CURATED PAST EXAM ITEMS
- Solutions -

RET 201 – Retirement Plan Valuation

Important Information:

- These curated past exam items are intended to allow candidates to focus on past SOA fellowship assessments. These items are organized by topic and learning objective with relevant learning outcomes, source materials, and candidate commentary identified. We have included items that are relevant in the new course structure, and where feasible we have made updates to questions to make them relevant.
- Where an item applies to multiple learning objectives, it has been placed under each applicable learning objective.
- Candidate solutions other than those presented in this material, if appropriate for the context, could receive full marks. For interpretation items, solutions presented in these documents are not necessarily the only valid solutions.
- Learning Outcome Statements and supporting syllabus materials may have changed since each exam was administered. New assessment items are developed from the current Learning Outcome Statements and syllabus materials. The inclusion in these curated past exam questions of material that is no longer current does not bring such material into scope for current assessments.
- Thus, while we have made our best effort and conducted multiple reviews, alignment with the current system or choice of classification may not be perfect. Candidates with questions or ideas for improvement may reach out to education@soa.org. We expect to make updates annually.

RET201 Learning Objective 1 Model Solutions

RETFRC, Fall 2020, Q2

Learning Outcomes:
b) Perform periodic valuations of ongoing plans, calculating normal cost and actuarial accrued liability, using a variety of cost methods

Sources:
References – Anderson

Commentary on Question:
Most candidates did well on this question.

Solution:
(a) Calculate the total normal cost and the unfunded actuarial liability as at January 1, 2020.

Show all work.

$EAN\ NC_x$ $= \sum PVFB_w / PVFS_w \times S_x$; w-entry age and x-current age
$EAN\ AL_x$ $= \sum(PVFB_x - PVFNC_x)$

<u>Member A</u>
$PVFB_w$ $= 2\% \times 60{,}000 \times 1.04^{(64-40)} \times (65-30) \times \ddot{a}_{65}^{(12)} \times v^{(65-30)}$
$= 1{,}200 \times 1.04^{24} \times 35 \times 13.5 \times v^{35}$
$= 263{,}486$

$PVFS_w$ $= 60{,}000 \times 1.04^{-10} \times \ddot{a}_{65-30\urcorner}^{\ j}$; where $j = (1.05/1.04)-1$
$= 1{,}211{,}326$

$EAN\ NC_x$ $= 263{,}486 / 1{,}211{,}326 \times 60{,}000$
$= 13{,}051$

$PVFB_x$ $= PVFB_w \times 1.05^{10}$
$= 263{,}486 \times 1.05^{10}$ $= 429{,}191$

$PVFNC_x$ $= EAN\ NC_x \times \ddot{a}_{65-40\urcorner}^{\ j}$
$= 291{,}575$

$EAN\ AL_x$ $= 429{,}191 - 291{,}575$ $= 137{,}616$

Member B

$PVFB_w$ $= 2\% \times 70{,}000 \times 1.04^{(64-50)} \times (65-30) \times \ddot{a}_{65}^{(12)} \times v^{(65-30)}$
$= 1{,}400 \times 1.04^{14} \times 35 \times 13.5 \times v^{35}$
$= 207{,}669$

$PVFS_w$ $= 70{,}000 \times 1.04^{-20} \times \ddot{a}_{65-30\urcorner}^{j}$
$= 954{,}716$

EAN NC_x $= 207{,}669 / 954{,}716 \times 70{,}000$
$= 15{,}226$

$PVFB_x$ $= PVFB_w \times 1.05^{20}$
$= 207{,}669 \times 1.05^{20} \quad = 551{,}007$

$PVFNC_x$ $= \text{EAN } NC_x \times \ddot{a}_{65-50\urcorner}^{j}$
$= 213{,}779$

EAN AL_x $= 551{,}007 - 213{,}779 \quad = 337{,}228$

Member C

$PVFB_w$ $= 2\% \times 80{,}000 \times 1.04^{(64-60)} \times (65-35) \times \ddot{a}_{65}^{(12)} \times v^{(65-35)}$
$= 1{,}600 \times 1.04^{4} \times 30 \times 13.5 \times v^{30}$
$= 175{,}400$

$PVFS_w$ $= 80{,}000 \times 1.04^{-25} \times \ddot{a}_{65-35\urcorner}^{j}$
$= 786{,}332$

EAN NC_x $= 175{,}400 / 786{,}332 \times 80{,}000$
$= 17{,}845$

$PVFB_x$ $= PVFB_w \times 1.05^{25}$
$= 175{,}400 \times 1.05^{25} \quad = 593{,}966$

$PVFNC_x$ $= \text{EAN } NC_x \times \ddot{a}_{65-60\urcorner}^{j}$
$= 87{,}542$

EAN AL_x $= 593{,}966 - 87{,}542 \quad = 506{,}424$

AL_{2020} $= 137{,}616 + 337{,}228 + 506{,}424 \quad = 981{,}268$

NC_{2020} $= 13{,}051 + 15{,}226 + 17{,}845 \quad = 46{,}122$

UAL_{2020} $= AL - F$
$= 981{,}268 - 1{,}000{,}000 \qquad = (18{,}732)$

(b) Calculate the unfunded actuarial liability as at January 1, 2021.

Show all work.

Member A (deferred pension)
AL $= 2\% \times 60{,}000 \times 11 \times \ddot{a}_{65}^{(12)} \times v^{(65-41)}$
$= 55{,}254$
Member B
$PVFB_w$ $= 2\% \times 70{,}000 \times 1.10 \times 1.04^{(64-51)} \times (65-30) \times \ddot{a}_{65}^{(12)} \times v^{(65-30)}$
$= 1{,}540 \times 1.04^{13} \times 35 \times 13.5 \times v^{35}$
$= 219{,}650$

$PVFS_w$ $= 77{,}000 \times 1.04^{-21} \times \ddot{a}_{\overline{65-30}|}^{j}$
$= 1{,}009{,}796$

EAN NC_{x+1} $= 219{,}650 / 1{,}009{,}796 \times 77{,}000$
$= 16{,}749$

$PVFB_x$ $= PVFB_w \times 1.05^{21}$
$= 219{,}650 \times 1.05^{21} \qquad = 611{,}936$

$PVFNC_x$ $= \text{EAN } NC_x \times \ddot{a}_{\overline{65-51}|}^{j}$
$= 220{,}508$

EAN AL_x $= 611{,}936 - 220{,}508 \qquad = 391{,}428$

Member C (immediate reduced pension)

AL $= 2\% \times 80{,}000 \times 26 \times \ddot{a}_{61}^{(12)} \times (1-.05 \times (65-61))$
$= 499{,}200$

AL_{2021} $= 55{,}254 + 391{,}428 + 499{,}200 \qquad = 945{,}882$

F_{2021} $= 1{,}000{,}000 \times (1-.10) + 50{,}000$
$= 950{,}000$

UAL_{2021} = AL – F
= 945,882 – 950,000 = (4,118)

(c) Calculate the gains and losses by source for 2020.

Show all work.

Exp'd UAL_1 = UAL_0 x 1.05
= (18,732) x 1.05 = (19,669)

Act'l UAL_1 = (4,118) (see above)

Gains/(Losses) = (19,669) – (4,118) = (15,551)

Gain on contributions/normal cost:
Normal cost =46,122 x 1.05
= 48,428

Act'l Conts = 50,000

Gain/(Loss) = 50,000 – 48,428 = 1,572

Gain on fund return:
Act'l F = 950,000 (see above)
Exp'd F = 1,000,000 x (1.05) + 50,000
= 1,100,000

Gain/(Loss) = 950,000 – 1,100,000 = (150,000)

Gain on termination – Member A:
Exp'd AL = (137,616 + 13,051) x 1.05
= 158,200

Actual AL = 55,254 (see above)

Gain/(Loss) = AL_{exp} – $AL_{act'l}$
= 158,200 – 55,254 = 102,946

Loss on salary increase – Member B:
Exp'd AL = (337,228 + 15,226) x 1.05
= 370,077

Act'l AL = 391,428 (see above)

Gain/(Loss) = $AL_{exp} - AL_{act'l}$
= 370,077 – 391,428 = (21,351)

Gain on retirement – Member C:
Exp'd AL = (506,424 + 17,845) x 1.05
= 550,482

Act'l AL = 499,200 (see above)

Gain/(Loss) = $AL_{exp} - AL_{act'l}$
= 550,482 – 499,200 = 51,282

Check:
Gains/(Losses) = 1,572 +(150,000) + 102,946 + (21,351) + 51,282
= (15,551)

RETFRC, Fall 2020, Q8

Learning Outcomes:

b) Perform periodic valuations of ongoing plans, calculating normal cost and actuarial liability, using a variety of cost methods.

Sources:

Anderson

A Problem-Solving Approach to Pension Funding and Valuation, Second Edition, Ch. 5

Commentary on Question:

A well-prepared candidate will be able to calculate actuarial liability and normal cost using both the Unit Credit and Projected Unit Credit, prorated on services, cost methods.

Solution:

(a) Calculate the total actuarial liability and normal cost as at January 1, 2020.

Show all work.

Commentary on Question:

Most candidates performed quite well calculating the liability and normal cost using the Unit Credit method.

<u>Member A</u>		
AL	$= 20{,}000 \times 13.5 \times v^{10}$	
	$= 165{,}757$	
NC	$= 2\% \times 80{,}000 \times 13.5 \times v^{10}$	
	$= 13{,}261$	
<u>Member B</u>		
AL	$= 10{,}000 \times 13.5 \times v^{20}$	
	$= 50{,}880$	
NC	$= 2\% \times 60{,}000 \times 13.5 \times v^{20}$	
	$= 6{,}106$	
AL_{2020}	$= 165{,}757 + 50{,}880$	$= 216{,}637$
NC_{2020}	$= 13{,}261 + 6{,}106$	$= 19{,}367$

(b) Calculate the total actuarial liability and normal cost as at January 1, 2020, using the Projected Unit Credit method, prorated on service.

Show all work.

Commentary on Question:
While some candidates were able to correctly determine the liability and normal cost using the PUC, prorated on service, method, others had some difficulty. For example, some candidates incorrectly projected the career average benefits to retirement, while others failed to prorate the liabilities on service, or did not correctly reflect the termination decrements.

Member A

B_y $= B_x + \sum b_x$ for all future years (since past termination age)
$= 20{,}000 + 2\% \times 80{,}000 \times s_{\overline{65-55}|}^{j}$; where j = 3.5%
$= 38{,}770$

AL $= 38{,}770 \times 15/25 \times 13.5 \times v^{10}$
$= 192{,}791$

NC $= 38{,}770 \times 1/25 \times 13.5 \times v^{10}$
$= 12{,}853$

Member B

AL $= [(10{,}000 + 2\% \times 60{,}000 \times s_{\overline{65-45}|}^{j}) \times .95^3 / 30$
$+ (10{,}000 + 2\% \times 60{,}000 \times s_{\overline{48-45}|}^{j}) \times .05 / 13$
$+ (10{,}000 + 2\% \times 60{,}000 \times s_{\overline{49-45}|}^{j}) \times .95 \times .05 / 14$
$+ (10{,}000 + 2\% \times 60{,}000 \times s_{\overline{50-45}|}^{j}) \times .95^2 \times .05 / 15] \times 10 \times 13.5 \times v^{20}$
where j = 3.5%
$= 71{,}689$

NC $= AL / 10$
$= 7{,}169$

PUC AL_{2020} $= 192{,}791 + 71{,}689 = 264{,}480$

PUC NC_{2020} $= 12{,}853 + 7{,}169 = 20{,}022$

RETFRC, Spring 2021, Q2

Learning Outcomes:
b) Perform periodic valuations of ongoing plans, calculating normal cost and actuarial accrued liability, using a variety of cost methods

Sources:
Pension Mathematics for Actuaries – Arthur W Anderson, 3rd Edition, 2006 Ch. 1-4 and 7

Commentary on Question:
The candidate will be able to perform periodic valuations of ongoing plans, calculating normal cost and actuarial liability, using aggregate method. Further, candidate will be able to evaluate actual experience, including comparisons to assumptions (i.e., gain/loss analysis).

Candidate provided answer to this question in excel format, where the 'calculations' are done within the various cells. In order to get full points, candidate is still expected to show intermediate 'steps' to get to the final answers.

Solution:
(a) Calculate the accrued liability and estimated normal cost of the plan, in dollars, as at December 31, 2020.

Commentary on Question:
Candidate is expected to show the following steps to get full points:

Correct formulas or methodology for aggregate method				
Calculation of PVFB				
Calculation of PVFS				
Calculation of AL				
Calculation of NC (% or $ or both)				

ALt = Ft (Aggregate Method)
NCt = (∑PVFBt – Ft)/ ∑PVFSt x ∑St where
PVFBx = ∑ ly × qy × By × äy(12) × v(y-x) for each member
PVFSx = ∑ ly × qy × Sx× v(y-x) for each member

i	5%	v	=1/(1+i)	0.9524
ss	3%	j	= (1+i)/(1+ss)	1.94%

Benefit at Retirement = 2% x salary x service

Member A:

Age	Year	Salary	Benefit @ Ret	Svc	Red	Annuity	Deferral v (65 to	tpx	v	qt	qr	PVFB	PVFS
40	0	$55,000	$1,100	10	0.0%	13.3	0.2953	100.0%	1.00	3%	0%	$1,296	
45	5	$63,760	$1,275	15	0.0%	13.3	0.2953	97.0%	0.78	2%	0%	$1,457	$48,459
60	20	$99,336	$1,987	30	25.0%	14.8		95.1%	0.38	0%	25%	$59,256	$35,589
63	23	$108,547	$2,171	33	10.0%	14.1		71.3%	0.33	0%	50%	$105,511	$25,196
65	25	$115,158	$2,303	35	0.0%	13.3		35.6%	0.30	0%	100%	$112,860	$12,122
												$280,381	**$989,964**

PVFS(A) = ∑ ly × qy × Sx× v(y-x) = $989,984 (see member B for sample calculation of PVFS)

Member B:

Member B

Age	Year	Salary	Benefit @ Ret	Svc	Red	Annuity	tpx	v	qt	qr	PVFB	PVFS
55	0	$65,000	$1,300	10	50.0%	15.6	100.0%	1.00	0%	0%	$0	
56	1	$66,950	$1,339	11	45.0%		100.0%	0.95	0%	0%	$0	$63,762
57	2	$68,959	$1,379	12	40.0%		100.0%	0.91	0%	0%	$0	$62,547
58	3	$71,027	$1,421	13	35.0%		100.0%	0.86	0%	0%	$0	$61,356
59	4	$73,158	$1,463	14	30.0%		100.0%	0.82	0%	0%	$0	$60,187
60	5	$75,353	$1,507	15	25.0%	14.8	100.0%	0.78	0%	25%	$49,152	$59,041
61	6	$77,613	$1,552	16	20.0%		75.0%	0.75	0%	0%	$0	$57,916
62	7	$79,942	$1,599	17	15.0%		75.0%	0.71	0%	0%	$0	$42,610
63	8	$82,340	$1,647	18	10.0%	14.1	75.0%	0.68	0%	50%	$95,476	$41,798
64	9	$84,810	$1,696	19	5.0%	13.6	37.5%	0.64	0%	0%	$0	$41,002
65	10	$87,355	$1,747	20	0.0%	13.3	37.5%	0.61	0%	100%	$106,988	$20,111
											$251,615	**$510,331**

PVFS(B) = ∑ ly × qy × Sx× v(y-x) = $510,331

Member C:

Age	Year	Salary	Benefit @ Ret	Svc	Red	Annuity	tpx	v	qt	qr	PVFB
65	1	$82,400	$1,648	14	0.0%	13.3	100.0%	0.95	0%	100%	$292,245

PVFS(C) = 1 x 80,000 x (1.03) x 0.9524 = $78,476

Total PVFB	$824,242	= sum of PVFB	
Total PVFS	$1,578,771	= sum of PVFS	
ALt = Ft	450,000		
NC (%) =	(PVFB - Ft)/PVFS =		23.7%
NC ($) =	NC (%) x sum of Sal 2021		$48,831

(b) Calculate the gains and losses by source for 2021.

Commentary on Question:
Candidate is expected to show the following steps to get full points

Calculation of investment gain (assets only)
Calculation of termination gain (PVFB and PVFS)
Calculation of salary loss (PVFB and PVFS)
Calculation of GL on retirement
Capture impacts on total PVFB and PVFS
Impact of contributions
Gain/loss on NC (% or $ or both)

Member A:
PVFB (2020) = 280,381 (from part (a))
PVFB (2021 – expected) = 280,381 x (1+i) = 294,400 where i = 5%
PVFB (2021 – expected sal) = 302,102 (see "expected salary" calculation below)
PVFB (2021 – actual sal) = 298,636 (see "actual" calculation below)

Termination gain/loss PVFB = 302,102 – 294, 400 = 7,702 (loss)
Salary gain/loss PVFB = 298,636 – 302,102 = -3,466 (gain)

Similarly,

	2020	2021	2021			
PFVS	Actual	Expected	Actual			
Member A	989,964	982,812	1,013,209	30,396	Termination	
		1,013,209	1,001,583	- 11,626	Salary	

Where PVFS(2021) = 982,812 = 989,964 x (1+ss) – expected 2021 sal
ss = 3% and expected 2021 sal = 55,000 x (1.03)

Actual- Member A (expected salary)

Age	Year	Salary	Benefit @ Ret	Svc	Red	Annuity	Deferral v (65 to current age)	tpx	v	qt	qr	PVFB	PVFS
41	0	$56,650	$1,133	11	0.0%	13.3	0.31007	100.0%	1.00	0%	0%	$0	
45	4	$63,760	$1,275	15	0.0%	13.3	0.31007	100.0%	0.82	2%	0%	$1,578	$52,456
60	19	$99,336	$1,987	30	25.0%	14.8		98.0%	0.40	0%	25%	$64,143	$38,524
63	22	$108,547	$2,171	33	10.0%	14.1		73.5%	0.34	0%	50%	$114,213	$27,274
65	24	$115,158	$2,303	35	0.0%	13.3		36.8%	0.31	0%	100%	$122,168	$13,122
												$302,102	**$1,013,209**

Member A (actual)													
Age	Year	Salary	Benefit @ Ret	Svc	Red	Annuity	Deferral v (65 to current age)	tpx	v	qt	qr	PVFB	PVFS
41	0	$56,000	$1,120	11	0.0%	13.3	0.31007	100.0%	1.00	0%	0%	$0	
45	4	$63,028	$1,261	15	0.0%	13.3	0.31007	100.0%	0.82	2%	0%	$1,560	$51,854
60	19	$98,196	$1,964	30	25.0%	14.8		98.0%	0.40	0%	25%	$63,407	$38,082
63	22	$107,302	$2,146	33	10.0%	14.1		73.5%	0.34	0%	50%	$112,903	$26,961
65	24	$113,836	$2,277	35	0.0%	13.3		36.8%	0.31	0%	100%	$120,766	$12,972
												$298,636	**$1,001,583**

Member B:
PVFB (2020) = 251,615 (from part (a))
PVFB (2021 – expected sal) = 251,615 x (1+i) = 264,195 where i = 5%
PVFB (2021 – actual sal) = 311,747 (see calculation below)

Salary gain/loss PVFB = 311,747 – 264,195 = 47,552 (loss)
No termination gain/loss because no termination decrement

	2020	2021	2021		
PFVS	Actual	Expected	Actual		
Member B	510,331	468,897	553,292	84,394	Salary

Member B												
Age	Year	Salary	Benefit @ Ret	Svc	Red	Annuity	tpx	v	qt	qr	PVFB	
56	0	$79,000	$1,580	11	45.0%		100.0%	1.00	0%	0%	$0	
60	4	$88,915	$1,778	15	25.0%	14.8	100.0%	0.82	0%	25%	$60,898	$73,151
63	7	$97,160	$1,943	18	10.0%	14.1	75.0%	0.71	0%	50%	$118,293	$51,787
65	9	$103,077	$2,062	20	0.0%	13.3	37.5%	0.64	0%	100%	$132,557	$24,917
											$311,747	**$553,292**

Member C:
PVFB (2020) = 292,254 (from part (a))
PVFB (2021 – expected sal) = 292,254 x (1+i) = 306,858 where i = 5%
PVFB (2021 – actual) = 262,808 (see calculation below)

Retirement gain/loss = 262,808 – 306,858 = -44,050 (retirement gain)

	2020	2021	2021
PFVS	Actual	Expected	Actual
Member C	78,476	-	-

Member C											
Age	Year	Salary	Benefit @ Ret	Svc	Red	Annuity	tpx	v	qt	qr	PVFB
65	0	$80,000	$1,600	13	5.0%	13.3	100.0%	1.00	0%	100%	$262,808

Member C annual retirement benefit = $80,000 x 13 x 2% x .95 = 19,760

Investment Gain/loss:
Fund (expected)
= Fund (2020) x (1 + i) + contribution (end of year) – payment x (1+i/2)
= 450,000 x (1+5%) +50,000 – 19,760 x(1+5%/2)
= $502,246

Fund (actual)
= Fund (2020) x (1 + ROR) + contribution (end of year) – payment x (1+ROR/2)
= 450,000 x (1+10%) +50,000 – 19,760 x(1+10%/2)
= $524,252

Investment Gain = 524,252 – 502,246 = $**22,006**

In summary,

	2020	2021	2021		
	Actual	Expected	Actual	Diff	Source
Ft	450,000	502,246	524,252	22,006	Investment
PFVB					
Member A	280,381	294,400	302,102	7,702	Termination
		302,102	298,636	- 3,466	Salary
Member B	251,615	264,196	311,747	47,551	Salary
Member C	292,245	306,858	262,808	- 44,050	Retirement
PFVS					
Member A	989,964	982,812	1,013,209	30,396	Termination
		1,013,209	1,001,583	- 11,626	Salary
Member B	510,331	468,897	553,292	84,394	Salary
Member C	78,476	-	-	-	
NC(%)	23.7%	25.0%	22.4%		
NC($)	48,831	31,852	31,205		

Each of the NC% and NC($) calculated using the corresponding formula of
(∑PVFBt – Ft)/ ∑PVFSt x ∑St

	NC(%)	NC ($)	
31-Dec-20	23.70%	48,831	
Contributions	1.31%	- 16,980	=25.0% - 23.7%
Investment	-1.52%	- 1,930	
Termination	0.04%	48	
Salary	1.73%	5,175	
Retirement	-2.83%	- 3,939	
31-Dec-21	22.44%	31,205	
	TRUE	TRUE	

RETFRC, Fall 2021, Q6

Learning Outcomes:
b) Perform periodic valuations of ongoing plans, calculating normal cost and actuarial accrued liability, using a variety of cost methods

Sources:
Pension Mathematics for Actuaries (Anderson)

Commentary on Question:
Parts a) and b) were answered well by candidates that were familiar with the cost method. Some candidates were not familiar with the cost method and did poorly as a result. Almost all candidates were not able to determine the gain/loss in part c) and as a result scored poorly in this part.

Solution:
(a) Calculate the unfunded actuarial liability and the total normal cost as at January 1, 2021.

Show all work.

