureable for the individual cost-sharing employer. However, the *funding* liability is indeed measureable for sole and agent employers.

At a minimum, a *funding* liability for sole and agent employers should be reported in the notes and RSI, along with other useful information – more than is being currently reported (but that is beyond the scope of this discussion of measurement).

GASB standards-setters will need to address how important it is for the statement of net assets to reflect consistent reporting between cost-sharing employers and sole/agent employers. Currently, cost-sharing employers' balance sheet pension liability is consistent with that of sole and agent employers. In a simplified sense, the balance sheet pension liability for all three types of employers is the cumulative difference between the amount the employer should have paid to the plan for sound actuarial financing (as judged by the plan and its actuary) and the amount that the employer actually paid. This creates consistent reporting among all three reporting types.

The downside, in the minds of some, is that there is no *benefit* or *funding* liability appearing on the statement of net assets of any of these employers. If consistency is more important, then the *funding* liabilities of sole and agent employers should not be recognized on the balance sheet because cost-sharing employers cannot measure their own *funding* liability for balance sheet recognition.

There is a choice to be made by GASB standards-setters for sole and agent employers. It is a choice between consistency on the one hand and balance sheet recognition on the other.

1. *Consistency and comparability* are important concepts in accounting and financial reporting. As long as sole and agent employers report their *funding* liability (and other information such as changes therein) in their notes and RSI and as long as their plans report a *benefit* liability (and other information such as changes therein), some may argue that consistency and comparability between reporting expenses and balance sheet liabilities for cost-sharing employers and sole/agent employers have been preserved. This way, the total actuarial-accrued funding liability for sole and agent employers would not appear on their statement of net assets. They may argue that the notes and RSI are included in the financials and are available for all to read; that analysts, rating agencies and others interested in such matters know where to find the information.

2. *Transparency and balance sheet recognition* of liabilities are also important concepts in accounting and financial reporting. Even though cost-sharing employers cannot measure their funding liabilities, that fact may not be sufficient reason for sole and agent employers not to do so. Some may believe that transparency in balance sheet reporting for sole and agent employers trumps consistency with cost-sharing employers. In this case, a sole or agent employer should record its entire unfunded actuarial accrued liability on its statement of net assets. Exactly how it expenses and reconciles from one year to the next is an accounting matter beyond the scope of this paper.

The measure of that liability, however, is the subject of this paper. As demonstrated previously, MVL and FVL are poor measures for accountability, have little to no usefulness, and fail in approximating intergenerational equity. Besides that, the MVL and FVL measure the *benefit* liability, which is not a liability of the employer, but a liability of the plan.

EAN is already a widely used and accepted cost method. It measures the *funding* liability, not the *benefit* liability. It seems to serve well as a benchmark for accountability, provides useful information including the change in funding liability for retroactive benefit improvements, and is actuarially designed to produce level percent of pay contributions for approximating interperiod equity.

However, not all plans use the EAN method for funding. We believe that, for comparability (more on this later) all plans should report their unfunded actuarial accrued liability using the EAN method, regardless of the cost method used for developing the actual funding requirements.

The unfunded actuarial accrued liability (UAAL) under the EAN method should be understood as the current value of the debt that the employer currently owes to the pension fund. Under choice two above, it appears on the sole or agent employer's statement of net assets as a long-term liability.

Value-in-Use

Consider the valuation premise. Is it better to think of the pension liability as a value-in-exchange or as a value-in-use? There are several re-measurement attributes that can be used for assets and liabilities. One such approach is value-in-use. The employer's pension liability to the pension trust can be thought of as the cost of maintaining its resources—its human resource. There are two agreements at work in tandem: the voluntary exchange transaction between employee and employer and the contract between employer and pension trust.

