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Marking Public Pension Plan Liabilities to Market

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Overview

- I. Introduction
- II. Market Value of Liabilities (MVL)
- III. Estimating a MVL
- IV. Implications
- V. Conclusion - TBD

I. Introduction

- Actuarial liabilities:
 - ✓ Developed for long-range projections
 - ✓ Facilitate long range budgeting process
 - ✗ Not related to economic values or reflect current market conditions
- A market-based value of plan liabilities (MVL) in conjunction with the market value of plan assets (MVA) informs employees, taxpayers, lenders and agents that all will find valuable
- No sector of the economy can escape the hard rules of the capital markets
 - Asset and liability figures \neq fair market values result in a misallocation of resources

II. Market Value of Liabilities (MVL)

- MVL helps to answer three questions
 1. Will future taxpayers pay for services of current generations?
 2. How do funding levels & benefit security compare across jurisdictions?
 3. What is MV of benefits earned by employees this year? What is total compensation? What does it cost taxpayers to give a past service benefit?
- How does the MVL and MVA help answer questions 1) and 2) ?
 1. If $MVA < MVL$ → Current taxpayers have underpaid their share of benefits
 2. Jurisdictions with poor market funded ratios → face higher taxes later
 - Impact on house prices?
- How the MVL and $MV\Delta AB$ help answer question 3?
 - \$1 bn plan amendment appears to only cost \$30 mn per year when amortized over thirty years of rising payroll
 - May actually re-consider improvement when full pension wealth increase is known

III. Estimating a MVL

- MVL rarely calculated and financial analysts don't have tools & information
 - Accurate measurement can be done only by actuaries working with reliable data, computer software & detailed plan provisions
- We arbitrarily select 4 plans to attempt to estimate the MVL
 - Southeast (SE), Northwest (NW), Northeast (NE) and Midwest (MW)
- The roughness of our calculations implies actuaries with intimate knowledge of the plan should prepare the cash flows that underlie MVL
- We make two adjustments:
 - Adjustment 1: AAL → ABO ... recognizes change in accrual pattern
 - Adjustment 2: ABO → MVL ... requires change to market discount & inflation rates
- AAL: Most plans use the Entry Age Normal (EAN) accrued actuarial liability
 - $AAL = PVFB - PVFNC - PVFEC$
- ABO: Economic obligation does not include future service, future pay increases

III. Conversion factors (Flat \$ plan)

- Employee: Age 50 with 20 years service and will work 10 more years.
- Annual accrual = \$1,000/year of service (Flat dollar plan)
 - Accrued annual benefit (payable at 60) = \$20,000
 - Projected annual pension = \$30,000

■ Annuity at age 60 = 10.0

- Non-indexed SLA at 8.0%

■ PVFB = \$30,000 * 10 = \$300k

■ PV at age 50 → discount at 8% for 10 years = \$138,958

■ Level annual conts of \$2,648 accumulate at 8% to \$300k

■ PVFNC at age 50 = \$17,770

■ AAL = PVFB - PVFNC = \$121,188

■ Conversion factor: ABO/AAL

- = \$92,639 / 121,188 = 76%

Age	PVFB	Salary	Normal Cost	PVFNC	EAN Accrued Actuarial Liability	Accrued Benefit Payable at age 60	ABO	Conversion Factor
30	29,813	100,000	2,648	29,813	0	0	0	
35	43,805	100,000	2,648	28,269	15,536	5,000	7,301	47%
40	64,364	100,000	2,648	26,001	38,364	10,000	21,455	56%
41	69,514	100,000	2,648	25,433	44,081	11,000	25,488	58%
42	75,075	100,000	2,648	24,819	50,256	12,000	30,030	60%
43	81,081	100,000	2,648	24,156	56,924	13,000	35,135	62%
44	87,567	100,000	2,648	23,440	64,127	14,000	40,865	64%
45	94,573	100,000	2,648	22,667	71,905	15,000	47,286	66%
46	102,138	100,000	2,648	21,833	80,306	16,000	54,474	68%
47	110,309	100,000	2,648	20,931	89,378	17,000	62,509	70%
48	119,134	100,000	2,648	19,957	99,177	18,000	71,480	72%
49	128,665	100,000	2,648	18,906	109,759	19,000	81,488	74%
50	138,958	100,000	2,648	17,770	121,188	20,000	92,639	76%
51	150,075	100,000	2,648	16,543	133,531	21,000	105,052	79%
52	162,081	100,000	2,648	15,218	146,862	22,000	118,859	81%
53	175,047	100,000	2,648	13,788	161,259	23,000	134,203	83%
54	189,051	100,000	2,648	12,242	176,808	24,000	151,241	86%
55	204,175	100,000	2,648	10,574	193,601	25,000	170,146	88%
56	220,509	100,000	2,648	8,771	211,738	26,000	191,108	90%
57	238,150	100,000	2,648	6,825	231,325	27,000	214,335	93%
58	257,202	100,000	2,648	4,722	252,479	28,000	240,056	95%
59	277,778	100,000	2,648	2,452	275,326	29,000	268,519	98%
60	300,000	100,000	2,648	0	300,000	30,000	300,000	100%