$AAN\ UAL_{initial} = UC\ UAL_{initial}$

$AAN\ NC_t = (\sum PVFB_t - AL_t) / \sum PVFY_t \times n$

Member A

$PVFB = 100 \times 12 \times (60\text{-}30) \times \ddot{a}_{60}^{(12)} \times v^{(60\text{-}43)} \times .95^2 +$
$100 \times 12 \times 13 \times \ddot{a}_{60}^{(12)} \times v^{(60\text{-}43)} \times .05 +$
$100 \times 12 \times 14 \times \ddot{a}_{60}^{(12)} \times v^{(60\text{-}43)} \times .95 \times .05$
$= 1200 \times 30 \times 14.8 \times .4363 \times .95^2 +$
$1200 \times 13 \times 14.8 \times .4363 \times .05 +$
$1200 \times 14 \times 14.8 \times .4363 \times .95 \times .05$
$= 219{,}983$

$PVFY = .95 + .95^2 / 1.05 \times \ddot{a}_{60-44\rceil}$
$= .95 + .95^2 / 1.05 \times 11.3797$
$= 10.7311$

UC AL $= 1200 \times 13 \times 14.8 \times .4363$
$= 100{,}732$

Member B

PVFB $= 100 \times 12 \times (60\text{-}35) \times \ddot{a}_{60}^{(12)} \times v^{(60-50)}$
$= 1200 \times 25 \times 14.8 \times .61391 = 272{,}577$

PVFY $= \ddot{a}_{60-50\rceil} = 8.1078$

UC AL $= 1200 \times 15 \times \ddot{a}_{60}^{(12)} \times v^{(60-50)}$
$= 1200 \times 15 \times 14.8 \times .61391 = 163{,}546$

Member C

PVFB $= 100 \times 12 \times (60\text{-}40) \times \ddot{a}_{60}^{(12)} \times v^{(60-59)}$
$= 1200 \times 20 \times 14.8 \times .95238 = 338{,}286$

PVFY $= \ddot{a}_{60-59\rceil} = 1$

UC AL $= 1200 \times 19 \times \ddot{a}_{60}^{(12)} \times v^{(60-59)}$
$= 1200 \times 19 \times 14.8 \times .95238 = 321{,}371$

$\sum PVFB_{2021} = 219{,}983 + 272{,}577 + 338{,}286 = 830{,}846$
$\sum PVFY_{2021} = 10.7311 + 8.1078 + 1 = 19.8389$
$UC\ AL_{2021} = 100{,}732 + 163{,}546 + 321{,}371 = 585{,}649$

$AAN\ UAL_{2021} = UC\ UAL_{2021}$
$= UC\ AL_{2021} - F_{2021}$
$= 585{,}649 - 0 = 585{,}649$

$AAN\ NC_{2021} = (\sum PVFB_{2021} - AL_{2021}) / \sum PVFY_t \times n$
$= (830{,}846 - 585{,}649) / 19.8389 \times 3$
$= 37{,}078$

(b) Calculate the unfunded actuarial liability and the total normal cost as at January 1, 2022.

Show all work.

Member A

PVFB $= 100 \times 12 \times (60\text{-}30) \times \ddot{a}_{60}^{(12)} \times v^{(60-44)} \times .95 +$
$100 \times 12 \times 14 \times \ddot{a}_{60}^{(12)} \times v^{(60-44)} \times .05$
$= 1200 \times 30 \times 14.8 \times .4581 \times .95 +$
$1200 \times 13 \times 14.8 \times .4581 \times .05$
$= 237{,}573$

PVFY $= .95 \text{ x } \ddot{a}_{60-44\rceil}$
$= .95 \text{ x } 11.3797 = 10.8107$

Member B
PVFB $= 100 \times 12 \times (60\text{-}35) \times \ddot{a}_{60}^{(12)} \times v^{(60-51)}$
$= 1200 \times 25 \times 14.8 \times .6446 = 286,206$
PVFY $= \ddot{a}_{60-51\rceil} = 7.4632$

Member C
PVFB $= 100 \times 12 \times (61\text{-}40) \times \ddot{a}_{60}^{(12)} \times v^{(60-59)}$
$= 1200 \times 21 \times 14.5 \times .95238 = 348,000$
PVFY $= \ddot{a}_{60-59\rceil} = 1$

$\sum PVFB_{2022} = 237,573 + 286,206 + 348,000 = 871,779$
$\sum PVFY_{2022} = 10.8107 + 7.4632 + 1 = 19.2739$

$F_{2022} = 150,000 * 1.0 = 150,000$

AAN UAL_{2022} = Expected AAN AL_{2022}
$= (\text{AAN } AL_{2021} + \text{AAN } NC_{2021}) \text{ x } 1.05 - 2021 \text{ Contributions w/int}$
$= (585,649 + 37,078) \text{ x } 1.05 - 150,000 \text{ x } 1.0$
$= 503,864$

AAN AL_{2022} = AAN $UAL_{2022} + F_{2022}$
$= 503,864 + 150,000 = 653,864$

AAN $NC_{2022} = (\sum PVFB_{2022} - AL_{2022}) / \sum PVFY_{2022} \text{ x } n$
$= (871,779 - 653,864) / 19.2739 \text{ x } 3$
$= 33,919$

(c) Calculate the impact of demographic experience, by source, between January 1, 2021 and January 1, 2022, on the normal cost **per active member**.

Show all work.

Increase in per member normal cost due to termination experience (Member A):
Exp'd $PVFB_{2022} = 219,983 \text{ x } 1.05 = 230,982$
Act'l $PVFB_{2022} = 237,573$
Exp'd $PVFY_{2022} = .95^2 \text{ x } \ddot{a}_{60-44\rceil} = 10.2702$
Act'l $PVFY_{2022} = 10.8107$
Exp'd $NC_{2022} = (871,779 + (230,982 - 237,573) - 653,864) / (19.2739 + (10.2702 - 10.8107))$
$= 211,324 / 18.7334 = 11,281$

Act'l NC_{2022} per mbr	= 33,919 / 3 = 11,306
Experience Loss	= 11,306 – 11,281 = 25

Decrease in per member normal cost due to retirement experience (Member C):

Exp'd $PVFB_{2022}$	= 338,286 x 1.05 = 355,200
Act'l $PVFB_{2022}$	= 348,000
Exp'd $PVFY_{2022}$	= 0 (*assumed to retire*)
Act'l $PVFY_{2022}$	= 1 (*assumed to retire 1 year later*)
Exp'd NC_{2022}	= (211,324 + (355,200 – 348,000)) / (18.7334 + (0 – 1)) = 12,323
NC (incl term'n exp)	= 11,281
Experience Gain	= 12,323 – 11,281 = 1,042

RETFRC, Spring 2022, Q9

Learning Outcomes:
b) Perform periodic valuations of ongoing plans, calculating normal cost and actuarial accrued liability, using a variety of cost methods

Sources:
Anderson – Pension Mathematics book

Commentary on Question:
This question was overall done poorly by candidates. Candidates generally answered part (a) of the question, but left other parts blank. Most candidates were not familiar with the cost method.

Solution:
(a) Calculate the unfunded actuarial liability and total normal cost as at January 1, 2021.

Member A

$PVFB_{2021}$ $= 1\% \times 70{,}000 \times 1.04^{(59-40)} \times (60-25) \times \ddot{a}_{60}^{(12)} \times v^{(60-40)} \times .25 +$
$1\% \times 70{,}000 \times 1.04^{(60-40)} \times (61-25) \times \ddot{a}_{61}^{(12)} \times v^{(61-40)} \times .3333 \times .75 +$
$1\% \times 70{,}000 \times 1.04^{(61-40)} \times (62-25) \times \ddot{a}_{62}^{(12)} \times v^{(62-40)} \times .5$
$= 700 \times 1.04^{(59-40)} \times 35 \times 14.8 \times v^{(60-40)} \times .25 +$
$700 \times 1.04^{(60-40)} \times 36 \times 14.5 \times v^{(61-40)} \times .25 +$
$700 \times 1.04^{(61-40)} \times 37 \times 14.3 \times v^{(62-40)} \times .50$
$= 288{,}085$

ILP AL_{2021} $= (AL_{2020} + NC_{2020}) \times 1.05$
$= (150{,}000 + 7{,}000) \times 1.05$
$= 164{,}850$

$PVFS_{2021}$ $= .25 \times 70{,}000 \times \ddot{a}_{20\urcorner}^{(j)} + .25 \times 70{,}000 \times \ddot{a}_{21\urcorner}^{(j)} + .50 \times 70{,}000 \times \ddot{a}_{22\urcorner}^{(j)}$
where $[\ddot{a}_{y-x\urcorner}^{(j)} = (1-(1+j)^{-(y-x)})/(1-1/(1+j))$ *&* $j = (1.05/1.04)-1\ ]$
$= 1{,}352{,}271$

ILP NC_{2021} $= (PVFB_{2021} - AL_{2021}) / PVFS_{2021} \times S_{2021}$
$= (288{,}085 - 164{,}850) / 1{,}352{,}271 \times 70{,}000$
$= 6{,}379$

Member B

$PVFB_{2021}$ $= 1\% \times 90{,}000 \times 1.04^{(59-50)} \times (60-30) \times \ddot{a}_{60}^{(12)} \times v^{(60-50)} \times .25 +$
$1\% \times 90{,}000 \times 1.04^{(60-50)} \times (61-30) \times \ddot{a}_{61}^{(12)} \times v^{(61-50)} \times .3333 \times .75 +$
$1\% \times 90{,}000 \times 1.04^{(61-50)} \times (62-30) \times \ddot{a}_{62}^{(12)} \times v^{(62-50)} \times .5$
$= 900 \times 1.04^{(59-50)} \times 30 \times 14.8 \times v^{(60-50)}$ x .25 +
$900 \times 1.04^{(60-50)} \times 31 \times 14.5 \times v^{(61-50)}$ x .25 +
$900 \times 1.04^{(61-50)} \times 32 \times 14.3 \times v^{(62-50)}$ x .50
$= 351{,}343$

ILP AL_{2021} $= (AL_{2020} + NC_{2020}) \times 1.05$
$= (240{,}000 + 10{,}000) \times 1.05$
$= 262{,}500$

$PVFS_{2021}$ $= .25 \times 90{,}000 \times \ddot{a}_{10\neg}^{(j)} + .25 \times 90{,}000 \times \ddot{a}_{11\neg}^{(j)} + .50 \times 90{,}000 \times \ddot{a}_{12\neg}^{(j)}$
where $[\ddot{a}_{y-x\neg}^{(j)} = (1-(1+j)^{-(y-x)})/(1-1/(1+j))$ *&* $j = (1.05/1.04)-1\ ]$
$= 964{,}238$

ILP NC_{2021} $= (PVFB_{2021} - AL_{2021}) / PVFS_{2021} \times S_{2021}$
$= (351{,}343 - 262{,}500) / 964{,}238 \times 90{,}000$
$= 8{,}292$

Member C

$PVFB_{2021}$ $= 1\% \times 100{,}000 \times 1.04^{(59-60)} \times (60-35) \times \ddot{a}_{60}^{(12)} \times v^{(60-60)} \times .25 +$
$1\% \times 100{,}000 \times 1.04^{(60-60)} \times (61-35) \times \ddot{a}_{61}^{(12)} \times v^{(61-60)} \times .3333 \times .75 +$
$1\% \times 100{,}000 \times 1.04^{(61-60)} \times (62-35) \times \ddot{a}_{62}^{(12)} \times v^{(62-60)} \times .5$
$= 1{,}000 \times 1.04^{(59-60)} \times 25 \times 14.8 \times v^{(60-40)}$ x .25 +
$1000 \times 1.04^{(60-60)} \times 26 \times 14.5 \times v^{(61-60)}$ x .25 +
$1000 \times 1.04^{(61-60)} \times 27 \times 14.3 \times v^{(62-60)}$ x .50
$= 360{,}810$

ILP AL_{2021} $= (AL_{2020} + NC_{2020}) \times 1.05$
$= (330{,}000 + 8{,}000) \times 1.05$
$= 354{,}900$

$PVFS_{2021}$ $= 0 + .25 \times 100{,}000 \times \ddot{a}_{1\neg}^{(j)} + .50 \times 100{,}000 \times \ddot{a}_{2\neg}^{(j)}$
where $[\ddot{a}_{y-x\neg}^{(j)} = (1-(1+j)^{-(y-x)})/(1-1/(1+j))$ *&* $j = (1.05/1.04)-1\ ]$
$= 124{,}525$

ILP NC_{2021} $= (PVFB_{2021} - AL_{2021}) / PVFS_{2021} \times S_{2021}$
$= (360{,}810 - 354{,}900) / 124{,}525 \times 100{,}000$
$= 4{,}746$

Tot NC_{2021} $= 6{,}379 + 8{,}292 + 4{,}746$
$= 19{,}418$

(pts for UAL)

UAL_{2021} $= AL_{2021} - F_{2021}$
$= 164{,}850 + 262{,}500 + 354{,}900 - 750{,}000$
$= 32{,}250$

(b) Calculate the unfunded actuarial liability and total normal cost as at January 1, 2022.

Member A

$PVFB_{2022}$ $= 1\% \times 77{,}000 \times 1.04^{(59-41)} \times (60-25) \times \ddot{a}_{60}^{(12)} \times v^{(60-41)} \times .25 +$
$1\% \times 77{,}000 \times 1.04^{(60-41)} \times (61-25) \times \ddot{a}_{61}^{(12)} \times v^{(61-41)} \times .3333 \times .75 +$
$1\% \times 77{,}000 \times 1.04^{(61-41)} \times (62-25) \times \ddot{a}_{62}^{(12)} \times v^{(62-41)} \times .5$
$= 770 \times 1.04^{(59-41)} \times 35 \times 14.8 \times v^{(60-41)} \times .25 +$
$770 \times 1.04^{(60-41)} \times 36 \times 14.5 \times v^{(61-41)} \times .25 +$
$770 \times 1.04^{(61-41)} \times 37 \times 14.3 \times v^{(62-41)} \times .50$
$= 319{,}940$

ILP AL_{2022} $= (AL_{2021} + NC_{2021}) \times 1.05$
$= (164{,}850 + 6{,}379) \times 1.05$
$= 179{,}791$

$PVFS_{2022}$ $= .25 \times 77{,}000 \times \ddot{a}_{19\urcorner}^{(j)} + .25 \times 77{,}000 \times \ddot{a}_{20\urcorner}^{(j)} + .50 \times 77{,}000 \times \ddot{a}_{21\urcorner}^{(j)}$
where $[\ \ddot{a}_{y-x\urcorner}^{(j)} = (1-(1+j)^{-(y-x)})/(1-1/(1+j))$ *&* $j = (1.05/1.04)-1\ ]$
$= 1{,}424{,}059$

ILP NC_{2022} $= (PVFB_{2022} - AL_{2022}) / PVFS_{2022} \times S_{2022}$
$= (319{,}940 - 179{,}791) / 1{,}424{,}059 \times 77{,}000$
$= 7{,}578$

Member B

$PVFB_{2022}$ $= 1\% \times 93{,}600 \times 1.04^{(59-51)} \times (60-30) \times \ddot{a}_{60}^{(12)} \times v^{(60-51)} \times .25 +$
$1\% \times 93{,}600 \times 1.04^{(60-51)} \times (61-30) \times \ddot{a}_{61}^{(12)} \times v^{(61-51)} \times .3333 \times .75 +$
$1\% \times 93{,}600 \times 1.04^{(61-50)} \times (62-30) \times \ddot{a}_{62}^{(12)} \times v^{(62-51)} \times .5$
$= 368{,}910$

ILP AL_{2022} $= (AL_{2021} + NC_{2021}) \times 1.05$
$= (262{,}500 + 8{,}292) \times 1.05$
$= 284{,}332$

$PVFS_{2022}$ $= .25 \times 93{,}600 \times \ddot{a}_{9\urcorner}^{(j)} + .25 \times 93{,}600 \times \ddot{a}_{10\urcorner}^{(j)} + .50 \times 93{,}600 \times \ddot{a}_{11\urcorner}^{(j)}$
where $[\ \ddot{a}_{y-x\urcorner}^{(j)} = (1-(1+j)^{-(y-x)})/(1-1/(1+j))$ *&* $j = (1.05/1.04)-1\ ]$
$= 917{,}949$

ILP NC_{2022} $= (PVFB_{2022} - AL_{2022}) / PVFS_{2022} \times S_{2022}$
$= (368{,}910 - 284{,}332) / 917{,}949 \times 93{,}600$
$= 8{,}624$

Member C

$PVFB_{2022}$ $= 1\% \times 104{,}000 \times 1.04^{(60-61)} \times (61-35) \times \ddot{a}_{61}^{(12)} \times v^{(61-61)} \times .3333 +$
$1\% \times 104{,}000 \times 1.04^{(61-61)} \times (62-35) \times \ddot{a}_{62}^{(12)} \times v^{(62-61)} \times .6667$
$= 1{,}040 \times 1.04^{(60-61)} \times 26 \times 14.5 \times v^{(61-61)} \times .3333 +$
$1{,}040 \times 1.04^{(61-61)} \times 27 \times 14.3 \times v^{(62-61)} \times .6667$
$= 380{,}616$

ILP AL_{2022} $= (AL_{2021} + NC_{2021}) \times 1.05$
$= (354{,}900 + 4{,}746) \times 1.05$
$= 377{,}628$

$PVFS_{2022}$ $= 0 + .6667 \times 104{,}000 \times \ddot{a}_{1\rceil}^{j}$
where $[\ \ddot{a}_{y-x\rceil}^{j} = (1-(1+j)^{-(y-x)})/(1-1/(1+j))$ *&* $j = (1.05/1.04)-1\ ]$
$= 69{,}333$

ILP NC_{2022} $= (PVFB_{2022} - AL_{2022})/ PVFS_{2022} \times S_{2022}$
$= (380{,}616 - 377{,}628) / 69{,}333 \times 104{,}000$
$= 4{,}481$

Tot NC_{2022} $= 7{,}578 + 8{,}624 + 4{,}481$
$= 20{,}684$

F_{2022} $= 750{,}000 \times 1.10 + 50{,}000$
$= 875{,}000$

UAL_{2022} $= AL_{2022} - F_{2022}$
$= 179{,}791 + 284{,}332 + 377{,}628 - 875{,}000$
$= -33{,}249$

(c) Calculate the impact of demographic experience, by source, between January 1, 2021 and January 1, 2022, on the normal cost.

Commentary on Question:
Most candidates did not attempt to answer this question. Some candidates did not calculate the impact of the demographic experience by source and others calculated the impact on the actuarial liability, rather than the normal cost.

Increase in NC due to salary increases (Member A):

Act'l PV FB_{2022} $= 319{,}940$
Exp'd $PVFB_{2022}$ $= 319{,}940 \times 1.04/1.1$
$= 302{,}489$
Act'l $PVFS_{2022}$ $= 1{,}424{,}059$
Exp'd $PVFS_{2022}$ $= 1{,}424{,}059 \times 1.04/1.1$
$= 1{,}346{,}383$
Exp'd NC_{2022} $= (302{,}489 - 179{,}791) / 1{,}346{,}383 \times 77{,}000 \times 1.04/1.10$
$= 6{,}634$ (or $6{,}379 \times 1.04$)
Increase $= 7{,}578 - 6{,}634$
$= 944$

Increase in NC due to retirement experience (25% of Member C not retiring):

Act'l $PVFB_{2022}$ $= 380{,}616$
Exp'd $PVFB_{2022}$ $= 360{,}810 \times 1.05$
$= 378{,}851$
Act'l $PVFS_{2022}$ $= 69{,}333$

Exp'd $PVFS_{2022}$ = 69,333 x .5 / .6667
= 51,997
Exp'd NC_{2022} = (378,851 – 377,628) / 51,997 × 104,000
= 2,446
Increase = 4,481 – 2,446
= 2,035

RETDAU, Fall 2022, Q11

Learning Outcomes:

b) Perform periodic valuations of ongoing plans, calculating normal cost and actuarial accrued liability, using a variety of cost method

Sources:
Embedded Options in Pension Plans: Valuation of Guarantees in Cash Balance Plans, sections 1, 2, 3, 4, 6, 7 & Appendix II

Commentary on Question:
This question was testing a candidate's knowledge and understanding of cash balance plans and underlying embedded options of some cash balance plan designs.

Solution:
(a) Compare and contrast the advantages of a cash balance plan and a defined contribution plan from the following perspectives:

(i) Plan sponsor

(ii) Plan participant

Commentary on Question:
To receive full credit in part (a), candidates needed to compare and contrast the advantages of a cash balance plan and a defined contribution plan from the different perspectives. Many candidates only provided similarities; both similarities and differences of the plans needed to be articulated. The illustrative solution below provides an answer that would receive full credit. Other valid answers not shown below also received credit.

(i) <u>Plan Sponsor perspective</u>

<u>Compare</u>

- Employer contributions to both plans on behalf of employees are tax deductible
- Both Plans are viewed as a benefit package for employee retention purposes

<u>Contrast</u>

- Cash Balance (CB) Plan offers the Plan sponsor funding flexibility whereas a Defined Contribution (DC) Plan is generally not flexible
- DC Plans shift the investment risk to the Plan Participant, whereas under a CB Plan, the investment risk is generally with the Plan Sponsor

- A DC Plan shifts the longevity risk to the Plan Participant, whereas under a CB Plan, the Sponsor must offer a lifetime annuity from the plan
- A Plan Sponsor can use a CB Plan as a mechanism to encourage retirement through early retirement offerings

(ii) <u>Plan Participant perspective</u>

<u>Compare</u>

- Both plans act as a capital accumulation benefit that is easy to understand
- Both plans offer lump sum portability upon termination or retirement providing employee flexibility

<u>Contrast</u>

- Under a DC Plan, employees generally make the investment decisions whereas under a CB Plan the Sponsor is responsible
- Participants' CB benefits are protected under the PBGC whereas their DC benefits are not
- A CB Plan can offer a guaranteed investment return (embedded option) to the plan participants, whereas a DC plan cannot
- DC Plans offer the ability for participant to take loans or withdrawals, but DB plans do not

(b) Calculate the value at the sample participant's retirement of the following:

(i) Enhanced money-back guarantee based on a minimum annual rate of 1%

(ii) Enhanced money-back guarantee based on a cumulative floor of 3% per year

Commentary on Question:
Part (b) tested candidates' comprehension of embedded options and understanding of how to value a guarantee provision within the cash balance plan. Many candidates struggled with calculating the cumulative floor, but some candidates did very well with this part.

The model solution for this part is in the Excel spreadsheet

(c) Describe considerations for setting assumptions to value embedded options in a cash balance plan for actuarial valuation purposes.

Commentary on Question:
Part (c) tested candidates' knowledge of the valuation methods for embedded options and the corresponding valuation assumptions. This was the most difficult part of the question for many candidates.

The actuary needs to understand that much of the risk is undiversifiable. With investment guarantees, an unfavorable market will affect all participants at once

Therefore, traditional deterministic approaches would not be appropriate to set assumptions due to this type of low frequency, high severity, asymmetric payoff of the embedded option. The assumptions need to cover the full distribution of the guarantee liability. This can be accomplished via stochastic modeling or an option-valuation based approach.

Another approach for valuing guarantees in cash balance plans can be viewed as equivalent to derivative securities based on some underlying asset or economic phenomenon and thus can be valued using option pricing theory.
Recommended approaches are as follows:

(i) Find an equivalent option trading in the market and use that option price as the price of the guarantee.

(ii) Closed Form Solution: Option price can be derived from a formula. The best-known application for option pricing is the Black-Scholes equation for valuing options.

(iii) Numerical methods: these methods are used when a closed-form solution does not exist. Two basic numerical methods are used (e.g., trees or Monte Carlo simulations)

RETFRC, Fall 2022, Q6

Learning Outcomes:
b) Perform periodic valuations of ongoing plans, calculating normal cost and actuarial accrued liability, using a variety of cost methods.

Sources:
Pension Mathematics for Actuaries, Anderson, Arthur W., 3rd Edition, 2006

Commentary on Question:
A well-prepared candidate will be able to calculate unfunded liability and normal cost using the Entry Age Normal cost method. They will also be able to reconcile experience gains/losses in respect of these items.

Solution:
(a) Calculate the unfunded accrued liability and normal cost of the plan at December 31, 2022.