The cost associated with these agreements is a cost of maintaining an intact workforce for an employer. The workforce can be thought of as an asset-in-use and pension contributions are on one of the costs of maintaining that asset in use. Employing a value-in-use attribute is a reasonable approach to valuing this debt, which the employer owes to the pension trust in satisfaction of these tandem agreements. This implies that the MVL and FVL are not the best attribute models for pension liabilities, with their market-driven discount rates. The value-in-use is best described with the unfunded actuarial accrued liability under the funding method employed by and required by the pension trust, or simply the EAN method for consistency.

Accounting vs. Funding

As discussed in the section titled "Comparability," it is a worthwhile goal to require a consistent recognition and disclosure method for public sector financial reporting. Using the EAN method along with the plan's long-term expected rate of return and other assumptions should be the basis for financial disclosure. This may be different from the plan's funding method, but it is worth the additional work and explanations which will inevitably be required.

Plan Financial Reporting

Since the *benefit* liability is assumed by the plan, some may argue that its own financial statements (if issued separately) should present its current benefit liability. If such a liability were on the pension fund's books, it should be valued at the long-term rate of return expected by the pension fund. It should be the present value of the expected contractual benefit liability (PVCBO), discounted to the measurement date using that expected rate of return. We suggest the expected long-term return (instead of a market-based return as MVL and FVL do), because plan liabilities are not generally being considered for settlement. They have virtually perpetual existence. If settlement were under serious consideration, that could change this treatment. Thus, a market-based discount rate would be inconsistent with that ongoing perspective.

Furthermore, a full-orbed treatment of the *benefit-funding* exchange transaction between sole/agent employers and their respective plans might suggest that the plan include an asset on its books equal to the amount of the *funding* liability held on the employer's books (the EAN UAAL under the second choice above). Development of this notion is beyond the scope of this paper.

By calculating and reporting this version of a *benefit* liability in the plan's financial statement, many might confuse the UAAL appearing in the employer's financial statement (the *funding* liability owed by the employer to the plan) with the PVCBO appearing in the plan's financial statement (the *benefit* liability owed by the plan to the members).

Many might even be tempted to calculate a *plan funded ratio* as the market (or actuarial) value of assets divided by this PVCBO. Whether the asset figure in the numerator should or should not include the UAAL (if it were to be included as an asset in the plan's financial statement) is also beyond this paper's scope. In any event, this may present some confusion between two measures of funded status — an *employer funded ratio* and a *plan funded ratio*.

D. Lenders and Rating Agencies

Rating agencies (and lenders who do their own research) obtain most of their information about a government's pension and OPEB obligations directly from the government's financial statements. They can also obtain their information from actuarial communications and from the government's or plan's staff as necessary.

Rating agencies are not asking for the MVL. Nor do they generally utilize unfunded actuarial accrued liabilities (under the reported method) the same as bonded debt in their evaluations. They are not interested in the expected or risk-adjusted future benefit cash flows because they are paid by the plan, not the employer. They are more interested in expected future employer contribution cash flows. Pension contribution demands on the employer create competition for scarce resources to service debt. Standard & Poor's Public Finance Criteria 2007 states (on page 64) that, *"The historical and forecast trends in pension funding are as important, if not more so, than the specific liability level at a single point in time."*

MVL's volatility makes it a poor indicator for use by rating agencies. It may create pressure to downgrade or upgrade ratings during temporary aberrations in the fixed income market, which do not actually affect the cash pension demands upon an employer's resources.

A very useful tool for users of financial statements (including lenders and rating agencies) would be an open group forecast of future employer contribution rates under an expected scenario, under alternate scenarios, and even under a stochastic approach.

Truly comparable measures, such as those described in the next section, "Comparability," would also be useful to lenders and rating agencies.

E. Comparability

Comparing one pension liability calculation to another is a worthy and useful purpose. Comparisons can be made of an individual plan's funded ratios over time, revealing useful progress trends. Furthermore, comparisons can be made of one plan's funded ratio to another plan's funded ratio at a point in time, or over time.