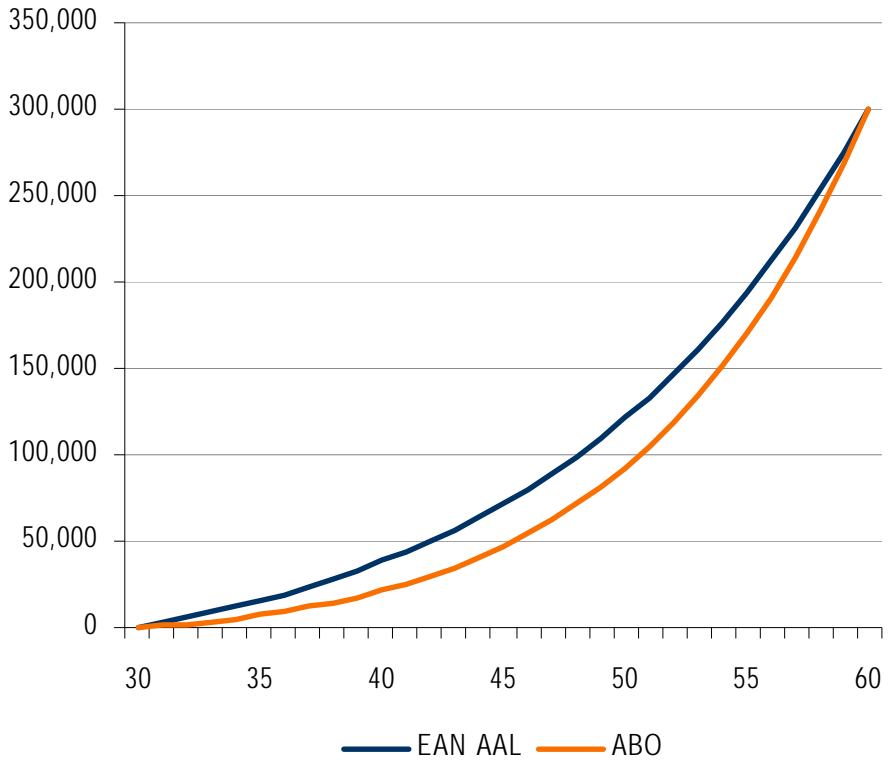
III. Conversion factors (pay-related plan)

- Most public plans compute pensions as %age of pay
- Annual accrual = 1% * service * salary
 - Assumed salary increase = 5%