Commentary on Question:
Candidates generally had some difficulty calculating the unfunded accrued liability and normal cost using the Entry Age Normal cost method, incorporating the multiple decrements. In particular, the decrements (beginning of year) were often not determined correctly.

EAN AL = PVFB - PVFNC
where EAN NC = $PVFB_w/PVFY_w = PVFB_w / \ddot{a}_{(y-w)\rceil}$

Member A

$PVFB_w$ = 75% x 100 x 12 x (60-27) x $\ddot{a}_{60}^{(12)}$ x v^{33} x .9 x .9
+ 25% x 100 x 12 x (65-27) x $\ddot{a}_{65}^{(12)}$ x v^{38} x .9 x .9
+ 10% x 100 x 12 x (30-27) x $\ddot{a}_{65}^{(12)}$ x v^{38}
+ 10% x 100 x 12 x (31-27) x $\ddot{a}_{65}^{(12)}$ x v^{38} x .9
= 75x12x33x13.9x.19987x.81 + 25x12x38x12.5x.15661x.81
+ 10x12x3x12.5x.15661 + 10x12x4x12.5x.15661x.9
= 66,836 + 18,076 + 705 + 845 **= 86,462**

$PVFY_w$ = 75% x .81 x $\ddot{a}_{33\rceil}$ + 25% x .81 x $\ddot{a}_{38\rceil}$ + 10% x $\ddot{a}_{3\rceil}$ + 10% x .9 x $\ddot{a}_{4\rceil}$
= 75% x .81 x $(1-v^{33})/(1-v)$ + 25% x .81 x $(1-v^{38})/(1-v)$
+ 10% x $(1-v^{3})/(1-v)$ + 10% x .9 x $(1-v^{4})/(1-v)$

= 75% x .81 x 16.8027 + 25% x .81 x 17.7113
+ 10% x 2.8594 + 10% x .9 x 3.7232
= 10.2076 + 3.5866 + .2859 + .3351 **= 14.4152**

NC = 86,462 / 14.4152 **= 5,998**

$PVFB_{2022}$ = 86,462 x 1.05^3 **= 100,091**

$PVFNC_{2022}$ = 5,998 x ($75\%x.81x\ddot{a}_{30\rceil} + 25\%x.81x\ddot{a}_{35\rceil} + 10\%x\ddot{a}_{0\rceil} + 10\%x.9x\ddot{a}_{1\rceil}$)
= 5,998x(75%x.81x16.1411+25%x.81x17.1929+10%x0+10%x.9)
= 80,237

AL_{2022} = 100,091 – 80,237 **= 19,854**

<u>Member B</u>

$PVFB_w$ = $75\% \times 100 \times 12 \times (62-32) \times \ddot{a}_{62}^{(12)} \times v^{30}$
+ $25\% \times 100 \times 12 \times (65-32) \times \ddot{a}_{65}^{(12)} \times v^{33}$
= 75 x 12 x 30 x 13.4 x .23138
+ 25 x 12 x 33 x 12.5 x .19987
= 83,713 + 24,734 **= 108,447**

$PVFY_w$ = $75\% \times \ddot{a}_{30\rceil} + 25\% \times \ddot{a}_{33\rceil}$
= $75\% \times (1-v^{30})/(1-v) + 25\% \times (1-v^{33})/(1-v)$
= 75% x 16.14107 + 25% x 16.80268
= 12.1058 + 4.2007 **= 16.3065**

NC = 108,447 / 16.3065 **= 6,651**

$PVFB_{2022}$ = 108,447 x 1.05^{30} **= 468,700**

$PVFNC_{2022}$ = 6,651 x ($75\% \times \ddot{a}_{0\rceil} + 25\% \times \ddot{a}_{3\rceil}$)
= 6,651 x (75% x 0 + 25% x 2.8594) **= 4,754**

AL_{2022} = 468,700 – 4,754 **= 463,946**

<u>Plan</u>

NC_{2022} = 90% x 5,998 + 25% x 6,651 **= 7,061**

UAL_{2022} = AL – F
= (19,854 + 463,946) – 500,000 **= (16,200)**

(b) You are given the following for 2023:

- Member B retires on January 1, 2023 and starts receiving a pension from the plan under the normal form.
- A contribution of $10,000 is made to the plan on January 1, 2023.
- The plan's fund earns a rate of return of 10% during 2023.

Calculate the unfunded accrued liability at December 31, 2023.

Commentary on Question:

Some candidates were able to correctly determine the updated assets and accrued liabilities, particularly for Member B. Many of the candidate did not reflect the pension payments made to Member B when calculating the updated asset amounts.

Member A

$PVFB_w$ $= 75\% \times 100 \times 12 \times (60-27) \times \ddot{a}_{60}^{(12)} \times v^{33} \times .9$
$+ 25\% \times 100 \times 12 \times (65-27) \times \ddot{a}_{65}^{(12)} \times v^{38} \times .9$
$+ 10\% \times 100 \times 12 \times (31-27) \times \ddot{a}_{65}^{(12)} \times v^{38}$
$= 75x12x33x13.9x.19987x.9 + 25x12x38x12.5x.1566 x.9$
$+ 10x12x4x12.5x.15661$
$= 74{,}261 + 20{,}085 + 940$ **= 95,286**

$PVFY_w$ $= 75\% \times .9 \times \ddot{a}_{33\rceil} + 25\% \times .9 \times \ddot{a}_{38\rceil} + 10\% \times \ddot{a}_{4\rceil}$
$= 75\%x.9x(1-v^{33})/(1-v) + 25\%x.9x(1-v^{38})/(1-v) + 10\%x(1-v^{4})/(1-v)$
$= 75\% \times .9 \times 16.8027 + 25\% \times .9 \times 17.7113 + 10\% \times 3.7232$
$= 11.3418 + 3.9851 + .3723$ **= 15.6991**

NC $= 95{,}286 / 15.6991$ **= 6,070**

$PVFB_{2023}$ $= 95{,}286 \times 1.05^4$ **= 115,821**

$PVFNC_{2023}$ $= 6{,}070 \times (75\% \times .9 \times \ddot{a}_{29\rceil} + 25\% \times .9 \times \ddot{a}_{34\rceil} + 10\% \times \ddot{a}_{0\rceil})$
$= 6{,}070 \times (75\% \times .9 \times 15.8981 + 25\% \times .9 \times 17.0025 + 10\% \times 0)$
= 88,353

AL_{2023} $= 115{,}821 - 88{,}353$ **= 27,468**

Member B

AL_{2023} $= 100 \times 12 \times 30 \times \ddot{a}_{63}^{(12)}$ (i.e., 13.1) **= 471,600**

Plan

F	= (500,000+10,000) x1.1–(100x12x30) x1.05	
	[or more precisely, w/mthly int]	
	= 561,000 – 37,800	**= 523,200**
UAL_{2023}	= AL – F	
	= (27,468 + 471,600) – 523,200	**= (24,132)**

(c) Calculate the gains and losses by source for 2023.

Commentary on Question:
Some candidates performed reasonably well in this section of the question, many correctly identifying several of the sources of gains/loss. Candidates had the most difficulty when determining the gain/loss in respect of the assets, due to Member B's pension payments. As well, some other candidates did not attempt to reconcile/check the gain/loss.

Exp'd UAL	= (16,200) x 1.05	**= (17,010)**
Total Gains	= (17,010) – (24,132)	**= 7,122**

Gain on contribution:

Gain	= (10,000 – 7,061) x 1.05	**= 3,086**

Gain on fund return:

Exp'd F_{2023}	= (500,000 + 10,000) x 1.05 – 36,000 x 1.025	
	= 498,600	
Gain	= 523,200 – 498,600	**= 24,600**

Loss on termination decrement:

Exp'd AL_{2023}	= (19,854 + 90% x 5,998) x 1.05	**= 26,515**
Loss	= 26,515 – 27,468	**= (953)**

Loss on retirement:

Exp'd AL_{2023}	= (463,946 + 25% x 6,651) x 1.05 – 36,000 x 1.025	
	= 451,989	
Loss	= 451,989 – 471,600	**= (19,611)**

Check	= 3,086 + 24,600 + (19,611) + (953)	**= 7,122**

RETFRC, Spring 2023, Q3

Learning Outcomes:
b) Perform periodic valuations of ongoing plans, calculating normal cost and actuarial accrued liability, using a variety of cost methods

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

Morneau Shepell, Handbook of Canadian Pension and Benefit Plans, 17th Edition, 2020 Ch. 3 and 6 (excluding pp., 176-183)

Pension Mathematics for Actuaries, Anderson, Arthur W., 3rd Edition, 2006 Ch. 1-4 and 7

Commentary on Question:
Candidates were asked to perform full going concern and solvency valuations including determination of gains and losses, solvency incremental cost and minimum contributions. While candidates were able to successfully complete some portions of the question, candidates struggled with other portions. Minor calculation errors were tracked through and resulted in minimal deductions if the rest of the calculations were done correctly.

Solution:
(a) Calculate the minimum required and maximum permissible employer contributions for 2022.

Commentary on Question:
Most candidates were able to correctly calculate the minimum and maximum contributions. Minor deduction if candidates did not realize the question provided beginning of year normal cost.

Minimum required contributions for 2022	73,920
Maximum permissible contributions for 2022	73,920

MVA	2,700,000
GC liability	1,898,000
PfAD	189,800
GC funding target	2,087,800
Funding excess	612,200
GC ratio	129%

MVA	2,700,000
Term expense	(100,000)
Solv liability	2,586,000
Solvency excess	14,000
Transfer ratio	104%

While the plan has a GC ratio over 125%, the transfer ratio is under 105%, so no contribution holiday is permitted. Minimum and maximum contributions are both normal cost plus PfAD.

Min and max contributions
= NC(BOY)*(1+i)*(1+PfAD)
= (13,000 + 22,000 + 29,000)*(1+0.05)*(1+0.1)
= 73,920

(b) Calculate the total normal cost, going concern liability, and the unfunded actuarial liability as at January 1, 2023.

Commentary on Question:
Candidates generally performed well on this part of the question. Most candidates were able to calculate the liabilities for the deferred and pensioners correctly but fewer candidates correctly calculated the liabilities for active members. Some common mistakes were miscalculating final average earnings, using the wrong early retirement reductions, or wrong factors.

Going concern funding target		
Going concern liabilities:		
Active members	992,862	
Deferred pensioners	113,425	
Pensioners	1,505,252	
Subtotal	2,611,539	
PfAD	182,808	
Total	2,794,346	
	Without PfAD	With PfAD
Funding excess (shortfall)	-11,539	-194,346
Normal cost	59,535	63,702

Active members (DR=3.5%):

Member 1														
x	Svc(x)	y	r	Svc(y)	v^(r-x)	qy	(y-x)px	FAE(y)	B(y)	f(x)	B(x)	annuity(r)	AL(x)	NC(x)
40	11	45	65	16	0.4231	0.10	1.00	97,281	28,017	0.6875	19,262	15.3	12,470	1,134
40	11	55	65	26	0.4231	0.05	0.90	130,738	61,185	0.4231	25,886	15.3	7,542	686
40	11	60	60	31	0.5026	1.00	0.86	151,561	84,571	0.3548	30,009	17.2	221,789	20,163
													241,800	**21,982**
Member 2														
x	Svc(x)	y	r	Svc(y)	v^(r-x)	qy	(y-x)px	FAE(y)	B(y)	f(x)	B(x)	annuity(r)	AL(x)	NC(x)
43	20	45	65	22	0.4692	0.10	1.00	147,167	58,278	0.9091	52,980	15.3	38,029	1,901
43	20	55	65	32	0.4692	0.05	0.90	201,646	116,148	0.6250	72,593	15.3	23,448	1,172
43	20	60	60	37	0.5572	1.00	0.86	233,763	155,686	0.5405	84,155	17.2	689,584	34,479
													751,061	**37,553**

FAE(y) = Salary Current Year * [1.03^(y-x-1) +1.03^(y-x-2) +1.03^(y-x-3)]/3
f(x) = Svc(x) / Svc(y)

B(x) = B(y) * f(x)
AL(x) = v^(r-x) * qy * (y-x)px * B(x) * annuity(r)
NC(x) = AL(x) / Svc(x)
PfAD = 7%

Inactive members (DR=3.5%):

	Status	x	r	benefit	v^(r-x)	annuity	AL(x)
Member 4	Deferred	51	65	12,000	0.6178	15.3	**113,425**
Member 3	Retired	55	55	32,589	1.0000	18.9	615,932
Member 5	Retired	61	61	22,800	1.0000	16.9	385,320
Member 6	Retired	76	76	48,000	1.0000	10.5	504,000
							1,505,252

Member 3 benefit = 1.8%*18*(122,000 + 118,000 + 115,000)/3*[1–3%*(60-55)]
Member 5 benefit = 2,500*12*[1–6%*(65-61)]

(c) Calculate the gains and losses on a going concern basis by source for 2022, excluding PfAD.

Commentary on Question:
Candidates generally did not complete or performed poorly on this part of the question.

Funding excess (shortfall) at January 1, 2022, excluding PfAD	802,000
Sources	
Interest on funding excess (shortfall) before PfAD	40,100
PfAD contributions with interest	6,720
Investment return	-259,720
Salary	-26,605
Retirement	29,613
Mortality	-11,700
Miscellaneous	-203
Impact of changes in assumptions	-591,744
Funding excess (shortfall) at January 1, 2023, excluding PfAD	-11,539

Active members (DR=5%):

Member 1														
x	Svc(x)	y	r	Svc(y)	v^(r-x)	qy	(y-x)px	FAE(y)	B(y)	f(x)	B(x)	annuity(r)	AL(x)	NC(x)
40	11	45	65	16	0.2953	0.10	1.00	97,281	28,017	0.6875	19,262	13.2	7,508	683
40	11	55	65	26	0.2953	0.05	0.90	130,738	61,185	0.4231	25,886	13.2	4,541	413
40	11	60	60	31	0.3769	1.00	0.86	151,561	84,571	0.3548	30,009	14.5	140,217	12,747
													152,266	**13,842**
Member 2														
x	Svc(x)	y	r	Svc(y)	v^(r-x)	qy	(y-x)px	FAE(y)	B(y)	f(x)	B(x)	annuity(r)	AL(x)	NC(x)
43	20	45	65	22	0.3418	0.10	1.00	147,167	58,278	0.9091	52,980	13.2	23,907	1,195
43	20	55	65	32	0.3418	0.05	0.90	201,646	116,148	0.6250	72,593	13.2	14,741	737
43	20	60	60	37	0.4363	1.00	0.86	233,763	155,686	0.5405	84,155	14.5	455,192	22,760
													493,839	**24,692**

Inactive members (DR=5%):

	Status	x	r	benefit	v^(r-x)	annuity	AL(x)
Member 4	Deferred	51	65	12,000	0.5051	13.2	**80,003**
Member 3	Retired	55	55	32,589	1.0000	15.7	511,647
Member 5	Retired	61	61	22,800	1.0000	14.3	326,040
Member 6	Retired	76	76	48,000	1.0000	9.5	456,000
							1,293,687

At DR=5%

G/L by individual	Expected	Actual	(G)/L	
Member 1	154,350	152,266	(2,084)	salary
Member 2	465,150	493,839	28,689	salary
Member 3	541,800	511,647	(30,153)	retirement
Member 4	79,800	80,003	203	miscellaneous
Member 5	325,500	326,040	540	retirement
Member 6	444,300	456,000	11,700	mortality
Total	2,010,900	2,019,795	8,895	

	Liabilities	Assets	Gain / (Loss)
1/1/2022	1,898,000	2,700,000	802,000
NC	67,200	73,920	6,720
BP	(48,000)	(48,000)	-
Interest	93,700	133,800	40,100
Salary	26,605		(26,605)
Mortality	11,700		(11,700)
Retirement	(29,613)		29,613
Assumption	591,744		(591,744)
Return		(259,720)	(259,720)
Misc	203		(203)
1/1/2023	2,611,539	2,600,000	(11,539)

(d) Calculate the solvency funded position as at January 1, 2023.

Commentary on Question:
Candidates generally performed well on this part of the question. Most deductions were on the active liabilities where there was incorrect application of grow-in.

Net assets	2,500,000
Present value of accrued benefits for:	
Active members	873,464
Deferred pensioners	159,600
Pensioners	1,759,890
Total solvency liability	2,792,954
Solvency excess (shortfall)	-292,954

Active members (DR=2.3%):

If 55 points, eligible to grow into early retirement subsidies
Member 1 = 40 + 11 = 51 therefore not eligible for grow-in
Member 2 = 43 + 20 = 63 therefore eligible for grow-in

Member 1					Member 2			
Benefit	16,896				Benefit	47,880		
Points	51				Points	63		
Grow in?	FALSE				Grow in?	TRUE		
SVC?	TRUE				SVC?	TRUE		
EURD	65				EURD	60		
Age	ERF	Factor	CV		Age	ERF	Factor	CV
55	0.40	16.40	110,838		55	0.85	17.50	712,215
56	0.46	15.80	122,800		56	0.88	16.80	707,858
57	0.52	15.10	132,667		57	0.91	16.10	701,490
58	0.58	14.50	142,095		58	0.94	15.50	697,612
59	0.64	13.90	150,307		59	0.97	14.80	687,365
60	0.70	13.30	157,302		60	1.00	14.20	679,896
61	0.76	12.70	163,080		61	1.00	13.50	646,380
62	0.82	12.10	167,642		62	1.00	12.90	617,652
63	0.88	11.60	172,474		63	1.00	12.30	588,924
64	0.94	11.00	174,705		64	1.00	11.80	564,984
65	1.00	10.50	177,408		65	1.00	11.20	536,256
		Max CV	177,408				Max CV	712,215
		EURD CV	177,408				EURD CV	679,896
		Solv AL	**177,408**				Solv AL	**696,056**

Inactive members (DR=2.3%):

	Status	benefit	annuity	AL(x)
Member 4	Deferred	12,000	13.3	**159,600**
Member 3	Retired	32,589	22.7	739,770
Member 5	Retired	22,800	19.9	453,720
Member 6	Retired	48,000	11.8	566,400
				1,759,890

(e) Calculate the 1-year solvency incremental cost for 2023.

Commentary on Question:
Many candidates knew how to calculate incremental cost, but some struggled to discount the projected liability or forgot to adjust for benefit payments.

Solvency incremental cost	145,235

SIC
= PV Exp 2023 BP + PV Solv AL 2024 – Solv AL 2023
= 102,220 + 2,900,000/(1+0.023) – 2,792,954
= 144,066

PV Exp 2023 BP (assuming mid-year payments)
= (Member 3 BP + Member 5 BP + Member 6 BP)/(1+0.023)^0.5
= (32,589 + 22,800 + 48,000)/(1+0.023)^0.5
= 102,220

(f) Calculate the minimum required and maximum permissible employer contributions for 2023.

Commentary on Question:
This part of the question was answered well by most of the candidates. Some candidates failed to recognize special payments are deferred 1 year.

Minimum required contributions for 2023	63,702
Maximum permissible contributions for 2023	356,656

From previously
GC deficit after PfAD = 194,396
GC ratio = 93%
NC with PfAD = 63,702

From part (c)
Solvency deficit = 292,954
Transfer ratio = 93%

No special payments in 2023 since transfer ratio over 85% and new GC SP are deferred 1 year

Minimum contribution
= NC with PfAD
= 63,702

Maximum contribution
= Max(GC deficit, solvency deficit) + NC with PfAD
= Max(194,396, 292,954) + 63,702
= 356,656

RETFRC, Spring 2023, Q5

Learning Outcomes:
b) Perform periodic valuations of ongoing plans, calculating normal cost and actuarial accrued liability, using a variety of cost methods

Sources:
Pension Mathematics for Actuaries, Anderson, Arthur W., 3rd Edition, 2006

Commentary on Question:
A well-prepared candidate will be able to calculate the accrued liability and normal cost using the Aggregate cost method, while properly reflecting multiple decrements and actual plan experience.

Solution:
(a) Calculate the normal cost of the plan as at December 31, 2022.

Commentary on Question:
Candidates generally performed well on this part of the question, determining the normal cost (NC) using the Aggregate cost method, incorporating the multiple decrements. However, quite a few candidates did have some difficulty correctly determining the Present Value of Future Salaries (PVFS) and many candidates didn't use a salary consistent with the PVFS when determining the NC [in particular, the decrements (beginning of year) were often applied to the PVFS, but not the salary].

Aggr NC = $(\sum PVFB_x - AL_t)/ \sum PVFS_x \times \sum S_x$

<u>Member A</u>

PVFB = $5\% \times [1.5\% \times 80{,}000 \times 9 \times 12.5 \times v^{36}] + (95\% \times 50\%) \times [1.5\% \times 80{,}000 \times 1.035^{31} \times 40 \times 13.9 \times v^{31} \times (1-3\% \times 5)] + (95\% \times 50\%) \times [1.5\% \times 80{,}000 \times 1.035^{36} \times 45 \times 12.5 \times v^{36}]$
= 364,611

PVFS = $5\% \times 0 + (95\% \times 50\%) \times 80{,}000 \times a^{s}_{\overline{31}|} + (95\% \times 50\%) \times 80{,}000 \times a^{s}_{\overline{36}|}$, where s = 1.035/1.05
= 2,032,597

S = 95% x 80,000 = 76,000

<u>Member B</u>

PVFB = $50\% \times [1.5\% \times 120{,}000 \times 1.035^{10} \times 30 \times 13.9 \times v^{10} \times (1-3\% \times 5)] + 50\% \times [1.5\% \times 120{,}000 \times 1.035^{15} \times 35 \times 12.5 \times v^{15}]$
= 593,566

PVFS = $50\% \times 120{,}000 \times a^{s}_{\overline{10}|} + 50\% \times 120{,}000 \times a^{s}_{\overline{15}|}$, where s = 1.035/1.05
= 1,378,200

S = 120,000

Plan

Aggr AL_t	=	F_t
	=	\$400,000
$\sum PVFB_x$	=	364,611 + 593,566
	=	958,177
$\sum PVFS_x$	=	2,032,597 + 1,378,200
	=	3,410,797
$\sum S_x$	=	76,000 + 120,000 = 196,000
Aggr NC	=	(958,177 – 400,000) / 3,410,797 * 196,000
	=	32,075

(b) Calculate the accrued liability and normal cost for the plan as at December 31, 2023.

Commentary on Question:
Candidates generally also performed reasonably well on this part of the question, determining the accrued liability and NC, while incorporating actual plan experience. However, some candidates had difficulty correctly determining Member B's retiree liability and a few candidates incorrectly excluded this liability when determining the plan's normal cost.

Member A

PVFB	=	$50\% \times [1.5\% \times 88{,}000 \times 1.035^{30} \times 40 \times 13.9 \times v^{30} \times (1-3\% \times 5)] +$ $50\% \times [1.5\% \times 88{,}000 \times 1.035^{35} \times 45 \times 12.5 \times v^{35}] +$
	=	426,931
PVFS	=	$50\% \times 88{,}000 \times a^{s}_{\overline{30}\rceil} + 50\% \times 88{,}000 \times a^{s}_{\overline{35}\rceil}$, where s = 1.035/1.05
	=	2,298,371
S	=	88,000

Member B

PVB	=	$1.5\% \times 120{,}000 \times 20 \times 12.5 \times v^{14}$
	=	227,281
PVFS	=	0 (terminated)
S	=	0

Plan

Aggr AL_t	=	F_t = (400,000 + 50,000) x 1.15
	=	517,500
$\sum PVFB_x$	=	426,931 + 227,281
	=	654,212
$\sum PVFS_x$	=	2,298,371
$\sum S_x$	=	88,000
Aggr NC	=	(654,212 – 517,500) / 2,298,371 * 88,000
	=	5,234

RETFRC, Fall 2023, Q4

Learning Outcomes:
d) Analyze and communicate the impact on cost stability of a variety of asset valuation methods

Sources:
Pension Mathematics for Actuaries, Anderson, Arthur W., 3rd Edition, 2006

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Calculate the smoothed value of assets as at January 1, 2023 using the two asset smoothing methods under consideration.