In addition to funded ratios, there are other statistics that are useful to compare (one plan with itself or with other plans), such as unfunded actuarial accrued liabilities (UAAL) as a percent of payroll, employer contribution rates and benefit levels.

Common Liability Types and Methods

In order to achieve comparability, we believe that all plans should calculate the same *type* of liability. We cannot compare *funding* liabilities to *benefit* liabilities. *Funding* liabilities are employer liabilities, while *benefit* liabilities are plan liabilities. We should be comparing employer *funding* liabilities to employer *funding* liabilities, and plan *benefit* liabilities to plan *benefit* liabilities.

Furthermore, except for employer contribution rates, of course, the actuarial methods for comparing *funding* liabilities should be the same. We cannot compare the funded ratio or the UAAL as a percent of payroll for frozen entry age to those of the entry age normal method. The aggregate cost method does not even have a UAAL.

It may be more difficult to settle on a single method of asset valuation for comparisons of funded ratios and UAALs as a percent of pay. Market value of assets is certainly convenient and consistent. However, it carries with it all the same volatile qualities of MVL and FVL. We suggest that calculating some or all comparative statistics using both market value of assets and smoothed value (whichever smoothing method is employed by the plan) is better than calculating only one or only the other.

Calculating additional actuarial statistics based on the EAN may require additional work, time and expense, especially if the plan is not already using the EAN method. However, the goal of improving comparability is worth it.

It may be useful to compare a plan's *benefit* liabilities to itself over time (and forecasted into the future) and to other plans' benefit liabilities at a point in time and over time.

Relevant Assumptions

Those who advocate MVL as the best or only measure of pension liabilities argue strongly that all employers should calculate and publish their benefit liabilities using the same discount rate. This is argued partly on the basis of comparability. The implication is that liabilities calculated using different discount rates are not comparable.

We believe this opinion is formed through a mistaken perspective on comparability. Many factors are at play within the employer and the plan that need to be captured for a comparison to reveal relevant similarities and differences. The long-term rate of investment return expected by the pool of assets, from which the benefit will be paid, is just as important in comparisons as the rates of rates turnover, retirement, salary increases and mortality.

A plan that invests solely in 90-day Treasuries is at a significant disadvantage in comparison to other plans which invest in a balanced portfolio. As stated previously, there is not much dispute that a plan invested entirely in 90-day Treasuries is expected to cost taxpayers more over the long term than if it were invested in a 60-40 balanced portfolio (at least matching the index performances). A pay-as-you-go OPEB program is expected to cost taxpayers much more over the long term than if it were advance funded with a balanced investment policy. Such disadvantage should be reflected in the comparative statistics. By discounting the plan's obligation at a designated rate, we lose that critical piece of comparative information. Funded ratios are *less* comparable (not more) when calculated without regard to their respective differences in investment policies and return expectations.

Similarly, a plan with employees who hardly ever terminate, who retire immediately upon eligibility, and who live longer is also at a disadvantage in comparison to other plans that have average levels of decrements. Such disadvantage should be reflected in the comparative statistics. That plan's liability (denominator in the ratio) needs to be larger to reflect its population's expected decrement pattern.

The discount rate should not be singled out as the one actuarial assumption that should be the same among all plans. By requiring the same discount rate (or the same demographic assumptions), valuable and useful comparative information about the long-term costs is lost.

We recognize that different actuaries and plans may adopt different investment discount rate assumptions, even if the investment policies and investments are identical. This does introduce some corruption in the comparability, but nothing is perfect. Different actuaries and plans are also likely to adopt different assumptions as to rates of turnover, retirement, disability, salary increases and mortality — even for the same plan. Forcing all comparative statistics to use the same discount rate introduces a worse corruption than using the actuaries' and plans' best estimates of all assumptions.

