



The Actuarial Costs of Closing a Defined Benefit Plan by Offering A Mandatory Defined Contribution Plan

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Employer Contributions to DB Plan

- Normal Cost: percentage of active payroll required to fund benefits which accrue during the next year
- Unfunded Accrued Liability (UAL) Cost: percentage of active payroll required to pay off the UAL

Ongoing Defined Benefit

- New entrants continue to join the plan replacing those who retire or otherwise terminate
- There is high turnover of new entrants. For those who leave, the employer contributions remain with the system to help fund benefits for those who will retire
- Since payroll increases with time, unfunded accrued liability (UAL) contributions as a percentage of pay are smaller than if pay does not increase

Closed Defined Benefit Plan

- No new entrants
- Fewer terminations, therefore, less non-refunded employer contributions remain to fund benefits for those who retire
- Payroll decreases, therefore, a higher UAL contribution percentage is required
- Retiree benefits increase as a percentage of overall assets, requiring re-allocation of portfolio and lowering, over the long term, expected ROA

The DB Plan

- Actives 300,000
- Payroll \$10 billion

- Retirees 156,000
- Payroll \$2.3 billion

- Actuarial value of assets equals market value
\$34,000,000,000
- Amortization period 20 years
- Currently 90% funded

DB Employer Contributions of Open Defined Benefit Plan

Year	Normal Cost	UAL Cost	Total
0	6.26%	3.35%	9.61%
5	6.37%	2.40%	8.77%
10	6.46%	1.57%	8.03%
15	6.53%	0.91%	7.44%
20	6.59%	0.76%	7.35%
25	6.65%	0.58%	7.23%
30	6.70%	0.67%	7.37%

- Open Group
- Amortized over increasing payroll
- Amortized over rolling 20 year period

Employer Contributions of Closed Defined Benefit Plan

Year	Normal Rate	UAL	Total	Open
0	6.26%	3.35%	9.61%	9.61%
5	6.28%	3.63%	9.91%	8.77%
10	6.33%	3.87%	10.20%	8.03%
15	6.42%	4.54%	10.96%	7.44%
20	6.54%	5.43%	11.97%	7.35%
25	6.62%	9.49%	16.11%	7.23%
30	6.54%	62.17%	68.71%	7.37%

- Closed Group
- Amortized over increasing payroll
- Amortized over rolling 20 year period

Employer Contributions of Closed Defined Benefit Plan

Year	Normal Rate	UAL	Total	Open
0	6.26%	5.75%	12.01%	9.61%
5	6.28%	5.15%	11.43%	8.77%
10	6.33%	4.31%	10.64%	8.03%
15	6.42%	4.10%	10.52%	7.44%
20	6.54%	0.00%	6.54%	7.35%
25	6.62%	15.37%	21.99%	7.23%
30	6.54%	50.80%	57.34%	7.37%

- Closed Group
- Amortized over decreasing payroll
- Amortized over fixed 20 year period

Retiree Benefit Payments vs. Assets

Closed Plan

Year	Retiree Payments	Assets	% of Assets
0	\$2.3	\$34.0	6.8%
5	\$2.9	\$43.7	6.6%
10	\$3.5	\$52.5	6.7%
15	\$4.1	\$59.7	6.9%
20	\$4.8	\$64.4	7.5%
25	\$5.7	\$62.8	9.1%
30	\$6.5	\$58.0	11.2%

- Current ratio in open plan of retiree payments to assets is 6.8% projected to be 5.0% in 30 years
- Since benefit payments are an ever increasing proportion of assets, re-allocation of portfolio may be required thereby lowering return of assets

Active Payroll vs. Retired Benefit Payments

Closed Plan

Year	Active Payroll	Retired Payroll	% Active to Retired
0	\$10.1	\$2.3	439%
5	\$9.2	\$2.9	317%
10	\$8.2	\$3.5	234%
15	\$6.9	\$4.1	168%
20	\$5.5	\$4.8	115%
25	\$3.4	\$5.7	060%
30	\$0.8	\$6.5	012%

Employer Contributions of Closed Defined Benefit Plan

Year	Normal Rate	UAL	Total	Open
0	6.26%	5.75%	12.01%	9.61%
5	6.28%	5.15%	11.43%	8.77%
10	6.33%	4.31%	10.64%	8.03%
15	6.42%	4.10%	10.52%	7.44%
20	6.54%	0.00%	6.54%	7.35%
25	6.62%	59.43%	66.05%	7.23%
30	6.54%	303.78%	310.32%	7.37%