Commentary on Question:
Most candidates were familiar with Method 1 and performed well. Candidates struggled with Method 2 and many candidates did not attempt this part of the question.

Method 1:

Net Investment gain/(loss) 2022:	16,225 = 17,243-1,018
Smoothed value of assets (pre-corridor):	122,264.5 = 30,377-1/2*16,225
Corridor:	
Low – 95%	123,858.2 = 130,377*0.95
High – 105%	136,895.9 = 130,377*1.05
Smoothed value of assets (post-corridor):	123,858.15 =MIN(MAX(122,264.5,123,858.15),136,895.85)

Method 2: *This solution uses simple interest, but compound interest could be used.*

	2019	2020	2021	2022	2023
1/1/2019	**87,153**				
CF	(316)				
Interest Rate	5.75%				
Interest	5,002				
12/31/2019	**91,839**				
1/1/2020	**91,839**	**102,193**			
CF	(6,394)	(6,394)			
Interest Rate	5.25%	5.25%			
Interest	4,654	5,197			
12/31/2020	**90,099**	**100,996**			
1/1/2021	**90,099**	**100,996**	**106,990**		
CF	(3,691)	(3,691)	(3,691)		
Interest Rate	5.25%	5.25%	5.25%		
Interest	4,633	5,205	5,520		
12/31/2021	**91,041**	**102,511**	**108,819**		
1/1/2022	**91,041**	**102,511**	**108,819**	**118,869**	
CF	(3,771)	(3,771)	(3,771)	(3,771)	
Interest Rate	5.25%	5.25%	5.25%	5.25%	
Interest	4,681	5,283	5,614	6,142	
12/31/2022	**91,951**	**104,023**	**110,662**	**121,240**	
1/1/2023	**91,951**	**104,023**	**110,662**	**121,240**	**130,377**

Smoothed value of assets = AVERAGE(91,951, 104,023, 110,662, 121,240, 130,377) = 111,650

(b) Compare and contrast the two asset smoothing methods taking into consideration the Canadian Institute of Actuaries' guidance on asset valuation methods.

Commentary on Question:
Generally, candidates did not perform well on this part of the question. Most candidates did not provide enough answers to obtain full credit.

	Method 1	Method 2
Achieves Objectives	Method is expected to smooth the fluctuations in assets from year to year. However the smoothed asset value will be very close to the market value and the method may not adequately mitigate the impact of market volatility on the Company's contribution requirements to the plan because: 1) the period over which realized gains/losses are recognized is	Method is expected to smooth the fluctuations in assets from year to year.

	short, 2) the corridor is small/tight and 3) unrealized gains/losses are not being smoothed	
Tracks to market value	Includes current market value as a component and ensures that the asset value is expected to track to market value over time.	Includes current market value as a component and ensures that the asset value is expected to track to market value over time.
Does not unduly deviate from market value	Isn't expected to deviate significantly from market value. Restricts the potential for undue deviation through the use of a "corridor".	Isn't expected to deviate significantly from market value.
Has a logical and reasonable relationship to market value	Appears to be rational and consistent with the Standards of Practice.	Appears to be rational and consistent with the Standards of Practice.
Generally free of bias	Method is generally free from any bias. It uses a symmetrical corridor.	Method is generally free from any bias. Uses an expected return assumption equal to the going concern discount rate (principles underlying the determination of an appropriate expected return assumption should be similar and/or consistent to the principles underlying the determination of an appropriate going concern interest rate assumption).
Has no undue influence on investment decisions and vice versa	Smooths unrealized gains and losses only; May influence the decision to liquidate certain asset positions based on the impact it would have on the smoothed asset value.	Does not have influence on investment decisions
Is consistent with the length of typical economic cycles	Inappropriate. The smoothing period is only 2 years	Appropriate. The smoothing period is within a typical economic cycle of 5 years

RETFRC, Spring 2024, Q5

Learning Outcomes:
b) Perform periodic valuations of ongoing plans, calculating normal cost and actuarial accrued liability, using a variety of cost methods

Sources:
Pension Mathematics for Actuaries, Anderson, Arthur W., 3rd Edition, 2006

Commentary on Question:
The question is trying to test whether candidates can apply the Aggregate Cost Method to calculate the normal cost and accrued liability. Candidates did not perform well for this question in general. Many candidates did not perform the test regarding the value of the pension not being less than 2 times the accumulated employee contributions with interest. Marks were given for calculations for funds either with or without employee contributions.

Solution:
(a) Calculate the normal cost of the plan as at December 31, 2023.

a)			
Aggr NC =	(∑PVFB - AL) / ∑PVFS x ∑S		
∑PVFB =	$920,490		
∑PVFS =	$2,594,379		
AL =	$500,000		
∑S=	$178,100		
Aggr NC =	**$28,866**		

Member A:									
			4%	8%	4%				
Year	Age	Service	Earnings	Ann Contr'n	Total CWI	Accr Pen	q_t	q_r	l_x
2023			75,000						
2024	30	5	78,000	6,240	32,000	7,500	0.050	0.000	1.000
2025	31	6	81,120	6,490	39,645	9,360	0.050	0.000	0.950
2026	32	7	84,365	6,749	47,850	11,357	0.050	0.000	0.903
2027	33	8	87,739	7,019	56,648	13,498	0.050	0.000	0.857
2028	34	9	91,249	7,300	66,074	15,793	0.050	0.000	0.815
2029	35	10	94,899	7,592	76,162	18,250	0.000	0.000	0.774
2030	36	11	98,695	7,896	86,953	20,878	0.000	0.000	0.774
2031	37	12	102,643	8,211	98,484	23,687	0.000	0.000	0.774
2032	38	13	106,748	8,540	110,799	26,687	0.000	0.000	0.774
2033	39	14	111,018	8,881	123,942	29,890	0.000	0.000	0.774
2034	40	15	115,459	9,237	137,959	33,305	0.000	0.000	0.774
2035	41	16	120,077	9,606	152,899	36,947	0.000	0.000	0.774
2036	42	17	124,881	9,990	168,813	40,826	0.000	0.000	0.774
2037	43	18	129,876	10,390	185,756	44,957	0.000	0.000	0.774
2038	44	19	135,071	10,806	203,784	49,353	0.000	0.000	0.774
2039	45	20	140,474	11,238	222,957	54,028	0.000	0.000	0.774
2040	46	21	146,093	11,687	243,338	58,999	0.000	0.000	0.774
2041	47	22	151,936	12,155	264,992	64,281	0.000	0.000	0.774
2042	48	23	158,014	12,641	287,990	69,891	0.000	0.000	0.774
2043	49	24	164,334	13,147	312,404	75,847	0.000	0.000	0.774
2044	50	25	170,908	13,673	338,309	82,167	0.000	0.000	0.774
2045	51	26	177,744	14,220	365,788	88,872	0.000	0.000	0.774
2046	52	27	184,854	14,788	394,923	95,982	0.000	0.000	0.774
2047	53	28	192,248	15,380	425,804	103,518	0.000	0.000	0.774
2048	54	29	199,938	15,995	458,524	111,504	0.000	0.000	0.774
2049	55	30	207,935	16,635	493,180	119,963	0.000	0.500	0.774
2050	56	31	216,253	17,300	529,874	128,920	0.000	0.000	0.387
2051	57	32	224,903	17,992	568,716	138,402	0.000	0.000	0.387
2052	58	33	233,899	18,712	609,816	148,436	0.000	0.000	0.387
2053	59	34	243,255	19,460	653,295	159,051	0.000	0.000	0.387
2054	60	35	252,985	20,239	699,277	170,278	0.000	0.000	0.387
2055	61	36	263,104	21,048	747,891	182,149	0.000	0.000	0.387
2056	62	37	273,629	21,890	799,276	194,697	0.000	0.000	0.387
2057	63	38	284,574	22,766	853,575	207,958	0.000	0.000	0.387
2058	64	39	295,957	23,677	910,939	221,968	0.000	0.000	0.387
2059	65	40	307,795	24,624	971,527	236,765	0.000	1.000	0.387

Member A:									
					19,327			356,289	1,609,199
Year	Age	Service	Val of Def Pen	Term Ben	Term Liab	Val of Imm Pen	Rtmt Ben	Rtmt Liab	PVFS
2023									
2024	30	5	16,996	64,000	3,200	0	0	0	74,100
2025	31	6	22,272	79,290	3,587	0	0	0	69,725
2026	32	7	28,374	95,700	3,917	0	0	0	65,608
2027	33	8	35,411	113,296	4,196	0	0	0	61,734
2028	34	9	43,502	132,147	4,428	0	0	0	58,088
2029	35	10	74,628	152,325	0	0	0	0	57,535
2030	36	11	89,643	173,905	0	0	0	0	56,987
2031	37	12	106,789	196,969	0	0	0	0	56,444
2032	38	13	126,332	221,599	0	0	0	0	55,907
2033	39	14	148,566	247,884	0	0	0	0	55,374
2034	40	15	173,823	275,918	0	0	0	0	54,847
2035	41	16	202,469	305,797	0	0	0	0	54,325
2036	42	17	234,914	337,626	0	0	0	0	53,807
2037	43	18	271,616	371,511	0	0	0	0	53,295
2038	44	19	313,083	407,567	0	0	0	0	52,787
2039	45	20	359,880	445,914	0	0	0	0	52,285
2040	46	21	412,639	486,675	0	0	0	0	51,787
2041	47	22	472,059	529,985	0	0	0	0	51,293
2042	48	23	538,919	575,980	0	0	0	0	50,805
2043	49	24	614,087	624,807	0	0	0	0	50,321
2044	50	25	698,524	698,524	0	0	0	0	49,842
2045	51	26	793,300	793,300	0	0	0	0	49,367
2046	52	27	899,602	899,602	0	0	0	0	48,897
2047	53	28	1,018,749	1,018,749	0	0	0	0	48,431
2048	54	29	1,152,205	1,152,205	0	0	0	0	47,970
2049	55	30	0	0	0	1,301,595	1,301,595	148,707	23,757
2050	56	31	0	0	0	0	0	0	23,530
2051	57	32	0	0	0	0	0	0	23,306
2052	58	33	0	0	0	0	0	0	23,084
2053	59	34	0	0	0	0	0	0	22,864
2054	60	35	0	0	0	0	0	0	22,647
2055	61	36	0	0	0	0	0	0	22,431
2056	62	37	0	0	0	0	0	0	22,217
2057	63	38	0	0	0	0	0	0	22,006
2058	64	39	0	0	0	0	0	0	21,796
2059	65	40	0	0	0	2,959,567	2,959,567	207,582	0

Member B:									
Year	Age	Service	Earnings	Ann Contr'n	Total CWI	Accr Pen	q_t	q_r	l_x
2023			100,000						
2024	50	15	104,000	8,320	190,000	30,000	0.000	0.000	1.000
2025	51	16	108,160	8,653	206,086	33,280	0.000	0.000	1.000
2026	52	17	112,486	8,999	223,156	36,774	0.000	0.000	1.000
2027	53	18	116,986	9,359	241,261	40,495	0.000	0.000	1.000
2028	54	19	121,665	9,733	260,457	44,455	0.000	0.000	1.000
2029	55	20	126,532	10,123	280,803	48,666	0.000	0.500	1.000
2030	56	21	131,593	10,527	302,361	53,143	0.000	0.000	0.500
2031	57	22	136,857	10,949	325,193	57,901	0.000	0.000	0.500
2032	58	23	142,331	11,386	349,368	62,954	0.000	0.000	0.500
2033	59	24	148,024	11,842	374,957	68,319	0.000	0.000	0.500
2034	60	25	153,945	12,316	402,034	74,012	0.000	0.000	0.500
2035	61	26	160,103	12,808	430,678	80,052	0.000	0.000	0.500
2036	62	27	166,507	13,321	460,969	86,456	0.000	0.000	0.500
2037	63	28	173,168	13,853	492,995	93,244	0.000	0.000	0.500
2038	64	29	180,094	14,408	526,845	100,437	0.000	0.000	0.500
2039	65	30	187,298	14,984	562,615	108,057	0.000	1.000	0.500

Member B:									
					0			544,874	985,181
Year	Age	Service	Val of Def Pen	Term Ben	Term Liab	Val of Imm Pen	Rtmt Ben	Rtmt Liab	PVFS
2023									
2024	50	15	255,038	380,000	0	0	0	0	104,000
2025	51	16	297,068	412,173	0	0	0	0	103,010
2026	52	17	344,673	446,311	0	0	0	0	102,028
2027	53	18	398,523	482,522	0	0	0	0	101,057
2028	54	19	459,364	520,915	0	0	0	0	100,094
2029	55	20	0	0	0	561,607	561,607	220,017	49,571
2030	56	21	0	0	0	0	0	0	49,098
2031	57	22	0	0	0	0	0	0	48,631
2032	58	23	0	0	0	0	0	0	48,168
2033	59	24	0	0	0	0	0	0	47,709
2034	60	25	0	0	0	0	0	0	47,255
2035	61	26	0	0	0	0	0	0	46,805
2036	62	27	0	0	0	0	0	0	46,359
2037	63	28	0	0	0	0	0	0	45,917
2038	64	29	0	0	0	0	0	0	45,480
2039	65	30	0	0	0	1,350,708	1,350,708	324,857	0

(b) Calculate the accrued liability and normal cost for the plan as at December 31, 2024.

b)	
F =	$609,500
∑PVFB =	$833,663
∑PVFS =	$1,794,574
AL =	**$609,500**
∑S=	$81,510
Aggr NC =	**$10,182**

RETFRC, Fall 2024, Q4

Learning Outcomes:
b) Perform periodic valuations of ongoing plans, calculating normal cost and actuarial accrued liability, using a variety of cost methods
c) Analyze and communicate the pattern of cost recognition that arises under a variety of cost methods

Sources:
Pension Mathematics for Actuaries, Anderson, Arthur W., 3rd Edition, 2006

Commentary on Question:
The question was designed to test candidates' ability to calculate liabilities and normal cost under the Projected Unit Credit and Individual Level Premium cost methods.

Solution:
(a) Calculate the accrued liability and normal cost as at January 1, 2024 using the projected unit credit, prorated on service actuarial cost method.

Commentary on Question:
For part(a), majority of candidates were familiar with the PUC method and were able to get most marks. One common mistake in the calculation of the NC for Member A was to include the termination NC.

- Please see attached Excel Workbook

(b) Calculate the accrued liability and normal cost as at January 1, 2024 using the Individual Level Premium cost method.

Commentary on Question:
For part(b), a lot of candidates were not familiar with the ILP cost method and calculated the ILP NC similarly to the PUC NC.

- Please see attached Excel Workbook

(c) Explain in words, why the results from (a) and (b) above are different.

Commentary on Question:
Most candidates got marks for naming the characteristics of PUC however a lot of candidates were not familiar with the ILP cost method.

- Please see attached Excel Workbook

RETFRC, Fall 2024, Q6

Learning Outcomes:
b) Perform periodic valuations of ongoing plans, calculating normal cost and actuarial accrued liability, using a variety of cost methods

Sources:
Morneau Shepell, Handbook of Canadian Pension And Benefit Plans, 17th Edition 2020 Ch. 3

Pension Mathematics for Actuaries, Anderson, Arthure W. 3rd Edition, 2006 Ch. 2, 4 & 7

Guidance on Asset Valuation Methods

Asset Valuation Methods under ERISA, Pension Forum, Sep 2002, Ch. 1 & 3

RET201-102-25: Pension Funding Exercises (background only)

Commentary on Question:
This question was meant to test the candidate's knowledge of valuation of liabilities, asset smoothing and measurements of gains/losses. Candidates generally performed well at calculating the expected assets and liabilities as well as recognizing the termination gain for Member B. Most candidates recognized that Member A had gains/losses for retirement, actual salary experience and the salary assumption change but were not able to appropriately attribute the value to each source.

Candidates did not perform well at smoothing of the assets and overall calculation of the gains/losses on assets. Common mistakes were using the full investment return for 2024 instead of the excess above the expected for smoothing or using the 2022 and 2023 investment gains/losses and ignoring the 2024 experience.

Solution:
Calculate the gains and losses by source for 2024.

Please see excel spreadsheet for solution.

RET201 Learning Objective 2 Model Solutions

RETRPIRM, Fall 2020, Q3

Learning Outcomes:
b) Describe and explain the different perspectives on the selection and development of assumptions, including financial economics.

Sources:
RET201-104-25: Use of Financial Economics in Pension Actuarial and Investment Practice

Pension Actuary's Guide to Financial Economics and Pension Arbitrage Example

Commentary on Question:
Generally this question was completed well.

Solution:
(a) Describe how to measure the following items from a financial economics perspective.

(i) Market Value of Assets; and

(ii) Liabilities

Commentary on Question:
Most candidates received full credit for this part.

(i) Market value of assets is the current fair value of assets of the pension portfolio.
It should not include smoothing adjustments, which would mislead investors as to the actual funds available to secure member benefits.

(ii) Liabilities from a financial economics perspective should be marked-to-market.
They should be measured without salary projections and at discount rates based on the prevailing corporate yield curve.

(b) Calculate the impact of the new portfolio on your after-tax returns by filing out the tables in Excel.

Commentary on Question:
Some candidates had difficulty in the calculation of pre-tax income – in particular how to apply the corporate tax rate.

Table 1: Individual Investor Portfolio Return (60/40 Portfolio)				
Pension Plan: 60% Equity / 40% Bonds	**Investor Holdings**	**Pre-tax Income**	**Personal Tax**	**After-tax Income**
Indirect holdings through corporate pension plan				
Equity	195,000	13,650		
Bond	130,000	3,900		
Total indirect holdings	325,000	17,550	2,632.50	14,917.50
Investors direct holdings				
Equity	4,805,000	336,350	-50,452.50	285,897.50
Bond	4,870,000	146,100	-58,440	87,660
Total direct holdings	9,675,000			373,557.50
Total portfolio	10,000,000			388,475

Table 2: Individual Investor Portfolio Return (Bond Portfolio)				
Pension Plan: 100% Bonds	**Investor Holdings**	**Pre-tax Income**	**Personal Tax**	**After-tax Income**
Indirect holdings through corporate pension plan				
Equity	0	0		
Bond	325,000	9,750		
Total indirect holdings	325,000	9,750	-1,462.50	8,287.50
Investors direct holdings				
Equity	5,000,000	350,000	-52,500	297,500
Bond	4,675,000	140,250	-56,100	84,150
Total direct holdings	9,675,000			381,650
Total portfolio	10,000,000			389,937.50

(c) Explain why shifting the pension plan's asset allocation to bonds represents an arbitrage opportunity.

Commentary on Question:
Most candidates understood and explained the concepts well, but sometimes there was a lack of completeness.

Bonds held in your portfolio are taxed at the individual bond tax rate of 40%.

Bonds held indirectly through the corporate pension plan are taxed at the individual equity tax rate of 15% since they increase the value of the company shares.

The bond investment return is therefore taxed at a lower level if held through the corporate pension plan
The greater the return on bonds, the greater the arbitrage opportunity
The greater the difference in individual tax rates on bonds vs equity, the greater the arbitrage opportunity
Return on the equity investments do not impact the arbitrage opportunity since they're taxed at 15% in all scenarios

RETFRC, Fall 2020, Q9

Learning Outcomes:
c) Recommend appropriate assumptions and defend the selection
d) Evaluate actual experience, including comparisons to assumptions

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

Credibility Educational Resource for Pension Actuaries

Selecting and Documenting Mortality Assumptions for Measuring Pension Obligations

CIA Educational Note, Dec 2017

Commentary on Question:
Candidates answered this question well. In part a) many candidates did not mention credibility considerations of using amounts vs count weighted experience data and lost marks. In part b) most candidates correctly identified adjustments required to the standard mortality table. Although only a few candidates identified other adjustments that might be required such as size adjustments, industry, credibility etc.

Solution:
(a) Assess the appropriateness of using amounts- versus counts-weighted results.

The actual/expected ratio for benefits vs counts differ significantly based on this experience study, reflecting the benefits are not homogenously distributed. Count and benefit weighted results will differ significantly.

Pension liabilities are amounts-weighted (i.e., individuals with higher benefit amounts contribute more to the pension liability than those with lower benefit amounts, all else being equal).

Benefit amounts are often a predictor of mortality rates. Therefore, amount weighted results will be more accurate to the degree that the distribution of amounts is similar in the future.

The standard mortality valuation tables are generally developed using amounts-weighting. So, if the experience study does not use amounts-weighting, there may be inconsistencies in the development of the appropriate adjustment.

Count weighted results might be appropriate for flat dollar benefit formulas, or plans with homogenous characteristics. However, this pension plan is a final average plan so a benefit weighted approach is appropriate.

Experience study performed on an amounts basis generally requires more exposures to achieve full credibility than a study based on number of lives. Therefore, a counts based study might offer better credibility.

(b) Recommend adjustments to the standard mortality table based on the experience study.

The shape of the standard table is a good approximation of the shape of actual experience for earlier ages (where most of the actual experience is). Therefore, a scaling adjustment to the standard table is recommended.

The actual mortality is higher for ages prior to 75, therefore an upward adjustment to the standard mortality table is recommended. Based on the credibility criteria (full/partial), a credibility factor will be applied to actual/expected ratio in calculating a standard mortality table multiplier.

Size adjustments: A size adjustment might be appropriate if the pension plans benefit distribution varies significantly from the industry distribution
Adjustments by Sub-groups: Adjustments might also be required based on sub-groups such as Male/Female, White collar/Blue collar, Industry, public/private sector, and other socio-economic indicators

Adjustments by age-groups. Any such adjustments should consider credibility per age group and smoothing adjustments.

RETDAC, Spring 2021, Q6

Learning Outcomes:
a) Evaluate appropriateness of current assumptions
b) Describe and explain the different perspectives on the selection and development of assumptions, including financial economics
c) Recommend appropriate assumptions and defend the selection
d) Evaluate actual experience, including comparisons to assumptions

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

Forecasting Investment Returns and Expected Return Assumptions for Pension Actuaries

Selecting and Documenting Pension Assumptions Other Than Discount Rate, Investment Return, and Mortality, AAA, Jun 2023

Selecting and Documenting Mortality Assumptions for Measuring Pension Obligations, AAA, Jan 2023

Selecting Investment Return Assumptions: Considerations When Using Arithmetic and Geometric Averages, AAA, Jul 2019

RET201-105-25: IFRS and US GAAP: Similarities and Differences, Ch. 5 only

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Calculate the following for the pension plan portfolio:

(i) Arithmetic return

(ii) Geometric return

Show all work.

Commentary on Question:
Successful candidates identified formulas and showed all calculations.

Many candidates struggled with the geometric return in part (ii). Candidates who successfully used the approximation method to calculate the expected geometric return were given full credit. Partial credit was given if candidates only identified the appropriate formulae and attempted the calculation of either the standard deviation (variance) or expected geometric return.

The model solution for this part is in the Excel spreadsheet.

(b) Critique each of the assumptions used to calculate the financial disclosure information.

Commentary on Question:
To receive full credit, candidates needed to address each of the 8 listed assumptions.

Successful candidates provided explanations in critiquing the appropriateness of each assumption. A number of candidates failed to recognize significance of the unreduced benefit at age 60 and how that should impact retirement age assumption.

The model solution below is a sample of an answer that would receive full credit and is not intended to be an exhaustive list of possible explanations.

Expected Return on Plan Assets
- The Expected Return on Plan Assets determined in part A is 5.28%, therefore a 6.00% assumption appears too high based on the information available.
- Should reflect the average rate of earnings expected on the funds invested or to be invested to provide for benefits.