Advocates of MVL also strongly argue that the common discount rate that must be used is a yield curve that varies every year with the market, resulting in volatile liability valuations. Not only does this lose the essential characteristic of plans' investment policies and expectations, it causes comparability over time to be impossible. If the funded ratios and UAALs as a percent of payroll are volatile solely due to fixed income market conditions from one year to another, it makes discerning plan trends impossible. Assessing the progress of the funded status over time or the employer's ability to service the UAAL debt over time is obscured by all the variation in the liability calculations which have nothing to do with funding progress.

MVL and FVL make for a poor comparator method for comparing a plan to itself over time, and for comparing different plans to each other at a point in time and over time.

Employer Contribution Rates

An employer's contribution rates are routinely compared to prior years. They are also compared to the employer contribution rates of neighboring states and local jurisdictions, and nationally. If not statutorily fixed, these contribution rates are routinely calculated using different discount rates, other actuarial assumptions which are different, and even using different actuarial cost methods. While the comparisons, over time and with other entities, are imperfect, they provide useful information.

Employer-Funded Ratios

A sole or agent employer's *employer-funded ratio* should be understood as a measure of how close the employer is to being "paid up" on the debt it owes to the plan.

Such an employer-funded ratio should, therefore, be defined as actuarial value of assets (AVA) divided by the unfunded actuarial accrued liability calculated under the common entry age normal cost method (EAN UAAL). Some may want to supplement that with the market value of assets (MVA) divided by the EAN UAAL. Each year the EAN method establishes an allocation of annual funding requirements (for each employee since his respective entry age. This cost allocation creates an accumulated amount which the employer should have paid over time to be "paid up." The costs of all benefit improvements and all actuarial losses (and gains) are rolled into what should have been paid every year, in hindsight. It is called the actuarial accrued liability (AAL). The shortfall between the AAL and the current measure of assets is the UAAL.

Comparing an employer's own *employer-funded ratios* over time is useful in tracking the employer's funding progress, as long as they are comparable. Comparing an employer's current funded ratio with those of other entities is also useful, as long as they are comparable.

As set forth in this section on financial reporting, the EAN method should be used as the common actuarial cost method for calculating the actuarial accrued liability for the reasons described. In addition, an actuarially smoothed value of assets should be permitted as long as it complies with Actuarial Standard of Practice No. 44 (*Selection and Use of Asset Valuation Methods for Pension Valuations*).

UAAL as Percent of Payroll

A good measure of the employer's ability to service the UAAL debt the size of the UAAL compared to the payroll. Again, the EAN method and asset smoothing should be used for this purpose.

Plan-Funded Ratios

The last part of the "Financial Reporting" section discusses plan financial reporting. It mentions a *plan-funded ratio*. This is not to be confused with the *employer-funded ratio*, which measures how close the employer is to paying off the debt it owes to the plan. The *plan funded ratio* is a measure of benefit security. It is not nearly as useful for coming to reasonable conclusions as the *employer funded ratio*.

Benefit Levels

Often stakeholders want to compare the pension benefit levels of one public sector employer to another. To isolate solely the level of benefits, the best comparative statistic is a ranking of the present values of future benefits for employees hired at selected ages from, say, 25 to 50. These ranking statistics are useful for union negotiations, setting benefits policy, and designing overall compensation packages.

Present value calculations for these hypothetical employees for this purpose should be calculated with the current (and proposed) benefit structure for the target employer. The same hypothetical employees should also have present value calculations made for all other employers in the comparative universe. All actuarial assumptions should be identical for all such employees and all such employers. This commonality of assumptions will isolate the benefit level for ranking and comparison purposes.

F. Risk Measurement and Analysis

A lot can be said about pension and OPEB risk measurement and analysis. Other papers and resources provide a wealth of useful metrics, techniques, objectives, processes and communications. This section will be limited to a brief discussion of the practical usefulness of MVL and FVL for discussions concerning risk measurement and analysis with plan and employer officials.