- Closed Group
- Decreasing payroll
- Decrease return on investment after 20 years creating actuarial losses

Closed DB with Mandatory DC

Year	Closed DB Rate	DC Rate	Combined Rate	Open DB Rate	Additional Cost
0	12.01%	6.00%	12.01%	9.61%	2.40%
5	11.43%	6.00%	9.62%	8.77%	0.85%
10	10.64%	6.00%	8.09%	8.03%	0.06%
15	10.52%	6.00%	7.54%	7.44%	0.10%
25	66.05%	6.00%	10.43%	7.23%	3.20%
30	310.32%	6.00%	9.93%	7.37%	2.56%

Closed DB with Mandatory DC

Currently 80% Funded					
Year	Closed DB Rate	DC Rate	Combined Rate	Open DB Rate	Additional Cost
0	15.64%	6.00%	15.64%	11.73%	3.91%
5	14.69%	6.00%	11.81%	10.31%	1.50%
10	13.65%	6.00%	9.35%	9.23%	0.12%
15	13.35%	6.00%	8.52%	8.01%	0.51%
25	66.05%	6.00%	10.43%	7.68%	2.75%
30	310.32%	6.00%	9.93%	7.70%	2.23%

Closed DB with Mandatory DC

Currently 70% Funded					
Year	Closed DB Rate	DC Rate	Combined Rate	Open DB Rate	Additional Cost
0	20.48%	6.00%	20.48%	14.55%	5.93%
5	19.05%	6.00%	14.72%	12.36%	2.36%
10	17.65%	6.00%	11.10%	10.74%	0.36%
15	17.11%	6.00%	9.62%	9.04%	0.58%
25	66.05%	6.00%	10.43%	8.28%	2.15%
30	310.32%	6.00%	9.93%	8.15%	1.78%



**Southern Conference
on Teacher Retirement
Financial Economics –
The New Actuarial Math?**

**Thomas J. Cavanaugh, FSA
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April 26, 2005**

What Is It?

- Branch of economics concerned with the workings of financial markets
- Concentrates on money transactions

How Is It Being Applied To Pensions?

- Pensions are deferred wages and an underfunded pension constitutes a borrowing from employees
- Borrowing from employees should be more expensive than borrowing externally if the transactions are transparent
- Therefore accrued pensions should be fully funded

How Is It Being Applied To Pensions?

- Ideal investment for full funding should be risk-free bonds because of tax-arbitrage and cash flow match
- Value of the obligation (the pension) is independent of the choice of assets used to secure it
- Failure to invest 100% in bonds is due to opaque accounting rules and will change when more transparency is mandated

What Are The Implications?

- Accounting – use risk-free bond yield for the discount rate with no salary scale for measurement purposes
- Funding – fully fund accrued liability measured by the risk-free rate and no salary scale
- Asset Allocation – 100% bonds (if corporate bonds are used need to fund above liability to account for defaults)

Follow The Bouncing Tax Ball

- Tax advantage to have fixed income in portfolio
- Taxpayer should want this and can rebalance personal portfolio to desired risk/reward profile
- Presupposes average taxpayer has outside investments (how do you diversify away from your home?)
- Ignores other reasons taxpayer may want equities in the plan, e.g. access to the equity markets and other investment classes, more efficient return delivery

Does This Make Sense in the Public Sector?

- For measurement purposes – maybe
 - ❖ GASB considered but rejected the use of a single interest rate when developing Statements 25 and 27
- For funding – no
 - ❖ A significant purpose of employer sponsored pension plans is to deliver valuable benefit as efficiently as possible, including managing both cost and risk
 - ❖ Penalizes current taxpayers to the benefit of future taxpayers
 - ❖ Cost is very great. One example UAL increases 59% and employer contribution increases 70%

Additional Thoughts

- Opportunities will exist if private sector moves to bonds. Current private sector asset base about \$2 trillion.
- In fact, who would buy all the equities currently held by both private and public plans?
- Interesting side argument regarding DC plans – shouldn't they be all bond portfolios as well?

In Summary

- This concept is likely to get more attention in the near future as FASB and IASB consider changes in private sector accounting
- Investment representatives are talking about this now with public plans
- Very complicated issue that will require significant education to make informed decisions