Discount Rate
- Based on the rate at which the benefit obligation could be effectively settled (rate of return on high-quality fixed-income investment with similar durations to those of the benefit obligation). i.e. based on marked-to-market bond rates
- Setting the discount rate equal to the Expected Return on Assets is not compliant with ASC 715 accounting standards. In this case, we know the Expected Return on Plan Assets value includes expectations related to equities

Salary Scale

- When compared to the expected long-term inflation assumption of 2.0%, the salary assumption appears insufficient to provide for future increases in salary.
- Salary assumption is typically set using a building block approach (inflation + productivity growth + merit). In this case, the assumption does not even provide for inflation.

Inflation

- An appropriate inflation assumption may include consumer price indices, the implicit price deflator, forecasts of inflation, yields on government securities or various maturities and yields on nominal and inflation-indexed debt.

Retirement Age

- A single retirement age may be appropriate in different circumstances, especially if the plan has a small membership with limited credibility, but it would generally not be appropriate for larger plans.
- Given the plan is unreduced at age 60, assuming members retire once their benefit is unreduced is reasonable. This is taking the plan design into consideration when setting the assumption.
- Other factors the actuary may consider are: employer-specific or job-related factors (occupation, employment policies, etc.), design of social insurance programs, and availability of other employer-sponsored postretirement programs.

Termination Assumption

- The actuary should consider employer-specific or job-related factors such as occupation, employment policies, etc and plan provisions when setting the termination assumption.
- In the case of a small active membership, not having a termination scale may be reasonable, but it would generally not be appropriate for larger plans.

Mortality Table

- It is only reasonable to adjust mortality base rates when credible plan experience is available.
- Depending on the size of the plan, the 90% adjustment of standard mortality base rates may or may not be reasonable.

Mortality Improvement Scale

- Actuaries should reflect mortality improvement scales.
- Actuaries should likely use Scale CPM-B

(c) Describe the economic assumption disclosures that an actuary must communicate in an actuarial report under Actuarial Standard of Practice No. 27, Selection of Economic Assumptions for Measuring Pension Obligations.

Commentary on Question:
Successful candidates were able to thoroughly describe the required disclosure items pertaining to economic assumptions (based on ASOP 27). The following solution illustrates an answer that would receive full credit. It is not an exhaustive list of descriptions of the economic disclosures; other correct answers were also awarded credit.

Assumptions used

- Describe each significant assumption used in the measurement.
- Sufficient detail should be shown to permit another qualified actuary to assess the level and pattern of each assumption.

Rationale for Assumptions

- Disclose the information and analysis used in selecting each economic assumption that has significant effect on measurement.

Change in Assumptions

- Disclose any changes in the economic assumptions from those previously used.

Changes in Circumstances

- Disclose change in circumstances known to the actuary that occur after the measurement date and that would affect economic assumptions selected as of the measurement date.

Disclosure of Prescribed Assumptions or Methods

- State the source of any prescribed assumptions or methods.
- With respect to prescribed assumptions or methods set by another party:
  - Any prescribed assumption or method set by another party that conflicts with what, in the actuary's professional judgment, would be reasonable for the purposes of the measurement; or
  - Any prescribed assumption or method set by another party that the actuary is unable to evaluate for reasonableness for the purpose of the measurement.

Additional Disclosures

- Disclose reliance on other sources and thereby disclaims responsibility for any material assumption or method set by a party other than the actuary.

(d) Explain three approaches to determine the expected return on plan assets.

Commentary on Question:
To receive full credit, candidates needed to reflect the implementation of the new investment strategy, which will phase in over three years, in explaining three approaches to determine the assumption. Many candidates provided generic investment strategy answers which ignored Company ABC's three year investment strategy. Candidates were granted partial marks for describing the assumption setting methodology based on current or future investment strategy.

Development of a blended expected return assumption

- Consisting of a single rate that reflects both the current and future expected asset allocations.
- This method would determine the blended rate based on the effective date of the new investment strategy.
- The weighting of the two end points depends on how quickly the asset allocation is expected to change and the timing of projected plan cash flows.

Use a select-and-ultimate expected return assumption

- Anticipates different levels of investment returns for different future time periods.
- One expected return on assets for the current investment strategy and a new expected return on assets once the new investment strategy becomes effective (in this case, 2 different rates would be used).

Base the expected return assumption on new investment strategy

- Only the anticipated future asset allocation would be used for the expected return on assets; no weight would be given to the current allocation.

RETDAC/U, Spring 2021, Q9

Learning Outcomes:
b) Describe and explain the different perspectives on the selection and development of assumptions, including financial economics
c) Recommend appropriate assumptions and defend the selection

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

Selecting and Documenting Pension Assumptions Other Than Discount Rate, Investment Return, and Mortality, AAA, Jun 2023

Selecting and Documenting Mortality Assumptions for Measuring Pension Obligations, AAA, Jan 2023

Credibility Educational Resource for Pension Actuaries, Society of Actuaries

Commentary on Question:
This question tested candidates' knowledge on how to appropriately set the mortality assumption. Candidates generally performed well on most parts of this question. Candidates that performed well in part a) correctly identified the factors. Candidates that performed well in part b) were those who honed into the specifics of the plans and provided appropriate rationale of factors to take into consideration. Lastly, candidates that performed well on part c) identified whether or not there was fully credible information and used that information to determine the credibility factor and develop the ultimate weight to be given to plan experience.

The model solution shown is not exhaustive of items which could be considered in parts a or b. It represents an answer that would receive full credit. Candidates also received credit if they included other relevant considerations related to the mortality assumption. Partial credit was provided in part c) if candidates knew how to do part of the calculations.

Solution:
(a) List the factors actuaries should take into account in the selection of mortality and mortality improvements, according to Actuarial Standard of Practice No. 35, Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations.

- Possible use of different assumptions before and after retirement (ex. no pre-retirement mortality for small plan)
- Possible use of different assumption for disabled lives than healthy lives
- Should reflect impact of mortality improvement after measurement date

- Mortality table should reflect expected mortality rates as of the measurement date (including improvement from effective date of table to the measurement date)

(b) Describe the considerations for setting the mortality assumption for the following:

(i) Plan A

(ii) Plan B

(iii) Plan C

(i) **Plan A (Unit benefit plan):**

- Since employee population is 85% male, may only have credible data to create credibility factor for male participants.
- Expect the retiree population to also be predominantly male (even though there could be some female beneficiaries receiving survivor benefits)
- Female mortality in the plan will likely be based on standard table without adjustment
- Should analyze data of those currently in pay for study (ignore those not yet in pay)
- Should use counts weighted methodology to determine credibility factor since plan formula not based on salaries
- Standard table for this plan should likely be blue-collar since hourly union employees
- Standard table for this plan may be a headcount weighted table
- Standard table should be a recently released table
- Aim to collect 3-5 years of data if do study to develop credibility factor for mortality table

(ii) **Plan B (FAP plan):**

- Since plan is 50/50 male female, both genders may have credible data for study
- Should evaluate deaths separately by gender to determine separate credibility factors
- Should analyze data of those currently in pay for study (ignore those not yet in pay)
- Should use amounts weighted methodology to determine credibility factor since plan formula based on salary
- Will need to include benefit amounts in study data
- Standard table for plan may be white collar or could be aggregate mix since salaried non-union employees benefit
- Standard table for this plan should be amounts-weighted
- Standard table should be a recently released table
- Aim to collect 3-5 years of data

(iii) **Plan C (plan with lump sum option):**

- Plan will not have enough data to be credible since most people take a lump sum
  -> very few annuitants
- Should likely assign 0 credibility to plan experience and instead fully rely on a standard mortality table
- Standard table should be white collar since plan is for physicians
- Standard table should be amounts weighted since benefit is based on salaries
- Standard table should be a recently released table
- Standard table should be sex-based (even if lump sums based on unisex table)

(c) Calculate the multipliers to be applied to the standard mortality table base rates based on the plan experience and credibility theory for the following:

(i) Males

(ii) Females

Show all work.

The model solution for this part is in the Excel spreadsheet

RETDAU, Spring 2021, Q6

Learning Outcomes:
a) Evaluate appropriateness of current assumptions
b) Describe and explain the different perspectives on the selection and development of assumptions, including financial economics
c) Recommend appropriate assumptions and defend the selection
d) Evaluate actual experience, including comparisons to assumptions

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

Forecasting Investment Returns and Expected Return Assumptions for Pension Actuaries

Selecting and Documenting Pension Assumptions Other Than Discount Rate, Investment Return, and Mortality, AAA, Jun 2023

Selecting and Documenting Mortality Assumptions for Measuring Pension Obligations, AAA, Jan 2023

Selecting Investment Return Assumptions: Considerations When Using Arithmetic and Geometric Averages, AAA, Jul 2019

RET201-105-25: IFRS and US GAAP: Similarities and Differences, Ch. 5 only

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Calculate the following for the pension plan portfolio:

(iii) Arithmetic return

(iv) Geometric return

Show all work.

Commentary on Question:
Successful candidates identified formulas and showed all calculations.

Many candidates struggled with the geometric return in part (ii). Candidates who successfully used the approximation method to calculate the expected geometric return were given full credit. Partial credit was given if candidates only identified the appropriate formulae and attempted the calculation of either the standard deviation (variance) or expected geometric return.

The model solution for this part is in the Excel spreadsheet.

(b) Critique each of the assumptions used to calculate the financial disclosure information.

Commentary on Question:
To receive full credit, candidates needed to address each of the 8 listed assumptions.

Successful candidates provided explanations in critiquing the appropriateness of each assumption. A number of candidates failed to recognize significance of the unreduced benefit at age 60 and how that should impact retirement age assumption.

The model solution below is a sample of an answer that would receive full credit and is not intended to be an exhaustive list of possible explanations.

Expected Return on Plan Assets

- The Expected Return on Plan Assets determined in part A is 5.28%, therefore a 6.00% assumption appears too high based on the information available.
- Should reflect the average rate of earnings expected on the funds invested or to be invested to provide for benefits.

Discount Rate

- Based on the rate at which the benefit obligation could be effectively settled (rate of return on high-quality fixed-income investment with similar durations to those of the benefit obligation). i.e. based on marked-to-market bond rates
- Setting the discount rate equal to the Expected Return on Assets is not compliant with ASC 715 accounting standards. In this case, we know the Expected Return on Plan Assets value includes expectations related to equities

Salary Scale

- When compared to the expected long-term inflation assumption of 2.0%, the salary assumption appears insufficient to provide for future increases in salary.
- Salary assumption is typically set using a building block approach (inflation + productivity growth + merit). In this case, the assumption does not even provide for inflation.

Inflation

- An appropriate inflation assumption may include consumer price indices, the implicit price deflator, forecasts of inflation, yields on government securities or various maturities and yields on nominal and inflation-indexed debt.

Retirement Age

- A single retirement age may be appropriate in different circumstances, especially if the plan has a small membership with limited credibility, but it would generally not be appropriate for larger plans.
- Given the plan is unreduced at age 60, assuming members retire once their benefit is unreduced is reasonable. This is taking the plan design into consideration when setting the assumption.
- Other factors the actuary may consider are: employer-specific or job-related factors (occupation, employment policies, etc.), design of social insurance programs, and availability of other employer-sponsored postretirement programs.

Termination Assumption

- The actuary should consider employer-specific or job-related factors such as occupation, employment policies, etc and plan provisions when setting the termination assumption.
- In the case of a small active membership, not having a termination scale may be reasonable, but it would generally not be appropriate for larger plans.

Mortality Table

- It is only reasonable to adjust mortality base rates when credible plan experience is available.
- Depending on the size of the plan, the 90% adjustment of standard mortality base rates may or may not be reasonable.

Mortality Improvement Scale

- Actuaries should reflect mortality improvement scales.
- Actuaries should use a recent MP scale (example MP-2020)

(c) Describe the economic assumption disclosures that an actuary must communicate in an actuarial report under Actuarial Standard of Practice No. 27, Selection of Economic Assumptions for Measuring Pension Obligations.

Commentary on Question:
Successful candidates were able to thoroughly describe the required disclosure items pertaining to economic assumptions (based on ASOP 27). The following solution illustrates an answer that would receive full credit. It is not an exhaustive list of descriptions of the economic disclosures; other correct answers were also awarded credit.

Assumptions used

- Describe each significant assumption used in the measurement.
- Sufficient detail should be shown to permit another qualified actuary to assess the level and pattern of each assumption.

Rationale for Assumptions

- Disclose the information and analysis used in selecting each economic assumption that has significant effect on measurement.

Change in Assumptions
- Disclose any changes in the economic assumptions from those previously used.

Changes in Circumstances
- Disclose change in circumstances known to the actuary that occur after the measurement date and that would affect economic assumptions selected as of the measurement date.

Disclosure of Prescribed Assumptions or Methods
- State the source of any prescribed assumptions or methods.
- With respect to prescribed assumptions or methods set by another party:
  - Any prescribed assumption or method set by another party that conflicts with what, in the actuary's professional judgment, would be reasonable for the purposes of the measurement; or
  - Any prescribed assumption or method set by another party that the actuary is unable to evaluate for reasonableness for the purpose of the measurement.

Additional Disclosures
- Disclose reliance on other sources and thereby disclaims responsibility for any material assumption or method set by a party other than the actuary.

(d) Explain three approaches to determine the expected return on plan assets.

Commentary on Question:
To receive full credit, candidates needed to reflect the implementation of the new investment strategy, which will phase in over three years, in explaining three approaches to determine the assumption. Many candidates provided generic investment strategy answers which ignored Company ABC's three year investment strategy. Candidates were granted partial marks for describing the assumption setting methodology based on current or future investment strategy.

Development of a blended expected return assumption
- Consisting of a single rate that reflects both the current and future expected asset allocations.
- This method would determine the blended rate based on the effective date of the new investment strategy.
- The weighting of the two end points depends on how quickly the asset allocation is expected to change and the timing of projected plan cash flows.

Use a select-and-ultimate expected return assumption
- Anticipates different levels of investment returns for different future time periods.

- One expected return on assets for the current investment strategy and a new expected return on assets once the new investment strategy becomes effective (in this case, 2 different rates would be used).

Base the expected return assumption on new investment strategy

- Only the anticipated future asset allocation would be used for the expected return on assets; no weight would be given to the current allocation.

RETRPIRM, Spring 2021, Q1

Learning Outcomes:
b) Describe and explain the different perspectives on the selection and development of assumptions, including financial economics

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

Pension Actuary's Guide to Financial Economics pages 6-7, section 4 p. 14-21, p.24

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Critique the following statement made by the CFO of ABC Company: "The only true representation of the liability of a pension plan is calculated by discounting its cash flows using the risk-free interest rate."

Commentary on Question:
Candidates were expected to recognize that plan cashflows should be discounted relative to a cash-flow matching portfolio and also comment on multiple shortfalls of the CFO's proposed approach. Candidates performed reasonably well on this question. The answer below includes more detail than would be needed for full credit.

Pension plan liability cashflows should be discounted with respect to the expected rate of return of the plan's assets in a cash-flow matching portfolio. This portfolio could include a variety of asset classes in addition to risk-free bonds, including corporate bonds, equities, or other asset classes. Risk-free interest rates alone may not capture all of the risk inherent in a liability; for example, if the liability contains economic risk (i.e., salary growth), the risk-free rate would not represent the cost of the future accrual. Typically, discounting using the risk-free interest rate would give the solvency liability, which includes all risk premium.

(b) Describe the advantages and disadvantages of this investment strategy.

Commentary on Question:
In order to receive full credit for this question, candidates were expected to provide multiple advantages and disadvantages to a 100% bond portfolio. Candidates performed reasonably well on this question. The answer below includes more advantages and disadvantages than would be needed for full credit.

Advantages

- Investing 100% in bonds increases interest rate protection, which can reduce both contribution volatility and funded status volatility
- By gaining fixed income exposure through the pension plan, shareholders can experience a tax arbitrage opportunity, which may drive the attractiveness of the stock
- Bonds have similar characteristics to pension liabilities, reducing risk through improving the liability match
- Government bonds have low default risk

Disadvantages

- There is a scarcity of long-term Treasuries, which contributes to lower yields for Treasuries relative to other bonds
- Because the plan is not fully funded, investing 100% in bonds requires the plan to forgo the potential for growth assets to help reduce the plan deficit
- Bonds may introduce a large amount of credit spread and yield curve risk
- Typically, bonds do not help with hedging the economic risk in the liability, such as future accruals
- A 100% bond portfolio may not be appropriately diversified
- Bonds typically do not protect against inflation

RETFRC, Spring 2021, Q4

Learning Outcomes:
b) Describe and explain the different perspectives on the selection and development of assumptions, including financial economics
c) Recommend appropriate assumptions and defend the selection
d) Evaluate actual experience, including comparisons to assumptions

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

Selecting and Documenting Pension Assumptions Other Than Discount Rate, Investment Return, and Mortality, AAA, Jun 2023

Commentary on Question:
Candidates were expected to understand the assumption setting process in the context of credible and non-credible experience. Marks were not given for non-relevant lists – successful candidates applied their knowledge to the specifics of the question.

Solution:
(a) Assess the appropriateness of the current retirement and termination assumptions.

- The actuary should use professional judgment to estimate possible future outcomes based on past experience and future expectations and select assumptions based upon application of that professional judgment.

- The actuary should select a reasonable assumption by ensuring it is appropriate for the purpose of the measurement.

Retirement Assumption:

- Given that the retirement assumption is credible, plan experience could be used. The plan specific experience shows that the retirement rates increase closer to normal retirement age.

- The retirement rates are much higher for age 62 – 65 based on plan experience. The plan provides unreduced pension for members with 20 years of service, therefore should be reflected in the assumptions.

- The assumption should take into consideration of plan design. Given the early retirement subsidies, the assumption may need to be revised to an age and service base table.

- The actuary may want to consider other factors when setting the assumptions, such as the availability of other employer-sponsored

postretirement benefit programs available and the design of, and date of anticipated payment from, social insurance programs.

Termination Assumption:

- Given that the plan experience is not credible for termination scale, the actuary should consider all the relevant assumption universe. This could be experience studies or published tables based on experience under uninsured plans and annuity contracts, or based on any other populations considered representative of the group at hand;

- The actuary may want to consider the significance and materiality of having a refined termination assumption table taking into consideration plan provisions, such as early retirement benefits, vesting schedule, or payout options.

- The actuary may want to consider other relevant factors that may affect future experience, such as the economic conditions of the area or industry, availability of alternative employment, or the human resources policy or practices of the employer.

- Job-related factors should be considered when setting the assumptions such as occupation, work environment, unionization, hazardous conditions, and location of employment.

(b) Recommend changes to the current retirement assumption. Justify your recommendation.

- Recommend updating the retirement assumption to an age and service based table.

- This is a significant service-based change to the early retirement subsidies, therefore should be reflected accordingly as this factor is anticipated to affect experience. The assumption format has the potential to model plan experience and will affect the results of the valuation.

- Retirement rates should increase for members who have 30 or more years of credited service. In the absence of plan specific experience, rates from published tables based on experience under uninsured plans and annuity contracts, or based on any other populations considered representative of the group at hand.

- This change in plan provision would encourage members to retire early and the retirement rates are expected to increase based on actuarial judgement. It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data

RETFRC, Spring 2021, Q7

Learning Outcomes:
c) Recommend appropriate assumptions and defend the selection
d) Evaluate actual experience, including comparisons to assumptions

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

Selecting and Documenting Pension Assumptions Other Than Discount Rate, Investment Return, and Mortality, AAA, Jun 2023

Credibility Educational Resource for Pension Actuaries, SOA, Aug 2017

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Assess the appropriateness of the termination assumption used in the January 1, 2020 AVR.

Commentary on Question:
Most candidates performed well on this question, recognizing that the termination assumption was not appropriate and the downsizing event was not expected to occur again.

- An assumption is reasonable if it is appropriate for the purpose of the measurement and if it reflects the actuary's estimate of future experience.
- Since no further downsizing is planned or expected, the termination assumption was not appropriate as it was based on data that does not represent a reasonable expectation of future experience.
- In setting the new termination assumption, the prior Actuary should have carved out the variance in experience due to a one-time downsizing event that was not expected to occur again.
- The assumed termination rates should be much lower once the one-time downsizing impact is removed.

(b) Describe how the termination assumption should have been developed based on the Standards of Practice.

Commentary on Question:
Most candidates were able to identify that the experience resulting from the downsizing event should be excluded from the termination assumption, but few candidates listed employer-specific/job-related factors or were able to identify the significant difference in assumption compared to the previous valuation report.

- The actuary should consider employer-specific or job-related factors such as occupation, employment, work environment, and hazardous conditions.
- In this case, the prior Actuary should have had a discussion with the client as to why termination rates had increased so much as compared to the previous valuation.
- The Actuary would have realized that a one-time downsizing event had happened and to request more information regarding the individual members who were true terminations and who were terminated as part of the downsizing.
- Once receiving this information, the Actuary could have performed an experience study using only the members who were true terminations as experience to produce a long-term expectation for termination.

(c) Describe the steps that should be taken and considerations for developing the credibility procedure for using the experience data.

Commentary on Question:
Many candidates had difficulty answering this question. Candidates were unable to describe the steps for developing a credibility procedure and many candidates did not provide enough considerations to receive full points.

- Credibility Procedure is a process that involves the following:
    - the evaluation of subject experience (estimated rate of turnover based on experience from the plan's population) for potential use in setting the assumptions without reference to other data; or
    - the identification of relevant experience (estimated rate of turnover from a standard table) and the selection and implementation of a method for blending the relevant experience with the subject experience.
- The amount of weight given to each depends on (1) the "accuracy" of the relevant experience and (2) the volatility of subject experience.
- Large variability in subject experience implies less reliable estimates and therefore less credibility. Generally, more subject experience data result in more accurate estimates, less variability and thus higher credibility.

- In selecting or developing a credibility procedure, the actuary should consider the following criteria:
    - Whether the data is expected to produce reasonable results
    - Whether the data is appropriate for the intended use and purpose
    - Whether the procedure is practical to implement when taking into consideration both the cost and benefit of employing a procedure.
- The actuary should consider the predictive value of more recent experience as compared to experience from earlier time periods
- Selection of Relevant Experience:
    - The actuary should exercise professional judgment and use care in selecting and using relevant experience.
    - Such relevant experience should have characteristics similar to the subject experience. If subject experience is a material part of relevant experience, the actuary should use professional judgment in deciding whether and how to use that relevant experience.
- In carrying out credibility procedures, the actuary should consider the homogeneity of both the subject experience and the relevant experience
- Professional judgement: In some situations, an acceptable procedure for blending the subject experience with the relevant experience may be based on the actuary assigning full, partial, or zero credibility to the subject experience without using a rigorous mathematical model.

RETRPIRM, Fall 2021, Q4

Learning Outcomes:
b) Describe and explain the different perspectives on the selection and development of assumptions, including financial economics

Sources:
RET201-104-25: Use of Financial Economics in Pension Actuarial and Investment Practice

Commentary on Question:
Commentary listed underneath question component.

Solution:
Assess the features of the accounting standards applicable to the following types of defined benefit pension plans according to the principles of financial economics:

Commentary on Question:
Most candidates performed well on this question and were able to identify the features of the accounting standards of both private sector and public sector plans and whether those features are consistent or inconsistent with the principles of financial economics. Answers from both the U.S. and Canadian standards were accepted, as well as any other valid answers not included below.

(a) Private sector plans.

Commentary on Question:
Full credit was given to candidates that provided at least 6 acceptable answers.