The MVL is only one number. The FVL is one other number. Useful information and discussions concerning pension and OPEB risk measurement and analysis cannot be captured in a single number.

As a starting point for such discussions, a public sector pension fund (and/or the public sector employer) might be interested in knowing how much it would cost to remove all risks for benefits earned to date. If the price were acceptable, a transaction would be consummated with a third party to assume all responsibilities for paying the specified benefits when due. The third party would most likely be an insurance company active and reputable in the single premium

group annuity market, although other governmental retirement systems might have an interest in bidding for the transaction (as described in Part 3 of this series).

FVL is a better proxy for a settlement liability than MVL. An actual settlement of the liability would be found in the single premium annuity market, likely using the private sector standards and criteria imposed by the U.S. Department of Labor. FVL would be a closer representation of the benefits actually earned at the measurement date (CBO) as described in Part 1 of this series. It is a closer representation of the risk-adjustments that the marketplace would charge for assuming the responsibility (risk-adjusted CBO), as described in Part 2 of this series. Finally, it is a closer representation of the discount rate which the marketplace would utilize in setting the exit price, as described in Part 3 of this series.

In any event, it would be merely a starting point for the risk discussion. Some sensitivity modeling around the best estimate FVL might be helpful.

When fiduciaries consider portfolios invested entirely in bonds, the notion usually has its origin either retreating from equity volatility or embracing MVL as the measure of pension liabilities. When MVL is embraced, it naturally leads to serious discussions of pension portfolios invested entirely in bonds.

Liability-driven investments in the private sector are motivated because funding and financial reporting standards have adopted MVL/FVL-like liability measurements. The private sector environment (funding and reporting) is particularly well-suited for discussions about portfolios designed to match the liability behavior over time. Since pension liability measures in the private sector are all discounted using fixed income yields, for funding and accounting purposes, there is a certain amount of logic in designing a portfolio whose market value of assets would behave in lock-step with the market value of liabilities. Surplus optimization makes the most sense when the liability measure varies with fixed income yields, as MVL and FVL do.

However, public sector liabilities are not required to be valued at varying discount rates for funding or reporting, as are private sector liabilities. Furthermore, the primary purpose of this paper is to demonstrate that public sector pension liabilities should *not* be measured that way. Hence, there is little interest in the public sector for liability-driven investing, dedicated bond portfolios, liability matching portfolios or any other such system of investments designed to vary in tandem with the liability measure.

Therefore, public sector discussions of risk measurement and analysis would involve forecast valuations optimizations, asset allocation, fat-tail distributions, stress testing, sensitivity testing, recovery testing, risk tolerance assessments, stochastic analyses, and very little about MVL or FVL.

G. Personal Wealth

Personal Asset Allocations

Much work has been undertaken to develop models and methods for assisting individuals to adopt asset allocation policies for their personal portfolios, which reflect their personal goals and risk tolerances. Mean-variance optimization models have been used for many years to set asset allocation policies among different asset classes.

A major challenge to the typical optimization model occurs when an individual has or will have a defined benefit pension stream of income. How to incorporate the value of that stream of income payments into the overall optimization model has not been fully developed.

One possible way to do so would be to calculate the market value (discounted at risk-free or market rates) of such benefit stream and consider that as an asset class alongside the other asset classes. Expected returns, standards deviations, correlations and constraints for the pension asset could be developed along with the other asset classes' capital market assumptions for an integrated optimization.

This technique would not be without its own challenges. It may result in some odd answers and strain a client's confidence. Without developing this notion further, we present it herein as possibly some practical application for MVL. Certainly, the presence of an individual's pension stream of income should affect his liquid asset allocation in some fashion.

