GAINS AND LOSSES

Typical pension valuation involves multiple sets of valuations each year

The first valuation should hold all items constant from the prior year:

- **Cost method**
- **Actuarial assumptions**
- **Plan benefits**
- **Section 415 maximum benefit limits**
- **Section 401(a)(17) compensation limit**

Reason is to use these valuation results to perform gain and loss analysis

GAINS AND LOSSES

$$\text{TOTAL G/L} = {}_eUAL_1 - UAL_1$$
$$UAL_1 = AL_1 - AAV_1$$
$${}_eUAL_1 = (1+i)(NC_0+UAL_0) - (\text{contrib+int})$$

Total G/L includes investment G/L and non-investment G/L.

$${}_eUAL_1 = {}_eAL_1 - {}_eAAV_1$$
$${}_eAL_1 = (1+i)(NC_0+AL_0) - (\text{actual BP + int})$$
$${}_eAAV_1 = (1+i)(AAV_0) + (\text{contrib+int}) - (\text{actual BP+int})$$

Calculate interest at valuation rate on cash flows from date of cash flow to valuation date. Note use of actual benefit payments in formulas for ${}_eAL_1$ and ${}_eAAV_1$.

GAINS AND LOSSES

INVESTMENT G/L = AAV_1 - $_eAAV_1$

$_eAAV_1$ = (1+i)(AAV_0)+(contrib+i)
- (actual BP+i)

AAV_1 = (1+j)(AAV_0)+(contrib+j)
- (actual BP+j)

inv G/L = (j-i)(AAV_0) + (j-i)(cash flows)

Must use actual benefit payments in $_eAAV_1$ definition so they net out of investment G/L.

GAINS AND LOSSES

Non-INVESTMENT G/L = $_eAL_1 - AL_1$

$_eAL_1$ = (1+i)(NC_0+AL_0)
- (actual BP+int)

AL_1 = defined by cost method

Difference between actual and expected benefit payments is part of mortality G/L.

GAINS AND LOSSES

Level AGGREGATE methods produce level NC if all assumptions are met.

Balance sheet analysis - all assumptions are met.

Year 0

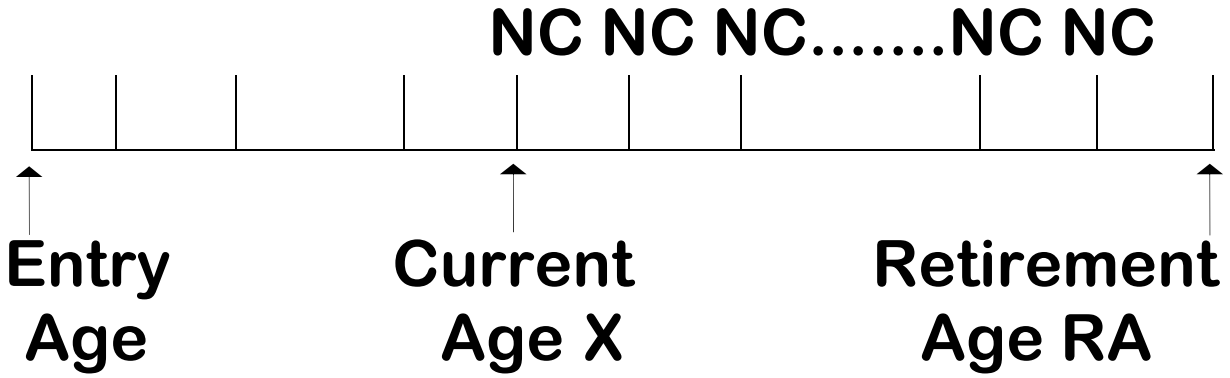
AAV_0
UAL_0
$PVNC_0$

$\Sigma = PVB_0$

$NCAR_0 = PVNC_0 / PVE_0$
$NC_0 = EARN_0 \times NCAR_0$

HYPOTHESIS:
Next year's total expected liability should be $(1+i)(PVB_0)$ - (actual BP+i)

Analysis of expected PVNC and PVE



At age X,

$PVNC_0 = NC * \ddot{a}_{X:\overline{RA-X}|}$

${}_ePVNC_1 = NC * \ddot{a}_{X+1:\overline{RA-X-1}|} * p_X$

$= (1+i) *(PVNC_0 - NC)$

${}_ePVE_1 = (1+i) *(PVE_0 - EARN_0)$

NOTE:

$\ddot{a}_{X:\overline{N}|} - 1 = v * p_X \ddot{a}_{X+1:\overline{N-1}|}$

Balance sheet analysis - All assumptions met

Year 1

$_eAAV_1 = (1+i)(AAV_0)+(contrib+i) - (actual\ BP+i)$

$_eUAL_1 = (1+i)(NC_0+UAL_0) - (contrib+i)$

$_ePVNC_1 = (1+i)(PVNC_0 - NC_0)$

$\Sigma = (1+i)(AAV_0+UAL_0+PVNC_0) - (actual\ BP+i)$

$= (1+i)(PVB_0) - (actual\ BP+i)$

$_ePVE_1 = (1+i)(PVE_0 - EARN_0)$

$_eEARN_1 = p_x^{(T)}\ (1+s)\ (EARN_0)$

assuming all employees < NRA-1

Balance sheet analysis - All assumptions met

$${}_eNCAR_1 = {}_ePVNC_1 / {}_ePVE_1$$

Level aggregate cost methods guarantee that ${}_eNCAR_1 = NCAR_0$.

Use above to develop balance sheet when a few assumptions are not met.