The following are acceptable answers regarding the U.S. standards:

- Pension expense uses a discount rate at which benefits could be effectively settled. In practice that discount rate has usually been based on investment-grade corporate bond yields, which would be consistent with financial economics (FE) measurements for most plan sponsors.
- The liability and normal cost were measured using projected salaries for most purposes so this would not be consistent with principles of FE.
- Pension expense uses the market value of assets for some purposes which is consistent with principles of FE although a smoothed market related value of assets option is also possible and that is not consistent with the principles of FE.

- The expected return on assets component of pension expense included risk premia and used a smoothed value of assets – not consistent with the principles of FE.
- The expense included amortization of plan amendments and gains and losses rather than immediate recognition - not consistent with the principles of FE.
- Funded status of the plan is recorded on the entity's balance sheet – consistent with the principles of FE.
- Funded status is required to be measured as of the date of the financial statement (no early measurement dates permitted) – consistent with the principles of FE.
- Immediate recognition of gains and losses is permissible – consistent with FE but not necessary typically and many plans use a g/l amortization methodology – not consistent with the principles of FE.

The following are acceptable answers regarding the Canadian standards:

- International Financial Reporting Standard IAS 19 uses a discount rate based on investment-grade corporate bond yields. Consistent with the principles of FE.
- Asset measurements use market value of assets. Consistent with the principles of FE.
- The liability and normal cost were measured using projected salaries for most purposes, so this would not be consistent with the principles of FE.
- The funded status of the plan is reflected on the sponsor's balance sheet. Consistent with the principles of FE.
- Unlike U.S. private sector accounting standards, IAS 19 calculates a net interest cost by applying the discount rate to the net liability, so it does not include an expected risk premium in the expense calculation. Consistent with the principles of FE.
- Gains and losses are recognized immediately in other comprehensive income. Consistent with the principles of FE.
- One feature that has always been present in Canadian and international pension accounting standards but absent from U.S. pension accounting standards is a ceiling on the balance sheet asset or liability linked to minimum contribution requirements. Consistent with the principles of FE.
- Some entities may rely on a rollforward of a funding valuation to determine the defined benefit obligation. With this choice, the discount rate only needs to be updated once every three years, even though the assets are recorded at market value every year. These changes could be regarded as not consistent with FE

(b) Public sector plans.

Commentary on Question:
Full credit was given to candidates that provided at least 4 acceptable answers.

The following are acceptable answers regarding the U.S. standards:

- GASB requires use of market value of assets - consistent with the principles of FE.
- Required plan sponsors to reflect the funded status on the sponsor's balance sheet, rather than just disclosing it in a footnote - consistent with the principles of FE.
- However, the measures of liability and expense use the entry age normal cost method - not consistent with the principles of FE.
- In most cases, GASB discounts future payments at an expected return on assets that incorporates risk premia expected to be earned on those assets – not consistent with the principles of FE.
- Plans for which current assets and projected future contributions are not sufficient to pay benefits in the long run are required to discount payments at a mix of the expected return on assets and a tax-exempt high-quality municipal bond rate – not consistent with the principles of FE.

The following are acceptable answers regarding the Canadian standards:

- Accounting under the Public Sector Accounting Board (PSAB)'s standard, *Retirement Benefits*, Section PS 3250, generally follows traditional practice – not consistent with the principles of FE.
- The expected return on plan assets is usually used to discount future benefit payments in calculating the accrued benefit obligation for plans that are partially or fully funded – not consistent with the principles of FE.
- The entity's cost of borrowing is used for plans that are unfunded – not consistent with the principles of FE.
- The accrued benefit obligation reflects the impact of future pay increases – not consistent with the principles of FE.
- Plan assets can be valued using a smoothing method – not consistent with the principles of FE.

Gains and losses are amortized rather than being immediately reflected on the entity's balance sheet – not consistent with the principles of FE.

RETDAC/U, Spring 2023, Q4

Learning Outcomes:
a) Evaluate appropriateness of current assumptions
b) Describe and explain the different perspectives on the selection and development of assumptions, including financial economics
c) Recommend appropriate assumptions and defend the selection

Sources:
Credibility Educational Resource for Pension Actuaries, Society of Actuaries

Commentary on Question:
Candidates generally did well on this question. To receive full credit, they needed to provide justification for their responses.

Solution:
(a) Propose the data items to collect for the mortality study.

Justify your response.

Commentary on Question:
Candidates needed to provide justification to receive full credit. Only partial credit was provided for items listed without justification.

Date of birth for each exposure each year – this item is needed to assess age for each exposure each year

Date of death, as applicable, for each exposure each year – this is needed to quantify number of deaths at each age

Gender – Standard mortality tables are gender-specific, and there is much evidence available that mortality significantly differs between males and females.

Benefit Amount – this is necessary because pension liabilities are amounts weighted. Benefit amounts are often a predictor of mortality rates, and standard tables are often developed using amounts weighting

(b) Recommend a response to Company ABC's inquiry.

Justify your response.

Commentary on Question:
Candidates needed to provide a response, with justification for why limiting the experience to only 2021 and 2022 may not be reasonable, to receive full credit.

NOC's recommended experience period of 2021-2022 is not appropriate, and five years of experience data should instead be used

Reasons NOC's suggested experience period may not be reasonable:

- Generally, three to five years of experience is recommended for a mortality credibility study
- 2021 and 2022 seem likely to be anomalous years and are not representative of the plan's experience as a whole
- Inclusion of additional years would increase the amount of exposures and provide greater credibility
- This shorter experience period may be difficult to justify by the actuary under ASOP 35

(c) Derive the multiplier to be applied to the standard table base rates based on credibility theory.

Show all work.

Commentary on Question:
Candidates generally performed well on this question.

The model solution for this part is in the Excel spreadsheet

RETFRC, Spring 2023, Q2

Learning Outcomes:
c) Recommend appropriate assumptions and defend the selection
d) Evaluate actual experience, including comparisons to assumptions

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

Selecting and Documenting Pension Assumptions Other Than Discount Rate, Investment Return, and Mortality, AAA, Jun 2023

Credibility Educational Resource for Pension Actuaries, SOA, Aug 2017

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Assess the appropriateness of the current retirement and termination assumptions.

Commentary on Question:
Candidates generally did well on this part of the question.

However, some candidates described the current retirement and termination assumptions or suggested changes to these assumptions instead of assessing the appropriateness of the current assumptions. The focus should have been on assessing the current assumptions using the experience that was provided.

Some incorrectly mentioned that the assumptions were appropriate, while the retirement and termination gains given were quite important relative to the unfunded going concern liability.

Some incorrectly mentioned that there were losses instead of gains, but points were awarded if the explanations were consistent with that answer.

Retirement:

- Current retirement assumption assumes 100% retirement at age 62, and members will not take advantage of early retirement subsidies.
- Assuming 100% retirement at age 62 does not take into consideration of the plan design, given the plan provides generous early retirement subsidies from 62 rather than from normal retirement date.
- However, plan experience reveals consistent retirement gains over the last three years.

- Seems that retirement-eligible retirees are leaving later than anticipated.
- This suggests that the current retirement assumption may no longer be appropriate.
- The current assumption may not consider other factors such as the availability of other employer-sponsored post-retirement benefit programs available and the design of, and date of anticipated payment from, social insurance programs.

Termination:

- Current termination assumption with no terminations prior to retirement assumes all members will reach retirement eligibility since the DB plan is a differentiator for the company.
- However, plan experience reveals consistent termination gains over the past few years or systematic gains year over year.
- Gains have accelerated over last 2 years, which aligns with observation of termination patterns.
- This suggests that assuming no pre-retirement termination is not reasonable and not appropriate based on experience.
- Furthermore, termination gains show an increasing pattern indicating a termination assumption should be considered and is consistent with the fact that the firm is in an industry where turnover is common.

(b) Describe the considerations for changing the retirement and termination assumptions for the January 1, 2023 valuation.

Commentary on Question:
Most candidates did not write enough to get full marks on this 5-point question. Very few candidates got full marks.

Some candidates listed some considerations instead of fully describing them and others described the considerations for setting assumptions in general instead of describing considerations for changing the current retirement and termination assumptions.

To get full marks, candidates were not required to describe all of the following, but most of them.

The actuary should consider:

- **Materiality** – The actuary should take into account the balance between refined demographic assumptions and materiality (the actuary should use professional judgement if the use of more refined assumptions is not expected to produce materially different results).

- **Cost of using refined assumptions** – The actuary should take into account the balance between refined demographic assumptions and the cost of using refined demographic assumptions.
- **Combined effect of assumptions** – The combined effect of all non-prescribed assumptions selected by the actuary (both demographic assumptions selected in accordance with this standard and economic assumptions selected in accordance with ASOP No. 27) should be reasonable. For example, the actuary may have decided not to make any assumption with regard to four different types of future events, each of which alone is immaterial. However, the effect of omitting assumptions for all four types of future events may be a material understatement or overstatement of the measurement results.
- **Changes in circumstance** – The demographic assumptions selected should reflect the actuary's knowledge as of the measurement date. However, the actuary may learn of an event occurring after the measurement date, that would have changed the actuary's selection of a demographic assumption. If appropriate, the actuary may reflect this change as a subsequent event as of the measurement date.
- **Views of experts** – Demographic data and analyses are available from a variety of sources, including representatives of the plan sponsor and administrator, demographers, economists, and other professionals. When the actuary is responsible for selecting or giving advice on selecting demographic assumptions within the scope of this standard, the actuary may incorporate the views of experts, but the selection or advice should reflect the actuary's professional judgment.
- **Credibility** – The actuary must consider the credibility of the experience. Given it is a small firm, experience may not be fully credible.
- For both termination and retirement assumptions, should consider:
  - if **firm's business environment** is changing that is leading to more rapid changes in withdrawal patterns compared to the past, and within industry
  - **employer-specific or job-related factors** such as occupation, employment policies, work environment, unionization, hazardous conditions, and location of employment
- Specifically for termination, should also consider:
  - **plan provisions**, such as early retirement benefits, vesting schedule, or payout options.
- Specifically for retirement, should also consider:
  - **the plan design**, where specific incentives may influence when participants retire;
  - the design of, and anticipated payment from, **social insurance programs**; and
  - the availability of other employer-sponsored **postretirement benefit programs** (for example, postretirement health coverage or savings plan).

RETFRC, Spring 2023, Q7

Learning Outcomes:
a) Evaluate appropriateness of current assumptions
c) Recommend appropriate assumptions and defend the selection
d) Evaluate actual experience, including comparisons to assumptions

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

Credibility Educational Resource for Pension Actuaries, SOA, Aug 2017

Forecasting Investment Returns and Expected Return Assumptions for Pension Actuaries, AAA, Feb 2019

Commentary on Question:
Generally, candidates did not perform well on this question. Most candidates did not provide enough details to obtain full credit.

Solution:
Describe the considerations for determining the following actuarial assumptions for a going concern valuation as at December 31, 2022.

(i) Inflation;

(ii) YMPE and Income Tax Act Maximum Defined Benefit Pension increases; and

(iii) Salary Scale.

(i) Inflation
A best estimate inflation rate assumption may consider the following:

- Bank of Canada inflation target range
- Inflation forecasts
- Yields on inflation-indexed securities
- Yields on various government securities used to derive the market implied rate of inflation (e.g., the spread between Government of Canada long-term nominal and real return bonds) – also called the Break-Even Inflation Rate

The actuary should review appropriate inflation data:

- the data used to develop inflation should include the consumer price indices, the implicit price deflator, forecasts of inflation, etc.
- not appropriate to base long term assumption exclusively on recent experience.

May consider choosing select and ultimate rate given uncertainty around economist consenus that inflation may either be transitory or that factors that drove recent inflation may be permanent.

- In this case, a 1-year select rate may be chosen given high levels of short-term inflation.
- It may be appropriate to select a 2% long-term ultimate rate given Break-Even Inflation Rate of 2% (2.86%-0.86%), Long-Term Economist Consensus Inflation Expectation of 2%, and Bank of Canada Target for Inflation midpoint.
- If economic consensus about long-term inflation changes, or if central bank authorities outline rationale for increased long-term inflation, based on structural/permanent changes to economy, it may be appropriate to increase long-term ultimate rate.

(ii) YMPE and Income Tax Act Maximum Defined Benefit Pension increases

- Assumptions must be internally consistent – Each economic assumption selected by the actuary should be consistent with all other economic assumptions unless the assumption is not material. In this case, methodology for selecting inflation should apply to these assumptions.
- YMPE and ITA Maximum increase assumptions will breakdown into the following components: General inflation + productivity growth, merit, and advancement.
- YMPE assumption is often determined as the long-term inflation assumption increased for productivity gains in the economy (consistent with salary scale assumption development). Common increases for productivity gains for most plans was in the range of 0.50% to 1.00%.

(iii) Salary Scale

- Should be internally consistent with inflation and YMPE/ITA increase assumption
- Typically, the salary increase assumption will breakdown into the following components: General inflation + productivity growth + merit.
- May consider select/ultimate rates if considering a similar methodology for inflation assumption, especially if special consideration is given to a larger short-term compensation increases as a result of short-term inflation or competitive pressures.
- May consider:
  - Separate scales for different employee groups (Executive vs. non-executive, Salaried vs. hourly, Long-term disability, Leave of absence, etc.)
  - Separate scales for different compensation elements (salary, bonus, etc.)
  - Age of employee population – salary growth potential for the older and long service groups is more limited
  - Any special considerations as part of collective bargaining agreements
- Would want to consider multiple sources of data:
  - the plan sponsor's current compensation practice and any anticipated changes in this practice;
  - may use plan sponsor specific data but would want to consider limitations imposed by credibility of data;
  - current compensation distributions by age or service;
  - historical compensation increases and practices of the plan sponsor and other plan sponsors in the same industry or geographic area; and
  - historical national wage increases and productivity growth.

RETDAC/U, Fall 2023, Q7

Learning Outcomes:
a) Evaluate appropriateness of current assumptions
b) Describe and explain the different perspectives on the selection and development of assumptions, including financial economics
c) Recommend appropriate assumptions and defend the selection

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

Selecting and Documenting Pension Assumptions Other Than Discount Rate, Investment Return, and Mortality, AAA, Jun 2023

Forecasting Investment Returns and Expected Return Assumptions for Pension Actuaries, AAA, Feb 2019

Commentary on Question:
This question was trying to test concepts on the selection of economic and demographic assumptions. Candidates in general did well on part (a), and more poorly in part (b).

Candidates who obtained the highest points in part (a) provided more details on each type of assumption. Candidates who did more poorly often omitted mentioning one or more proposed formats for the assumptions, e.g., was the termination assumption based on rates that vary by age, service or age and service. Poor answers also were those that had no comment on one or more assumptions or provided only a few keywords without further explanation.

Comments that related to more than one assumption received credit, whether mentioned at the beginning of the answer, or under a specific assumption. For example, mentioning that plan sponsor experience is relevant to selecting a disability assumption got credit whether mentioned as a general comment or a comment specific to disability.

The model solution below is an example of an answer that would receive full credit; it does not include all possible answers. Other reasonable answers also received credit.

In part (b) many candidates were unable to relay the concepts of ASOP 35 with clarity or sufficient level of detail. Many wrote generic comments such as "Assumptions are reasonable" without providing the context that the actuary needs to disclose: the information and analysis to support their determination that the assumptions are reasonable.

Solution:
(a) Describe considerations for setting the following long-term assumptions for a defined benefit pension plan:

(i) Termination

(ii) Retirement

(iii) Disability

(iv) Election of optional forms of benefits

(v) Salary merit scale

Considerations applicable for all demographic assumptions:

- characteristics of the obligation to be measured. pattern of future payments
- materiality of changes in the assumptions to the measurement
- Knowledge of upcoming changes: plan changes (plant closures, benefit changes), economic condition (recession)

(i) Termination

- Assumption format: single termination rate? By age? By service? Gender? Ends at retirement age?
- job related factors: occupation, work environment/conditions, unionization, location – how do these factors affect termination patterns?
- plan design and incentives offered (vesting, payout availability)

(ii) Retirement

- Assumption format: single assumption at Normal Retirement Date (NRD)? Consider Early Unreduced Retirement Date (EURD)? By age or service, or points? Differ by gender?
- plan design and incentives (ERD, EURD)
- link to social insurance programs or other employer sponsored programs

(iii) Disability

- Assumption format: differ by age? Gender?
- definition of disability: 'own' job vs. 'any' job?
- the potential for recovery

(iv) Election of optional forms of benefits

- optional forms of benefits and commencement dates available to members (i.e., payout after reaching retirement age)
- historical experience of elections under the plan being valued (and experience of similar plans).
- degree to which particular optional forms may be subsidized.

(v) Salary merit scale

- Assumption format: single rate? Vary by age or service? Vary over future years?
- historical compensation increases and practices of the plan sponsor, and other plan sponsors in the same industry

(b) Identify the disclosures required to document demographic assumptions based on Actuarial Standard of Practice No. 35, Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations.

The actuary is required to disclose:

- The **assumptions used**: whether the assumption represents an estimate of future experience, an observation of the estimates inherent in market data, or combination
- Any **explicit adjustments** made for adverse deviations
- **Rationale** for assumptions: disclose the information and analysis used to support the actuary's determination that the assumption is reasonable
- The disclosure should be based on the assumption as of the **measurement date**, without regard to changes planned for future dates
- **Change in assumptions**: compared to those previously used for the same type of measurement.
- **Change in circumstances**: that occur after the measurement date that would affect the demographic assumptions

RETRPIRM, Fall 2023, Q2

Learning Outcomes:
b) Describe and explain the different perspectives on the selection and development of assumptions, including financial economics

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

RET201-104-25: Use of Financial Economics in Pension Actuarial and Investment Practice

Pension Actuary's Guide to Financial Economics and Pension Arbitrage Example

Commentary on Question:
Many candidates did not respond with enough information to earn full points on the question and generally performed better on Part B than Part A.

Solution:
(a) Critique the following statements related to the financial economics viewpoint:

(i) Pension plans should invest 100% in bonds

(ii) Liabilities must be discounted at the risk-free rate

Commentary on Question:
In order to receive full credit both strengths and weaknesses (pros and cons) were required however many candidates focused on one or the other. The answer below includes more pros and cons than would be needed for full credit.

(i)
Pros:

- Pension liabilities are a series of future cash flows which most closely resemble debt i.e., bonds
- A portfolio of assets that most closely matches these future cash flows would consist of 100% risk-free bonds
- Investing in bonds through the pension plan may drive attractiveness of company stock, as shareholders can experience a tax arbitrage opportunity
- Due to the asymmetry of surplus vs. deficit, the payoff from baring risk in the corporation is usually better than taking that risk in the pension plan.

- Debt interest tax shield: companies can deduct interest paid on debt from taxable income, and all things being equal, debt financing is less expensive on an after-tax basis than equity financing.

Cons:

- If the cash flows have economic risk, for example future salary increases, investing in 100% bonds actually increases risk
- The portfolio that minimizes risk may actually be one that include stocks to the extent that the stock matches the risk of the liability cash flows
- If a pension plan has access to lower cost or better managed assets compared to an individual investor, there could be an argument for including non-bond assets in the pursuit of alpha.

(ii)
Pros:

- If you argue that the liability cash flows are best matched by 100% risk free bonds, the liability should therefore be calculated using the corresponding risk-free rates of return on bonds
- The maturities should match the timing of the liability payments
- Liabilities should be marked-to-market.

Cons:

- Liabilities should be discounted at the expected return on the assets of the cash-flow matching portfolio;
- The cash-flow matching portfolio could include a variety of asset classes beyond just risk-free bonds, such as corporate bonds, equities or other asset classes
- In the case where the matching portfolio does not include 100% risk-free bonds, it would not be appropriate to use the risk-free rate of return to calculate the liability.
- Risk-free interest rates may not capture all the risk associated with liabilities, for example economic risk (salary growth).

(b) Explain why an investment strategy of investing in 100% cash flow matching bonds may not be optimal for a pension plan.

Commentary on Question:
Candidates generally performed well on this part of the question.

- If the pension plan is not fully funded, will make it difficult to reduce the plan deficit with investment returns;
- Practically, there is a scarcity of long-term bonds so matching pension liabilities may not be even possible
- Bonds may introduce a large amount of credit spread and yield curve risk
- Typically, bonds do not help with hedging the economic risk in the liability, such as future salary accruals
- A 100% bond portfolio with 100% cash flow matching bonds may not be appropriately diversified

RETDAC/U, Spring 2024, Q1

Learning Outcomes:
a) Evaluate appropriateness of current assumptions
b) Describe and explain the different perspectives on the selection and development of assumptions, including financial economics
c) Recommend appropriate assumptions and defend the selection
d) Evaluate actual experience, including comparisons to assumptions

Sources:
Forecasting Investment Returns and Expected Return Assumptions for Pension Actuaries, AAA, Feb 2019

Selecting Investment Return Assumptions: Considerations When Using Arithmetic and Geometric Averages, AAA, Jul 2019

DA201-105-25: IFRS and US GAAP Similarities and Differences, Ch. 5 only

Commentary on Question:
This question was intended to test candidates' knowledge about the development of the expected return on assets assumption for ASC-715, as well as their knowledge about determining the appropriateness of the same assumption in a practical situation.

Solution:
(a) Describe the factors that should be considered when setting an expected return on assets assumption under U.S. Accounting Standard ASC 715.

Commentary on Question:
Many candidates did not perform well on this part because they did not adequately describe enough unique factors that should be considered.

The model solution below is an example of an answer that would receive full credit; it does not include all possible answers. Other reasonable answers also received credit.

<u>Investment Policy</u>
- What is the current allocation?
- What types of securities eligible to be held?
- Does target allocation differ from the current allocation?

<u>Expenses</u>
- What are they? Transaction, custodian, management fees? How much?
- Are they paid from the plan assets or by the plan sponsor directly?
- If paid by the plan assets, may be able to reflect a reduction in the investment return assumption.

Cash Flow Timing

- What is the timing of expected contributions and benefit payments?
- How does that impact the plan's liquidity needs?
- How does that impact the plan's investment opportunities?

Market Conditions

- How has the plan performed historically?
- What are experts saying about future market conditions?
- What is the expectation for inflation in the future?

(b) You are the actuary for NOC's pension plan. NOC's Chief Financial Officer has asked you to use an expected return on assets assumption of 9.50% for the 2025 Net Periodic Pension Cost.

Propose a course of action as an actuary in response to the request.

Commentary on Question:
Many candidates performed well on this part. Candidates who performed the best were able to utilize the case study and conduct analysis that was specific to NOC. Below is a sample response of an answer that would receive full credit.

This is the course of action that I would propose:

- First, determine the reasonableness of the 9.50% assumption using the information I have at my disposal, including the factors mentioned in part (a).
  - Asset mix for NOC's plan during 2023 was 50% equity, 40% fixed income, 6% real estate, and 4% cash.
  - Use this asset mix to determine what may be a reasonable expected asset return based on current market conditions.
- Second, if I determine that the 9.50% is unreasonable, I would explain my rationale to the CFO at NOC
  - NOC had an EROA assumption in the 6.00%-7.00% range for the past two years. Jumping up to 9.50% seems extremely unlikely without a major shift in investment policy
- If the CFO insists on using the 9.50% assumption without changing investment policy, I have two choices
  - If it is within a reasonable range, and I don't think it's deliberately misleading or dishonest, I can use the 9.50% and add wording to the actuarial communication that the assumption is management's best estimate and does not reflect my view as the Actuary
  - If it is outside the reasonable range, I can refuse the assignment

RETDAC/U, Fall 2024, Q10

Learning Outcomes:
a) Evaluate appropriateness of current assumptions
b) Describe and explain the different perspectives on the selection and development of assumptions, including financial economics
c) Recommend appropriate assumptions and defend the selection

Sources:
RET101-115-25: An Improved Application of the Variable Annuity (ASSUMED BACKGROUND FROM RET 101)

Selecting and Documenting Pension Assumptions Other Than Discount Rate, Investment Return, and Mortality, AAA, Jun 2023

Selecting and Documenting Mortality Assumptions for Measuring Pension Obligations, AAA, Jan 2023

Forecasting Investment Returns and Expected Return Assumptions for Pension Actuaries, AAA, Feb 2019

Credibility Educational Resource for Pension Actuaries, Society of Actuaries, Aug 2017

Commentary on Question:
This question requires candidates to demonstrate their understanding of the Actuarial Standards of Practice as applied to assumption setting for the two types of listed plans – Defined Benefit Plan and a Variable Annuity Plan

Generally, candidates did better in part b than in part a. Also, in part a, candidates performed better in comparing and contrasting the economic assumptions than comparing and contrasting the demographic assumptions.