Plaintiff Advocacy

MVL may play a role in qualified domestic relations orders (and any governmental plan equivalents). Negotiations in divorce settlement often involve the value of pension benefits earned. Consider an employee or retiree who is a member of a public sector pension plan. If such plan member were to find himself in divorce negotiations over property values, his actuary may wish to keep the value of such pension as low as legitimately possible, while the alternate payee's actuary may wish to keep the value as high as legitimately possible. Her actuary may choose to argue that the value of the member-spouse's public sector pension should be discounted at risk-free rates, rather than IRC 417(e) rates, plan rates or some other rates suggested by his actuary or the plan's actuary.

While MVL may be of no practical use for those public sector pension purposes identified previously in this Part 5, it may indeed have usefulness in plaintiff litigation. Similar actuarial positioning may also occur in wrongful death or disability litigation and negotiations.

H. Plan Terminations and Freezes

MVL and FVL have legitimate uses as proxies for plan benefit liability settlement. As mentioned in the "Risk Measurement and Analysis" section of this Part 5, if a plan or employer were seriously considering a plan termination, calculation of the MVL and FVL might provide a reasonable estimate of what an insurance company might bid to assume all responsibility for paying the benefits earned to date when they fall due. Nothing replaces and actual request for bids, but these may provide some estimate, along with some sensitivity testing on the discount rate.

If a plan or employer were seriously considering a plan freeze, the approach described in Part 4 of this series, "The Residual Benefit Liability," would be useful in modeling the operation of the frozen plan.

I. Summary of the Series

The current model of the market value of public sector pension liabilities fails in three important ways in its attempt to serve as a fair value model. It fails certain labor economics principles by its use of the accumulated benefit obligation cash flow, in that the ABO does not represent the contractual benefit obligation between the employer and employee. It fails certain actuarial finance and pricing principles by treating expected cash flows as fixed. Finally, it fails certain financial engineering principles by not discounting cash flows with market-related rates, observable in real world markets.

Depending on standards-setting bodies or other forces, actuaries might be required to calculate and communicate the fair value of public sector pension liabilities. If so, the authors wanted to make a constructive contribution by proposing three *improvements* to the current model in order to produce a better model of fair value. These improvements include the use of the contractual benefit obligation (CBO), risk-adjusted CBO cash flows, and discount rates higher than risk-free to better reflect market-related rates.

An alternative model for fair value of the employer's benefit liability, one which is more faithful to the contract terms that exist between the public sector employer and the public sector pension fund, is presented as the residual benefit liability.

In spite of these improvements to the current so-called "market value of liability" model to offer a better representation of the fair value of the liability, these measures of the benefit liability have little usefulness for real world purposes. They are merely theoretical constructs with little to no decision utility.

Conventional and some not-so-conventional methods for measuring public sector pension and OPEB liabilities are much more appropriate for funding purposes, taxpayers' purposes, financial reporting purposes, lenders' and rating agencies' purposes, and for comparability purposes. Nevertheless, market and fair value of public sector liabilities may have some limited usefulness for certain personal wealth purposes, certainly including plan termination purposes, and might be worth a passing comment within risk measurement and analyses among more sophisticated and useful techniques.

James J. Rizzo, ASA, MAAA, is senior consultant and actuary at Gabriel, Roeder, Smith & Company in Fort Lauderdale, Fla. and can be reached at *jim.rizzo@gabrielroeder.com*.

Dr. Krzysztof M. Ostaszewski, FSA, CFA, CERA, MAAA, is actuarial program director and professor of mathematics at Illinois State University in Normal, Ill. and can be reached at *krzysio@ilstu.edu*.

Dr. Piotr Krekora, ASA, MAAA, is senior actuarial analyst at Gabriel, Roeder, Smith & Company in Fort Lauderdale, Fla. and can be reached at *piotr.krekora@gabrielroeder.com*.

Special Thanks and References for the Series

Special Thanks

We wish to express our gratitude to many friends and colleagues who assisted in various aspects of this series of papers. These include Stephen Gauthier (Government Finance Officers Association), Penelope Wardlow, Girard Miller (The PFM Group), Terry Mumford and Albert J. Lee (Ice Miller), members of National Association of Public Pension Attorneys, Sean McShea (Ryan Labs, Inc.), Robin Prunty (Standard & Poor's) and Karl Johnson (GASB).