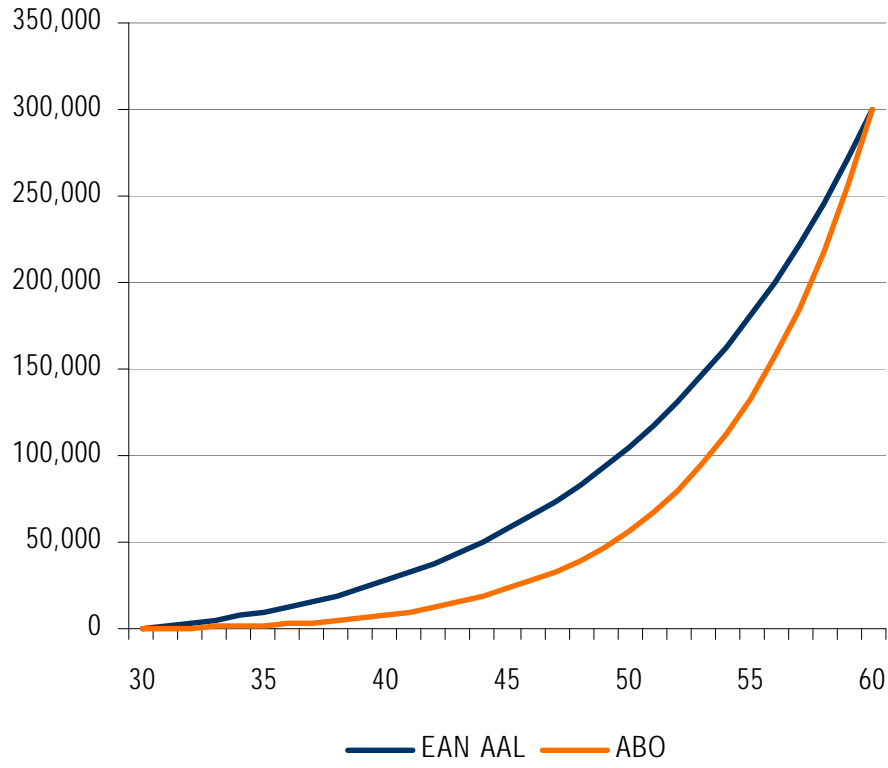
Age	PVFB	Salary	Normal Cost	PVFNC	EAN Accrued Actuarial Liability	Accrued Benefit Payable at age 60	ABO	Conversion Factor
30	29,813	23,138	1,493	29,813	0	0	0	
35	43,805	29,530	1,906	33,717	10,088	1,477	2,156	21%
40	64,364	37,689	2,432	36,666	27,698	3,769	8,086	29%
41	69,514	39,573	2,554	37,046	32,468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

III. Adjustment 1: Conversion factors

Formula: $1\% * \text{final salary} * \text{years of Svc.}$
Assumed salary scale: 0%.



Formula: $1\% * \text{final salary} * \text{years of Svc.}$
Assumed salary scale: 5%.



III. Adjustment 1: Conversion factors

- Need to extract key data from CAFR
- Need to select a conversion factor for adjustment 1
 - Conversion factors decrease as salary scale assumption increases
 - Many considerations impact the choice of a conversion factor
 - The liability-weighted average number of years to retirement is the most important