Solution:
(a) Compare and contrast assumption setting for the following types of pension plans:

(i) Defined benefit plan

(ii) Variable Annuity Plan

Commentary on Question:
As noted above, candidates generally did not provide enough in their answers to demonstrate that they knew the similarities and differences between the two types of plans especially with the demographic assumptions. Some candidates described the plan features instead of providing information about setting valuation assumptions.

Economic assumptions:
Compare:

Consider ASOP 27's requirement for setting reasonable economic assumptions that:

- Are appropriate for the purpose of the measurement
- reflects the actuary's professional judgement
- takes into account historical and current economic data at the measurement date
- reflects the actuary's estimate of future experience, the actuary's observation of the estimate inherent in market data, or a combination thereof

The types of economic assumptions used to measure obligations under both types of plans may include inflation, investment return, discount rate, compensation increases and other economic factors such as Social Security, cost-of-living adjustments, rate of payroll growth, growth of individual account balances, and variable conversion factors.

Contrast:

Variable Annuities Plans have plan provisions that can be difficult to measure The actuary should consider using alternative valuation procedures, such as stochastic modeling, option-pricing techniques, or deterministic procedures in conjunction with assumptions that are adjusted to reflect the impact of variations in experience from year to year.

For pure Variable Annuities Plans, sponsor's obligation is independent of market interest rates and is directly tied to the performance of the portfolio of assets.

For defined benefit plan, changes in market interest rates have an effect on the sponsor's obligation. Best-estimate assumption would apply.

Demographic assumptions

Compare:
Both should consider ASOP 35's guidance in setting a demographic assumption. Consider plan design, events that could impact member decisions (ex. upcoming retirement window), economy, and plan demographics/characteristics of membership.
Under both plans, similar considerations can be given to the use of experience studies or published tables.

Contrast:

The main difference in setting mortality assumptions for VAP is if the variable annuity adjusts pension benefits for mortality experience, benefit adjustments are determined using the member's personal characteristics requiring more scrutiny around selecting an appropriate hurdle mortality assumption.
Adoption of general mortality basis could leave the variable annuity program subject to potential anti-selection by members who have longer expected longevity. To mitigate, the selected mortality basis would be used to determine actual buy-in amounts and reviewed annually.

(b) Propose a process for assessing and potentially updating the following assumptions for the National Oil Pension Plan:

(i) Retirement

(ii) Mortality

(iii) Turnover

(iv) Salary scale

Commentary on Question:
Candidates performed much better in part b and provided answers that indicated they were prepared to critique the actuarial assumptions. Candidates needed to comment on each of the four assumptions to receive full credit.

The model solution below is an example of an answer that would receive full credit; it does not include all possible answers. Other reasonable answers also received credit.

(i) Retirement

NOC's actuary should review recent gains/losses in the plan due to its retirement assumption as the current assumption is likely understating pension obligations. Given that NOC members can retire from age 55, with a subsidized early retirement reduction, it would be more prudent to use a retirement assumption table based on age instead of a single retirement age.

Could do a study using recent experience data to evaluate the retirement assumption.

Consider using select-and-ultimate assumptions if believe the effect of these events on employment will continue for the short term.

Retirement assumption should also take into account the different status groups (actives vs. deferred vested)

Consideration should be given to the provisions of the retiree health benefit program as well, since any changes to the retiree health benefit program could have an impact on the retirement of members.

(ii) Mortality

NOC's actuary should review the magnitude of mortality gains or losses in the past few years / valuations to assess if the current assumption is still appropriate. Large gains or losses may mean that the assumption is no longer reasonable.

The actuary can recommend the best estimate mortality assumption by considering the plan's actual mortality experience, the credibility of the plan's actual mortality experience, and the credibility of the similar plans in the industry
.
Given it's a small plan, there will likely be a small number of pre-retirement deaths which means a plan specific study will not be credible enough. For mortality experience study, 3-5 years experience is needed and at least 1100 deaths at each age.

NOC is currently using a standard table with no mortality improvement: need to assess why no improvement is assumed. Seems inappropriate for a plan with a decent number of participants

(iii) Turnover

NOC's current assumption is based on NOC experience from 2000-2005, which is dated and may not be representative of current turnover experience.

NOC's actuary should review the magnitude of termination gains or losses in the past few years / valuations to assess if the current assumption is still appropriate. Large gains or losses may mean that the assumption does not represent recent experience.

It is more favorable to use more recent experience study data when setting the termination assumption, so NOC could conduct a new turnover experience study using more recent data.

Consideration should be given to the provisions of retiree health benefit program as well to determine if the same or a different termination scale/assumption would be appropriate for the retiree health plan.

(iv) Salary scale

NOC uses a flat salary scale assumption which may or may not represent experience.

NOC's actuary should review the magnitude of salary gains or losses in the past few years / valuations to assess if the current assumption reflects their recent experience.

NOC could work with HR to understand the go-forward salary increase expectations. Consider inflation, average industrial wage increases, increases to minimum wage.

Consider the impact of a salary scale vs a single rate. Would that better represent NOC's experience?

RETFRC, Fall 2024, Q8

Learning Outcomes:
a) Evaluate appropriateness of current assumptions
c) Recommend appropriate assumptions and defend the selection
d) Evaluate actual experience, including comparisons to assumptions

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

Selection of Mortality Assumptions for Pension Plan Actuarial Valuations, CIA Educational Note, Dec 2017

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Describe the considerations in setting the base mortality assumption for a going concern valuation of a defined benefit pension plan

Commentary on Question:
This portion was well answered. Candidates were able to identify multiple considerations when setting the base mortality. Most mentioned the importance of assessing the credibility of the experience. However, only a few candidates mentioned that it needs to reflect a best estimate assumptions.

To set a base mortality assumption, the actuary should consider the following:

- The base mortality assumption should reflect best estimate of current mortality level
- Plan experience, if available, should be used if credibility is sufficient
- Without sufficient credibility of the plan experience, published mortality table should be used, and could be adjusted to reflect plan's characteristic and experience such as:
    - collar type
    - industry
    - pension size
    - private vs public sector

- When adjusting for multiple factors, caution should be used to not understate or overstate relationship between each factors
- Reasonable approach is to look at it separately

(b) Describe the assumptions needed to establish a mortality improvement scale for a going concern funding valuation of a defined benefit pension plan.

Commentary on Question:
This portion was not well answered. Most candidates did not provide the 3 items (short-term, long-term, transition). Many candidates copied the answer of a) and changed the base table for improvement table. While we were not asking for considerations, most candidates read the question as the same as a)

For mortality improvement scale is composed of 3 elements:
1) A short-term improvement rate
2) An ultimate long-term improvement rate
3) A transition from short-term to the ultimate improvement rates over a certain period and based on particular pattern

The short-term improvement rate should be based on recently observed improvement rates and may be smoothed to reflect historical data set based on ages and date of birth (cohorts)

The ultimate long-term improvement rate is considered largely judgmental and may reflect historical trends, expert opinions or surveys for forward-looking life expectancy.

The transition period represent the length of time until the ultimate long-term improvement rate is attained and may be based on judgment. Historical data should be considered and different transition period could be used by age cohorts

(c) Describe the considerations for adjusting the base mortality assumption for the January 1, 2024 going concern valuation.

Commentary on Question:
In general, candidates mentioned that the experience was lower than the base table and mentioned the credibility in some way. Few candidates mentioned the subtility about being an executive plan, with high earners. Not many candidates mentioned the possibility to look at it by sub-group.

The expected mortality curved in the graph seems to adequately reflect the shape actual mortality curved. A downward scaling adjustment might be appropriate since the actual curve is in general under the expected mortality. A credibility factor should be considered when applying an adjustment.

Collar type and pension size also support a lesser mortality than the CPM-2014. When adjusting for collar type and pension size, caution should be used as they may influence each other.

Finally, adjustment by sub-group (age, gender) could also be considered but adjusted for credibility.

RET201 Learning Objective 3 Model Solutions

RETDAC/U, Fall 2020, Q5

Learning Outcomes:
Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs

Sources:
Pension Risk Transfer: Evaluating Impact and Barriers for De-Risking Strategies, pp. 16, 17 & 20-27

Commentary on Question:
The question tested candidates' knowledge on de-risking, in particular why balance sheet liabilities differ from the price insurers would charge to take on additional obligations. This question also tested candidates on evaluating a plan's funded status after a change in discount rates. Candidates performed well on both parts but generally better on part b. Candidates that performed well in part a) additionally identified balance sheet liabilities do not reflect the true financial leverage involved and that insurers adjust discount rates to reflect potential credit risk and investment management fees. On part b) candidates that performed well recognized that changes in discount rates affect both the value of the liabilities as well as the value of fixed income assets.

Solution:
(a) Explain why the annuity purchase price would likely be different than the liability currently reflected on the balance sheet.

Balance sheet liability is the plan's funded status. Accounting changes have led companies to show a market value of the unfunded defined benefit obligation, and the netting of liabilities against the assets doesn't display the true financial leverage involved

Balance sheet focuses on only benefit payment outflows and expected cash flows based on plan assumptions. It ignores the following additional costs that insurance company will include, thus increasing the annuity purchase price

- Present value of plan operating expenses
- Insurance company profit margin
- Provisions for adverse deviation – insurance company will look at the optional forms available to participant and cost out annuity vs lump sum, assuming anti-selection. Plan may assume 100% lump sum while the insurance company will be conservative and price to cover the liability of all scenarios.

Discount rate differences: balance sheet typically uses a rate based on corporate bond yields rather than a risk-free rate, and insurers may apply an adjustment to the discount rate to reflect potential credit risk and for investment management expenses.
Longevity improvements are not always fully captured in the mortality tables used by plan sponsors. Insurers generally use different mortality tables with higher rates of longevity improvements in annuity contracts.

(b) Calculate ABC Pension Plan's accounting funded status assuming a 0.65% decrease in interest rates and a 10% increase in the market value of equities.

Show all work.

The model solution for this part is in the Excel spreadsheet. Other reasonable methods to estimate the value of the liabilities and the fixed income value of assets due to the change in the interest rate were also awarded credit.

RETDAC, Fall 2020, Q9

Learning Outcomes:
a) Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

Pension Risk Transfer: Evaluating Impact and Barriers for De-Risking Strategies, pp. 16, 17 & 20-27

RET201-105-25: IFRS and US GAAP: Similarities and Differences, Ch. 5 only

RET201-109-25: Plan Curtailments & Settlements Under FASB ASC Topic 715 Relating to Plan Terminations (Part 1)

RET201-110-25: Plan Curtailments and Settlements Under FASB ASC Topic 715 Relating to Plan Terminations (Part 2)

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Compare and contrast components of Net Periodic Pension Cost under U.S. Accounting Standard ASC 715 and Defined Benefit Cost under International Accounting Standard IAS 19, Revised 2011.

Commentary on Question:
This question tested the candidates' knowledge on the similarities and differences of the two accounting standards. Most candidates only listed components of expense as opposed to evaluating them and did not receive full credit.

- Interest cost under IFRS applies the single discount rate to the funded status (same interest rate applies to both assets and liabilities)
- Interest cost under ASC 715 is based only on liability, with the discount rate applied to PBO and expected benefit payments

- No separate EROA expense item under IFRS
- EROA under ASC 715 is based on the assets, expected contributions, and expected benefit payments, using expected asset rate of return

- EROA may be based on a market related value of assets under ASC 715 (does not have to be fair market value)

- No asset smoothing allowed under IFRS

- Service cost included in both standards for participants accruing benefits
- Administrative expenses may be included as part of expense in both standards

- Settlement accounting required under ASC 715 if settlement payments exceed sum of service cost and interest cost
- Settlement accounting required under IFRS if there are any settlement payments during the year (which are not assumed as part of the DBO calculation)

- Effects of re-measurements (ex. assumption changes) recognized immediately in OCI under IFRS (not recycled through income statement)
- Effects of re-measurements (ex. assumption changes) are recognized in income statement under ASC 715: either immediately or amortized over future years

- Effects of plan changes (prior service cost) are recognized immediately in P&L under IFRS
- Effects of plan changes (prior service cost) are recognized in OCI and then amortized through P&L over participant's future service under ASC 715

(b) Calculate the impact on the following values due to the plan freeze under U.S. Accounting Standard ASC 715:

(i) 2020 Net Periodic Pension Cost

(ii) Funded Status as of December 31, 2020

(iii) Amounts recognized in AOCI as of December 31, 2020

Show all work.

Commentary on Question:
The question tested curtailment accounting under ASC 715; Canadian candidates did not do well with the US accounting calculations.

The model solution for this part is in the Excel spreadsheet.

RETDAU, Fall 2020, Q9

Learning Outcomes:
a) Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations

Sources:
RET201-111-25: FASB Accounting Standards Codification Topic 715

RET201-109-25: Plan Curtailments & Settlements Under FASB ASC Topic 715 Relating to Plan Terminations (Part 1)

RET201-110-25: Plan Curtailments and Settlements Under FASB ASC Topic 715 Relating to Plan Terminations (Part 2)

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Calculate the impact of the plan freeze on the 2020 Net Periodic Pension Cost under U.S. Accounting Standard ASC 715.

Show all work.

Commentary on Question:
This question tested candidates' ability to calculate expense for a plan with a mid-year plan freeze. A mid-year curtailment requires many steps and partial credit was given. Candidates still faired either well or not well at all. The model solution uses simple interest; candidates who used compound interest also received credit.

The model solution for this part is in the Excel spreadsheet.

(b) Explain how the following de-risking strategies would affect the 2021 financial results under U.S. Accounting Standard ASC 715:

(i) Option to all retirees to receive an October 1, 2021 lump sum payment in lieu of future lifetime annuities

(ii) Full plan termination where all benefits are paid out in 2021

No calculations required.

Commentary on Question:
This question tested the understanding of settlement accounting under ASC 715. To receive full credit, candidates needed to fully explain impacts of the expense calculations under both scenarios

(i) <u>Retiree lump sum window</u>

- settlement accounting required if total retiree lump sum payments greater than interest cost
- settlement accounting should be measured as of date of payments (October 1)
- settlement charge will be based on % of PBO settled times unrecognized loss immediately before payments
- expense for 1/1/21 – 9/30/21 will be based on 1/1/21 PBO, MVA, and assumptions
- expense for 10/1/21 – 12/31/21 will be based on remaining PBO & MVA at 10/1/21 remeasurement date
- discount rate at re-measurement date will be based on updated future benefit payment stream
- EROA component as of 10/1 will be based on much lower asset value so will be lower
- NOC could change its asset allocation strategy as a result of updated duration and therefore have an updated EROA assumption to use at 10/1

(ii) <u>Full plan termination</u>

- Settlement accounting will occur due to plan payouts
- Settlement accounting should be measured as of the date of the payments
- Will have regular components of expense (SC, IC, EROA) prior to date settlement benefits are paid out
- Plan will need to be fully funded on termination basis in order for the termination to occur -> this may require additional contributions from plan sponsor

- Gain (or loss) associated with settlement payments (the difference between the cost of lump sums/annuities vs. the PBO) immediately recognized in expense at settlement date
- 100% of remaining unrecognized (gain)/loss will be recognized in expense due to termination since all liabilities will be paid out
- Total expense for 2021 will be amount needed to recognize all remaining charges in AOCI (BOY unrecognized loss + additional gains/losses due to termination payments and data updates through payout date)

RETDAC/U, Spring 2021, Q1

Learning Outcomes:
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

Pension Risk Transfer: Evaluating Impact and Barriers for De-Risking Strategies, pp. 16, 17 & 20-27

RET201-105-25: IFRS and US GAAP Similarities and Differences, Ch 5

Commentary on Question:
In general. the candidates who were familiar with ASOP 51 were able to describe the risks and methods to assess these risks. Not all candidates seemed to be familiar with this relatively new ASOP. To receive full credit in parts c) & d), candidates needed to identify appropriate risk transfer strategies and correctly describe the accounting treatment of the chosen strategies.

Solution:
(a) Describe the risks an actuary should disclose in a valuation report based on Actuarial Standard of Practice No. 51, Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions (ASOP 51).

Commentary on Question:
To receive full credit, candidates needed to describe four separate risks noted in ASOP 51. The model solution below is not a comprehensive list of risks; candidates also received credit for other relevant answers.

The actuary should identify risks that, in the actuary's professional judgment, may reasonably be anticipated to significantly affect the plan's future financial condition.

Examples of risks which should be disclosed include the following:
- Investment risk: the potential that investment returns will be different than expected;
- Asset/liability mismatch risk: the potential that changes in asset values are not matched by changes in the value of liabilities;
- Interest rate risk: the potential that interest rates will be different than expected;
- Longevity and other demographic risks: the potential that mortality or other demographic experience will be different than expected.

(b) Identify the methods for assessing the risks described in part (a) based on ASOP 51.

Commentary on Question:
Most candidates were able to identify the different methods for this part of the question.

Methods to assess risk may include:
- Scenario tests,
- Sensitivity tests,
- Stochastic modeling, stress tests, and
- A comparison of an actuarial present value using a discount rate derived from minimal-risk investments to a corresponding actuarial present value from the funding valuation or pricing valuation.

The actuary should take into account the degree to which the methods and models reflect the nature, scale, and complexity of the plan. In using professional judgment, the actuary may take into account practical considerations such as usefulness, reliability, timeliness, and cost efficiency

(c) Recommend two pension risk transfer strategies available to Company XYZ.

Justify your response. No calculations required.

Commentary on Question:
Most candidates correctly identified at least one pension risk transfer strategy available to Company XYZ; candidates needed to recommend two different strategies in order to receive full credit. The model solution below is not an exhaustive list of all possible strategies; candidates also received credit for recommending other relevant strategies and justifying their response.

1. **Provide a lump sum offering to a group of participants (ex. terminated vested participants)**
   - Bulk lump sum offerings typically occur when traditional plans allow a group of participants a one-time, limited opportunity to elect to receive their benefits in the form of a lump sum distribution (usually referred to as a "window election").
   - Such plans may not offer participants the option to receive their retirement benefits as a lump sum after the defined window.
   - Paying out lump sum benefits transfers all risk from the pension plan to the electing participants, as well as eliminating corresponding fees associated with maintaining the liabilities
   - A lump sum window may be a way to begin a larger pension risk transfer (PRT) strategy or can be simply a point solution to eliminate a certain amount of risk and liability on a relatively inexpensive basis.

2. **Purchase a group annuity for a group of participants (commonly referred to as a "buy-out")**
   - A plan sponsor enters into a contract with an insurer to take on the remaining pension obligations for some of the plan's population, usually a group of retirees
   - The plan sponsor will transfer the existing pension liability for this group to the insurer for a single premium.
   - The insurer's group annuity contract is usually sold at a higher cost than the DBO under IAS 19
   - In return, the plan no longer has responsibility for future benefits payments to plan participants or the corresponding fees associated with maintaining the liabilities.

(d) Compare and contrast the accounting treatment of each strategy identified in part (c) under:

(i) U.S. Accounting Standard ASC 715

(ii) International Accounting Standard IAS 19, Rev. 2011

No calculations required.

Commentary on Question:
Most candidates who identified correct risk transfer strategies in part c) were able to explain the accounting treatment of the strategies under both accounting standards. The model solution below corresponds with the above model solution for part (c); candidates also received credit if they were able to correctly answer the question for other strategies they listed in part (c).

Lump Sum Offerings

IAS-19	ASC 715
Triggers settlement accounting; there is no material threshold. Any settlement payments due to lump sum elections by employees as part of the normal operating procedures of the plan are excluded from settlement accounting calculations.	Triggers settlement accounting if settlement price exceeds the sum of Service cost + Interest cost.
Settlement gain/loss from the lump sum paid to the participant will be recognized immediately through the profit and loss.	Settlement gain/loss from the lump sum paid to the participant will be recognized immediately in OCI.
	Portion of unrecognized g/l will be recognized immediately through profit and loss as the pro rata share of the

	settlement to the overall liabilities of the plan.
The pension obligation settled is removed from the DBO and the assets are paid to the participant as a lump sum.	The pension obligation settled is removed from the PBO and the assets are paid to the participant as a lump sum.

Annuity buy-out

IAS-19	ASC 715
Triggers settlement accounting. There is no materiality considerations for the settlement (threshold).	Triggers settlement accounting if settlement price exceeds the sum of Service cost + Interest cost.
Settlement gain/loss from the premium paid to the insurer will be recognized immediately through the profit and loss.	Settlement gain/loss from the premium paid to the insurer will be recognized immediately in OCI
	Portion of unrecognized g/l will be recognized immediately through profit and loss as the pro rata share of the annuity buy-out to the overall liabilities of the plan.
The pension obligation settled is removed from the DBO and the assets are transferred to the insurer.	The pension obligation settled is removed from the PBO and the assets are transferred to the insurer.

RETDAC, Spring 2021, Q5

Learning Outcomes:
a) Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations

Sources:
Retirement Plans - 401(k)s, IRAs and Other Deferred Compensation Approaches, Allen et al., 12th Edition, 2018, Ch. 14 (pp. 250-263)

RET201-109-25: Plan Curtailments & Settlements Under FASB ASC Topic 715 Relating to Plan Terminations, Part 1

RET201-107-25: Introduction (A58), IFRS1 (paragraphs 1-40 & Appendix A), IAS19, IFRIC14

RET201-105-25: IFRS and US GAAP: Similarities and Differences, Ch. 5 only

Commentary on Question:
This question tested the participants' ability to calculate the DBO and benefit cost of an executive plan both before and after a plan freeze. The question also tested the candidates' understanding of both IAS 19 and ASC 715 as it pertains to curtailments. On average, candidates did fairly well on this question. Candidates that entered formulas in Excel rather than hard coded numbers were more likely to receive partial credit if there were errors in any of the underlying steps.

Solution:
(a) Calculate the 2021 Defined Benefit Cost for the SRP under IAS 19.

Show all work.

Commentary on Question:
Candidates generally did well on part a). Common mistakes included:

- *Projecting service to retirement age for DBO*
- *Neglecting to project pay to retirement age for DBO*
- *Neglecting to discount the annuity factor to valuation date*

The model solution for this part is in the Excel spreadsheet

(b) Calculate the revised 2021 Defined Benefit Cost, including the change to Other Comprehensive Income, for the SRP under IAS 19 reflecting the plan freeze. Show all work.

Commentary on Question:
Candidates did not perform as well on part b). The most common mistakes were:

- *Failure to correctly remeasure the liability after the plan change*
- *Failure to note that service cost becomes zero after the plan change*

Note that the preferred approach was to remeasure the liability as of March 31, 2021 before the plan change. Some candidates remeasured the liability after the plan change; credit was also provided for this approach.

The model solution for this part is in the Excel spreadsheet

(c) Compare and contrast the accounting treatment of the plan freeze under IAS 19 and U.S. Accounting Standard ASC 715.
No calculations required.

Commentary on Question:
Most candidates did well on part c). Candidates most commonly lost points by failing to mention when the curtailment should be recognized under both standards.