References

Actuarial Standards Board, Actuarial Standard of Practice No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations,* September 2007.

Bader, L. N., "Pension Deficits: An Unnecessary Evil," *Financial Analysts Journal,* 60 (3), May/June 2004, pp. 15-20.

Daniel Bauer, Matthias Borger and Jochen Russ, *Pricing Longevity Bonds Using Implied Survival Probabilities,* 2006 meeting of the American Risk and Insurance Association (ARIA), 2006.

Boaz, G.C., *Memorandum*, State of Tennessee Comptroller of the Treasury, Feb. 24, 2009.

Boivie, Ilana and Almeida, Beth, *Pensionomics: Measuring the Economic Impact of State & Local Pension Plans*, National Institute on Retirement, February 2009.

Casualty Actuarial Society Task Force on Fair Value Liabilities, *White Paper on Fair Valuing Property/Casualty Insurance Liabilities,* Arlington, Va., 2000.

Casualty Actuarial Society, *Fair Value of P&C Liabilities: Practical Implications,* Arlington, Va., 2004.

Derman, Emanuel, *My Life as a Quant*, John Wiley & Sons, Inc.

Gabriel, Roeder, Smith & Co., "Valuing Public Pension Plans: Comparing Financial Economics with Conventional Approaches," *GRS Insight,* April 2008, pp. 1-4.

Gold, J., "Never Again: A Transition to a Secure Private Pension System," *The Journal of Portfolio Management,* Fall 2005, pp. 92-97.

Gold, J. and G. Latter, "The Case for Pension Plan Liabilities to Market," working paper, Aug. 11, 2008.

MacMinn, R., K. Ostaszewski, R. Thiagarajah, and F. Weber, "An Investigation of Select Birth Cohorts," in: *Living to 100 and Beyond,* Society of Actuaries Monograph, Schaumburg, Ill., January 2005.

MacMinn, R., K. Ostaszewski, R. Thiagarajah, and F. Weber, "Mortality improvement select birth cohorts and their effect on pricing of survivor bonds," in: *Re-Envisioning Retirement in the 21st Century,* Society of Actuaries Monograph, Schaumburg, Ill., June 2006.

Modigliani, F., and M. Miller (1958), "The Cost of Capital, Corporation Finance, and the Theory of Investment," *American Economic Review*, pp. 261-297.

Mueller, Dennis C. (1989), *Public Choice II*. Cambridge: Cambridge University Press.

Myers, Stewart C., "Capital Structure", *Journal of Economic Perspectives*, Spring 2001, pp. 81-102.

Pension Research Committee, "The Projected Unit Credit Cost Method," *The Pension Forum*, September 1991, pages 3-4.

Society of Actuaries, Report of the Society of Actuaries Mortality Improvement Survey Subcommittee, March 2003.

Society of Actuaries, *Pension Actuary's Guide to Financial Economics,* Schaumburg, Ill., 2006.

Society of Actuaries Group Annuity Valuation Table Task Force, *1994 Group Annuity Mortality Table and 1994 Group Annuity Reserving Table*, Transactions of the Society of Actuaries, January 1995, Vol. 47, pp. 865-919.

Society of Actuaries, Retirement Plans Experience Committee, *RP-2000 Mortality Tables*, July 2000.

SunGard, SunGard *Investment Plus*, Capital market assumptions updated as of Dec. 31, 2008.

Wilcox, D., Deputy Director in the Division of Research and Statistics at the Federal Reserve Board, Oral Comments at a Forum in Washington, D.C. on Sept. 4, 2008, sponsored by the Public Interest Committee of the American Academy of Actuaries.

Wilmott, Paul, *Derivatives: the theory and practice of financial engineering*, J. Wiley, 1998.