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

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

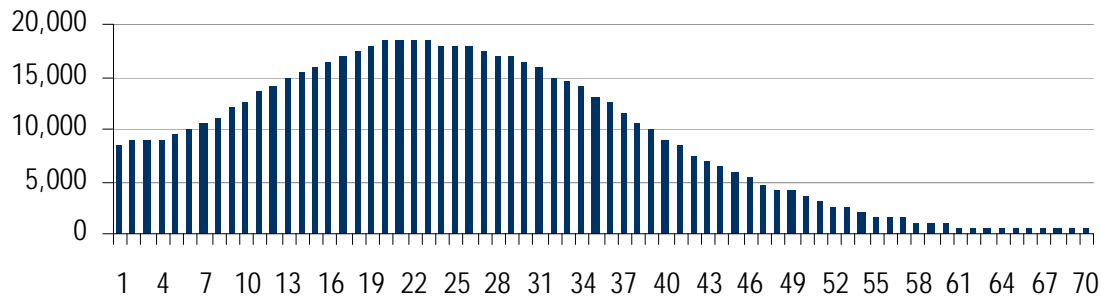
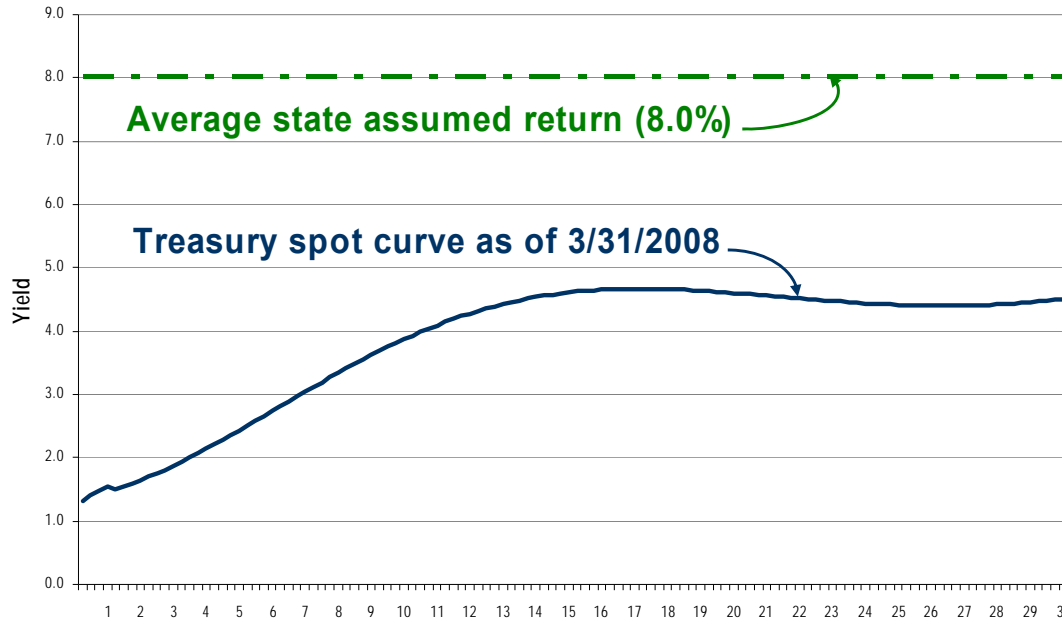
III. Adjustment 1: AAL → ABO

- Conversion factor: we used 65% for three plans
 - NE plan provided ABO figure (FAS 35)
- If plan provisions and demographic info in concert with actuarial assumptions differ from example, need to adjust conversion factor
- Hot takeaway: ABO uses actuarially assumed discount and inflation rates - BUT these do not have to be assumed - we can observe market rates!

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

III. Adjustment 2: ABO → MVL

- State average plan assumption is significantly above Treasury curve
 - Largest 2 plans in each state

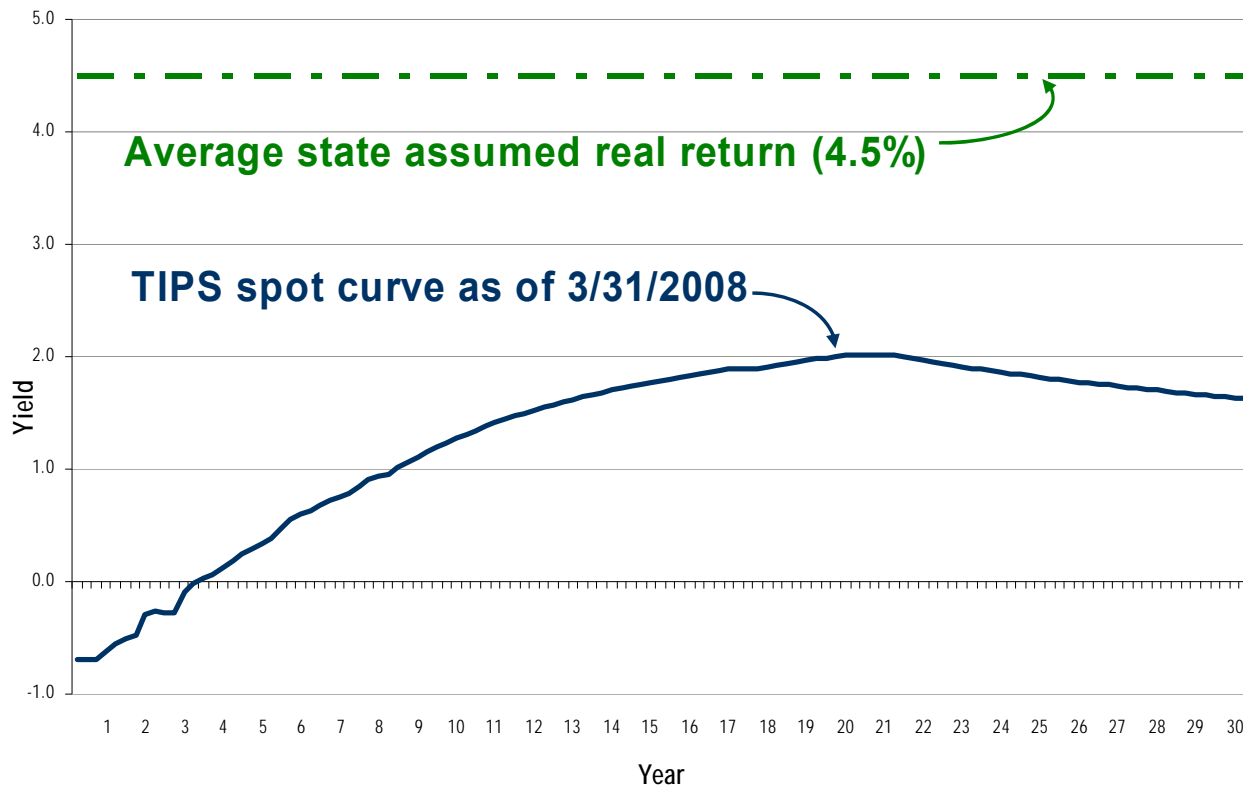


- Actuaries could develop cash flows that underlie the ABO
- Since not available in CAFR, we use hypothetical Cash Flows to approximate ABO term structure
 - CFs ignore COLA's

III. Adjustment 2: ABO → MVL

- Need to separate hypothetical actives from retirees as most plans provide COLA's
- Average actuarial real return plan assumptions significantly above TIPS curve
 - The discount rate is 8.0%
 - The inflation rate is 3.5%

Actuarial Real return = 4.5%
(8.0% - 3.5%)



III. Adjustment 2: ABO → MVL

- Need to adjust cash flows twice:
 - Once for actuarial assumptions & once for market assumptions
- Need to use either Treasury or TIPS curve depending on indexation provisions

■ SE Plan: 3% indexation regardless

- Use Treasury curve adjustment

■ MW Plan: Lesser of CPI & 1.5%

- Use Treasury curve adjustment as 1.5% cap should apply in every year

■ NW & NE provide full indexation after retirement

■ Note: NE much more conservative than NW plan

- MVL adjustment not as severe

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

III. Comparison of funded ratios

- Comparison of Actuarial vs. Market funded ratios
 - In this market environment, Market funded ratios typically lower
- NE plan funded ratio is the same (coincidence):
 - MVL adjustment not as severe → Actuarial assumptions relatively conservative
 - Market value of assets is higher than actuarial value

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

III. Estimating $MV\Delta AB$

- How does the $MV\Delta AB$ answer Question 3?
 - What is the market value of benefits being earned by public employees this year?
 - What does this tell us about their total compensation?
 - What does it cost taxpayers to give a past service benefit?
- In recent years, combination of an aging workforce & low market discount rates
 - Implies that $MV\Delta AB_t$ is generally much higher than the actuarially required contribution reported in actuarial reports and CAFRs.

- What is the Value of the Benefit Earned Each Year?

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

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

- Looking at NYCERS... need to determine liability return (r)
 - Use MVL, duration & interest rates provided
- $MV\Delta AB = 49.8 - 55.4 * (1 - .095) + 3.0 * (1 - .095/2) = 2.5$
 - But, NYC/EE's contributed \$1.4 bn
- Thus, \$12.5 bn market deficit plus \$1 bn (differential) paid by future taxpayers

IV. Implications

- Resistance to Market disclosures come in two forms:
 1. Market economics don't apply to the public sector
 - GASB supports long-term view
 - MVL suggests a termination concept
 2. Market disclosures will threaten future of public DB plans
- 1. Agree that public DB plans are not like most operating companies ... they are financial institutions
 - More akin to an Insurance Company
 - MVL measures accrued pension wealth - independent of plan termination
- 2. We share concerns that DC plans are less capable of providing retirement security, but does not justify suppression of key information...
 - MVL disclosures tell us pensions cost more in low interest rate environments