	ASC 715	IAS 19
Event	The event is considered a curtailment under both ASC 715 and IAS 19 due to reduction in future accruals for the one employee.	
Recognition	Curtailments resulting from plan terminations or amendments are recognized when realized (for example once the plan amendment is adopted).	Curtailment gains and losses should be recorded when the curtailment occurs.
Interim Remeasurement	-The liability is remeasured as of March 31, 2021 using updated discount rates both before and after the plan freeze	
Gain/Loss Amortization	The remaining gain/loss is re-amortized using a 10% corridor at the remeasurement date	No gain/loss amortization
Curtailment recognition	-The decrease in liability is used to offset net loss of the plan. -Entire prior service cost is recognized in expense -Curtailment charge shown as a separate line item	-The full change in liability due to the plan amendment is recognized as a curtailment expense -Curtailment charge shown in past service cost.

RETDAU, Spring 2021, Q5

Learning Outcomes:
a) Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations

Sources:
Retirement Plans - 401(k)s, IRAs and Other Deferred Compensation Approaches, Allen et al., 12th Edition, 2018, Chapter 14

RET201-111-25: FASB Accounting Standards Codification Topic 715

RET201-109-25: Plan Curtailments & Settlements Under FASB ASC Topic 715 Relating to Plan Terminations, Part 1

Commentary on Question:
This question tested the participants' ability to calculate the PBO and benefit cost of an executive plan both before and after a plan freeze. On average, candidates did relatively well on this question. Candidates that entered formulas in Excel rather than hard coded numbers were more likely to receive partial credit if there were errors in any of the underlying steps.

Solution:
(a) Calculate the 2021 Net Periodic Pension Cost for the SRP under ASC 715.

Show all work.

Commentary on Question:
Candidates generally did well on part a). Common mistakes included:

- *Projecting service to retirement age for PBO*
- *Neglecting to project pay to retirement age for PBO*
- *Neglecting to reflect 10% corridor when calculating (gain)/loss amortization*
- *Neglecting to discount the annuity factor to valuation date*

The model solution for this part is in the Excel spreadsheet.

(b) Calculate the revised 2021 Net Periodic Pension Cost for the SRP under ASC 715 reflecting the plan freeze.

Show all work.

Commentary on Question:
Candidates did not perform as well on part b). Common mistakes included:

- *Failure to indicate that PBO decreases to ABO after the plan change*
- *Failure to correctly recognize the curtailment gain.*
- *Failure to note that service cost becomes zero after the plan change*
- *Failure to fully recognize prior service cost as a result of the curtailment*

The model solution for this part is in the Excel spreadsheet

RETDAC, Fall 2021, Q8

Learning Outcomes:
a) Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

RET201-105-25: IFRS and US GAAP: Similarities and Differences, Ch. 5 only

RET201-107-25: Introduction (A58), IFRS1 (paragraphs 1-40 & Appendix A), IAS19, IFRIC14

Commentary on Question:
Overall, candidates performed poorly on this question. For part (a), partial credit was given to candidates who carried forward any mathematical errors. Many candidates struggled with the accounting principles related to curtailments and special termination benefits.

Solution:
(a) Calculate the revised 2021 Defined Benefit Cost, including the change to Other Comprehensive Income, under International Accounting Standard IAS 19, rev. 2011 (IAS 19).

Show all work.

Commentary on Question:
Part (a) required candidates to determine the curtailment impact in addition to the impact of the enhanced benefits as part of the revised benefit cost calculation. However, several candidates incorrectly included the actuarial gain/loss due to change in the discount rate at July 1, 2021 as part of the curtailment impact when the assumption change actuarial gain/loss is to be captured in OCI at year-end. Successful candidates determined the expected DBO at July 1, 2021 using the duration provided in the case study and then used that DBO to determine the curtailment impact.

Most candidates failed to correctly calculate the OCI impact at year-end (that is, isolate the actuarial gain/loss due to the discount rate assumption).

The model solution uses simple interest; credit was also provided if candidates used compound interest.

The model solution for this part is in the Excel spreadsheet.

(b) Compare and contrast the accounting treatment of the retirement incentive program under IAS 19 and U.S. Accounting Standard ASC 715.

No calculations required.

Commentary on Question:
Although most candidates provided general differences/similarities about timing and amortization, candidates failed to include commentary specifically about treatment of the early retirement window (ERW) recognition under the two standards.

	ASC-715	IAS19
Timing	- Recognized at July 1, 2021 - ERW loss is recognized when employees accept the offer and the amount can be estimated	- Recognized at July 1, 2021 - ERW loss recognized at earlier of date entity recognizes related restructuring costs or employee can no longer withdraw from offer
Interim Remeasurement	- Liability remeasured as of July 1, 2021 using updated discount rates - Assets and liability remeasured based on the special termination event date	- Liability remeasured as of July 1, 2021 using updated discount rates - Assets and liability remeasured based on the special termination event date
Gain/Loss Amortization	- Gain/loss amortized using 10% corridor	- No gain/loss amortization
ERW recognition	- The increase in liability is immediately recognized (if a gain, it would have reduced any existing unamortized losses) - Entire prior service cost is recognized in expense - Total of the two above items is the ERW charge, shown as a separate line item	- Full change in liability due to ERW is recognized as a curtailment expense - ERW charge shown in past service cost

RETDAU, Fall 2021, Q8

Learning Outcomes:
a) Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations

Sources:
RET201-111-25: FASB Accounting Standards Codification Topic 715

Commentary on Question:
Commentary listed underneath question component.

Solution:
Calculate the following under U.S. Accounting Standard ASC 715:

(i) Revised 2021 Net Periodic Pension Cost

(ii) Accumulated Other Comprehensive Income as of December 31, 2021

(iii) Funded status as of December 31, 2021

Show all work.

Commentary on Question:
Part (i) required candidates to determine the curtailment impact in addition to the impact of the enhanced benefits as part of the revised net periodic pension cost calculation. However, several candidates incorrectly included the actuarial gain/loss due to change in the discount rate at July 1, 2021 as part of the curtailment impact. Many candidates struggled with the accounting principles related to curtailments and special termination benefits. Both the curtailment impact as well as the impact of the enhanced benefits are to be recognized immediately. The actuarial gain/loss due to the change in the discount rate assumption is amortized. Successful candidates determined the expected PBO at July 1, 2021 using the duration provided in the case study and then used that PBO to determine the curtailment impact.

The model solution uses simple interest; credit was also provided if candidates used compound interest.

The model solution for this part is in the Excel spreadsheet.

RETDAC/U, Fall 2021, Q9

Learning Outcomes:
a) Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations

Sources:

RET201-109-25: Plan Curtailments & Settlements Under FASB ASC Topic 715 Relating to Plan Terminations, Part 1

RET201-110-25: Plan Curtailments & Settlements Under FASB ASC Topic 715 Relating to Plan Terminations, Part 2

RET201-105-25: IFRS and US GAAP: Similarities and Differences, Ch. 5 only

Commentary on Question:
This question was intended to test if candidates could apply the accounting standards to a realistic example of plan termination timing. Most candidates provided basic accounting concepts. Well prepared candidates were able to demonstrate a deeper understanding of how to apply the accounting concepts to this scenario. Many candidates showed poor understanding of accounting principles for a terminating plan.

Solution:
(a) Describe the effect on the 2021 Net Periodic Pension Cost (NPPC) under U.S. Accounting Standard ASC 715 (ASC 715) if Company XYZ's pension plan prior to the termination was structured as:

(i) Open and ongoing

(ii) Closed to new entrants

(iii) Frozen for all participants

Commentary on Question:
The intention of this question was to test candidates' knowledge of the differences in accounting treatment of an amendment to terminate a plan under ASC 715 from the three different statuses.

Most candidates responded there would be a curtailment in 2021 due to the plan termination, however, the curtailment would actually occur during 2020 since that is when the plan amendment was adopted (and the termination was probable to occur). Credit was also given for responses which assumed curtailment accounting occurred during 2021.

Open and Closed plans would be treated the same:

- Service cost would be based on a full year of accruals
- PBO used for interest cost would reflect accruals to 12/31/2021
- EROA should be based on portfolio allocation
  - Consideration should be given if the sponsor plans to reduce the equity allocation during the year or wait until the following year
- Gain/Loss (G/L) Amortization
  - Corridor would shrink for unfunded plans or plans where PBO is used for corridor since the PBO is reduced
  - No change to amortization period since active employees still accruing
- No PSC amortization since fully recognized during 2020 curtailment

Frozen plans
No change to any component of NPPC, except for possibly EROA for the same reason as mentioned above

(b) Compare and contrast the calculation of the following:

(i) 2022 NPPC under ASC 715

(ii) 2022 Defined Benefit Cost under International Accounting Standard IAS 19 (IAS 19)

Commentary on Question:
This part was testing candidates' knowledge of the considerations that need to be made between the plan termination/wind-up date and settlement date. Candidates responding only with the similarities and differences in components of NPPC under ASC 715 and DBC under IAS 19 without relating it to the plan termination received minimal points.

	ASC 715	IAS 19
Service Cost	No SC for accruals after 2021	No SC for accruals after 2021
Interest Cost	PBO should reflect no further accruals Consideration should be given if estimated plan term cost should be reflected in PBO Assumptions should reflect any changes needed due to plan term If plan term PBO is not used, no change in method to determine DR, else use DR that reflects short time until settlement	DBO should reflect no further accruals DR should still reflect old method. IC based on net funded status
EROA	EROA assumption may be adjusted to reflect shift to more liquid assets and less risky assets	*N/A – see IC*
Net g/l	Amortized over average remaining life expectancy instead of average future working lifetime	No difference from before - g/l's are immediately recognized
PSC	Curtailment Accounting would have been done for FY2020 and all outstanding bases would have been recognized	N/A - Plan Change would have been recognized in FY2020 at time of plan term amendment

(c) Explain how the 2023 NPPC under ASC 715 would be calculated.

Commentary on Question:
Most candidates were able to identify there would be a remeasurement during the year which would result in ½ year of NPPC calculated normally and then $0 for the remainder of the year.

The typical expense calculation would be recognized for 1/1/2023-6/30/2023. PBO should be based on plan termination estimates. IC and EROA should reflect expected payments, contributions, and settlement discount rates.

The plan would then be remeasured on 6/30/2023 (or final asset distribution date) to reflect the final contribution and asset distributions, which zeroes out the assets and liabilities. Settlement accounting would be required which recognizes the remaining AOCI at the remeasurement date. This would then leave all balance sheet components at 0.

RETDAC/U, Spring 2022, Q3

Learning Outcomes:
a) Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs
c) Demonstrate the sensitivity of financial measures to given changes in plan design
d) Perform and interpret the results of projections for short-term planning including the effect of proposed plan changes

Sources:
Morneau Shepell, Handbook of Canadian Pension and Benefit Plans, 17th Edition, 2020 Ch. 6

ASOP 4, Measuring Pension Obligations and Determining Pension Plan Costs or Contributions

RET201-109-25: Plan Curtailments & Settlements Under FASB ASC Topic 715 Relating to Plan Terminations, Part 1

RET201-110-25: Plan Curtailments and Settlements Under FASB ASC Topic 715 Relating to Plan Terminations, Part 2

Commentary on Question:
Parts (a) and (b) were numerical questions and both were answered well. Successful candidates were able to show their calculations for the calculation of the 2023 net periodic pension cost. Some candidates struggled with the calculation of the amortization component.

Successful candidates for part (c) were able to discuss both short and long-term impacts of the change in relation to the financial accounting results.

There was a typo in the question; the 2022 average future working lifetime should have been 11.9, not 11.8. This value was not used in determining the 2023 net periodic pension cost, but if candidates attempted to match the 2022 amortization of gain/loss provided in the question, they would not have been able to do so.

Solution:
(a) Calculate the 2023 Net Periodic Pension Cost under ASC 715 assuming no experience gains or losses.

Show all work.

Commentary on Question:
See above

The model solution for this part is in the Excel spreadsheet.

(b) Calculate 2023 Net Periodic Pension Cost under ASC 715 based on these new assumptions.

Show all work.

Commentary on Question:
See above

The model solution for this part is in the Excel spreadsheet.

(c) Describe the impact of these strategies on Company ABC's financial results under ASC 715 in the short and long term.

No calculations required.

Commentary on Question:
See above

Strategy 1: Moving a portion of their target asset allocation from equities to fixed income over a period of 3 years

Company ABC will need to re-evaluate the EROA assumption
Depending on the materiality of the change, the EROA assumption may decrease for future years beginning with the following year's expense
A reduction in the EROA will lead to an increase in the expense for future years
As a result of the de-risking, the expense will likely be less volatile in the long-term
Depending on how long Company ABC decides to phase in the reduction of the EROA assumption, there may be a mismatch between the actual return on assets and expected return on assets, which could lead to additional volatility in the balance sheet in the short-term
De-risking the assets may also lead to a more stable funding position and may lead to a reduction in contributions to the plan going forward

Strategy 2: Providing a one-time option to all terminated vested employees to receive a lump sum payment in lieu of future benefit

If the total lump sum payments are greater than the sum of service cost and interest cost, settlement accounting will be triggered.
Depending on how long the payments take to process, settlement accounting may affect multiple year-ends

Depending on the basis used to determine the lump sum payment, settlement accounting may result in additional gains/losses in the short-term when compared to the accounting liability held for these members

As part of settlement accounting, a portion of unamortized losses will also need to be reflected immediately, which may result in additional losses in the short-term

In the long-term, the reduction in the PBO will reduce the volatility in the balance sheet

The payment of lump sums will also reduce the asset base used for EROA and may increase the expense in the long-term

RETDAU, Spring 2022, Q5

Learning Outcomes:
a) Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

RET201-111-25: FASB Accounting Standards Codification Topic 715

Commentary on Question:
Comments are included in each part below.

Solution:
(a) Describe the considerations when selecting an asset valuation method under Actuarial Standard of Practice No. 44, Selection and Use of Asset Valuation Methods for Pension Valuations.

Commentary on Question:
Full credit was provided if four considerations were provided with a description.

- Purpose and nature of the measurement - might select different methods for different purposes like a smoothed method for contribution forecasts and market value for termination basis
- Objectives of principal - like potential desire for more stable contributions or costs
- Multiple asset valuation Methods - different methods for different classes of assets, ex. smoothed for equities and market value for fixed income
- Adjustment of asset value for timing differences - Adjusting values if they are not available at the measurement date

(b) Calculate the 2022 Net Periodic Pension Cost under U.S. Accounting Standard ASC 715 using the following asset valuation methods:

(i) Fair Value of Assets

(ii) Market-related Value of Assets with unrecognized gains and losses smoothed over five years.

Show all work.

Commentary on Question:
Part (i) was generally well understood whereas many candidates experienced difficulties with Part (ii). Partial credit was awarded for demonstrating key concepts and correctly interpreting portions of the calculation. The use of either sinple interest or compound interest in the calculation of pension cost was accepted. The model solution shown uses compound interest. One example of a 5-year smoothing market-related value of assets is shown; other valid interpretations also received credit.

The model solution for this part is in the Excel spreadsheet

(c) Recommend whether Company ABC should move to using the Fair Value of Assets valuation method.

Justify your response. No calculations required.

Commentary on Question:
This portion of the question was generally well understood. Several interpretations of the recommendation with details for justification were awarded full credit.

- Recommend moving to Fair Value of assets
- Moving to more fixed income assets would make the assets more closely follow the liabilities so no longer have the need to smooth out asset gains and losses
- Using the fair value of assets to determine EROA going forward should lead to more stable expense (both EROA and G/L amortization components)

RETDAC/U, Spring 2022, Q11

Learning Outcomes:
a) Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations

Sources:
RET201-105-25: IFRS and US GAAP: Similarities and Differences, Ch. 5 only

RET201-109-25: Plan Curtailments & Settlements Under FASB ACS Topic 715 Relating to Plan Terminations, Part 1

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Compare and contrast the impact of closing the pension plan to new entrants under U.S. Accounting Standard ASC 715 (ASC 715) and International Accounting Standard IAS 19, Rev. 2011 (IAS 19) on the following:

(i) Net Periodic Pension Cost

(ii) Funded Status

(iii) Other Comprehensive Income

No calculations required.

Commentary on Question:
The question was trying to test the candidate's knowledge of US GAAP and IAS in a situation where a plan sponsor closes a final average pay defined benefit plan to new entrants. No calculations were required or expected. Candidates were expected to comment on both US GAAP and IAS19, or state where the impact was the same or different under each standard to receive full credit.

Net Periodic Pension Cost:

- Under both standards, closing the plan to new entrants will have no immediate impact on the net periodic pension cost given the PBO/DBO and service cost do not take into account new entrants
- Under both standards, the service cost will decrease over time as there are no new plan participants
- Under both standards, the interest cost will decrease over time as the PBO/DBO decrease
- Under ASC 715, if gains and losses are not immediately recognized, then gains and losses will be amortized over a shorter period as the average future working lifetime of the population decreases

Funded Status:

- Under both standards, there is no immediate impact on the funded status since closing the plan to new entrants does not immediately impact the assets or liabilities

Other Comprehensive Income (OCI):

- Under both standards, there is no immediate impact on OCI

(b) Compare and contrast the impact of freezing future service accruals under ASC 715 and IAS 19 on the following:

(i) Net Periodic Pension Cost

(ii) Funded Status

(iii) Other Comprehensive Income

No calculations required.

Commentary on Question:
Part b is looking for candidates to compare/contrast freezing future service accruals (but not freezing salaries/future pay accruals). This type of soft plan freeze does not trigger curtailment accounting under either accounting standard, but many candidates stated that it would. Candidates who received full credit described the impact on the different components of the Net Periodic Pension Cost.

Net Periodic Pension Cost:

ASC 715	IAS 19
Curtailment accounting will not be triggered even though future service accruals for a significant number of employees is eliminated. Employees will still be eligible to earn future benefits due to salary increases.	Not a curtailment because a curtailment under IAS 19 is described as a significant reduction in the number of employees covered by the plan
Should trigger a remeasurement	Should trigger a remeasurement
The PBO service cost will go to zero even though there are still future pay accruals (salaries were not frozen); PBO incorporates expected future salaries and will be higher than ABO	The DBO service cost will go to zero even though there are still future pay accruals (salaries were not frozen); DBO incorporates expected future salaries
The discount rate assumption may need to be revisited due to change in expected future cash flows	The discount rate assumption may need to be revisited due to change in expected future cash flows
No impact on EROA unless there is a change in assets due to remeasurement	

Funded Status:

ASC 715	IAS 19
There is no change to PBO due to the service accrual freeze. Only impact to funded status would be due to market movements and assumption changes between original measurement date and re-measurement date.	There is no change to DBO due to the service accrual freeze. Only impact to funded status would be due to market movements and assumption changes between original measurement date and re-measurement date.

Other Comprehensive Income (OCI):

ASC 715	IAS 19
Any gains or losses due to remeasurement become part of unrecognized gain/loss in OCI and are then amortized over time in expense	Any gains or losses due to remeasurement flow through OCI.

(c) Compare and contrast the impact of freezing future pay accruals under ASC 715 and IAS 19 on the following:

(i) Net Periodic Pension Cost

(ii) Funded Status

(iii) Other Comprehensive Income

No calculations required.

Commentary on Question:
Part c is looking for candidates to compare/contrast future pay accruals after service accruals had already been frozen (typically referred to as going from a "soft freeze" to a "hard freeze"). Curtailment accounting was triggered under ASC 715 due to the full plan freeze as all benefit accruals were ceased for current employees. Candidates who received full credit described the impact on the different components of the Net Periodic Pension Cost.

Net Periodic Pension Cost:

ASC 715	IAS 19
Curtailment accounting triggered. Timing – plan amendments are recognized when they are realized (i.e., once the plan amendment is adopted)	Not a curtailment Timing – recognition of past service costs is required when the plan amendment occurs
The service cost remains $0	The service cost remains $0
The interest cost will decrease since the PBO decreases due to removing future salary increases (PBO = ABO)	The interest cost will decrease since the DBO decreases due to removing future salary increases (DBO = ABO)
If gains and losses are not immediately recognized, then the gain/loss amortization period could be changed to average remaining life expectancy since all participants can be considered inactive. This will impact the gain/loss amount that is amortized	
Since the freeze eliminates all future years of service for benefit accruals, 100% of any existing prior service costs/credits and the curtailment gain of the liability decreasing from PBO to ABO should be immediately recognized in expense	Negative past service cost recognized in pension expense when the plan is amended and not amortized

Funded Status:

ASC 715	IAS 19
Since there are no future service accruals or salary projections, the PBO decreases to the ABO. Assuming assets are unchanged, the funded status will improve.	Since there are no future service accruals or salary projections, the DBO decreases to the ABO. Assuming assets are unchanged, the funded status will improve.

Other Comprehensive Income (OCI):

ASC 715	IAS 19
Any gains or losses (excluding curtailment gain) due to remeasurement become part of unrecognized gain/loss in OCI and are then amortized over time in expense	Any gains or losses due to remeasurement flow through OCI
Any existing prior service cost/credit bases go to zero	

RETRPIRM, Spring 2022, Q5

Learning Outcomes:
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations
c) Demonstrate the sensitivity of financial measures to given changes in plan design

Sources:
Corporate Pension Risk Management and Corporate Finance

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Calculate the following ratios for each company, adjusted for the net pension obligation:

- Debt-to-equity ratio;
- Long-term debt to equity ratio; and
- Asset-to-equity ratio.

Commentary on Question:
Some candidates scored well in this section. Candidates that did not do well made unnecessary adjustments or did not understand the balance sheet components.

Company A Debt-to-equity ratio = 34,453 / 12,709 = 2.71

Pension deficit = 12,983 – 11,663 = 1,320
Total long-term debt = 20,994 + 1,320 = 22,314
Long-term debt to equity ratio = 22,314 / 12,709 = 1.76

Asset-to-equity ratio : 47,162 / 12,709 = 3.71

Company B: Debt-to-Equity ratio = 52,267 / 18,392 = 2.84

Pension deficit = 0
Total long-term debt = 24,437
Long-term debt to equity ratio = 24,437 / 18,392 = 1.33

Asset-to-equity ratio : 70,659 / 18,392 = 3.84

(b) Calculate the following ratios for each company using a holistic corporate balance sheet approach:

- Debt-to-equity ratio;
- Long-term debt to equity ratio; and
- Asset-to-equity ratio.

Commentary on Question:
Candidates generally did not do well in this section. Many candidates did not understand the pension plan adjustments needed for the holistic corporate balance sheet approach. Some candidates did not realize that long term debt is already included in the balance sheet liabilities.

Company A: Liabilities excluding pension deficit = 34,453 – 1,320 = 33,133
Total liabilities = 33,133 + 12,983 = 46,116
Debt-to-Equity ratio = 46,116 / 12,709 = 3.63

Total long-term debt = 20,994 + 12,983 = 33,977
Long-term debt to equity ratio = 33,977 / 12,709 = 2.67

Pension surplus = 0
Assets excluding pension surplus: 47,162 – 0 =47,162
Total assets : 47,162 + 11,663 = 58,825
Asset-to-equity ratio : 58,825 / 12,709 = 4.63

Company B: Liabilities excluding pension deficit = 52,267 – 0 = 52,267
Total liabilities = 52,267 + 2,298 = 54,565
Debt-to-Equity ratio = 54,565 / 18,392 = 2.97

Total long-term debt = 24,437 + 2,298 = 26,735
Long-term debt to equity ratio = 26,735 / 18,392 = 1.45

Pension surplus = 3,764 – 2,298 = 1,466
Assets excluding pension surplus: 70,659 – 1,466 =69,193
Total assets : 69,193 + 3,764 = 72,957
Asset-to-equity ratio : 72,957 / 18,392 = 3.97

(c) Describe the advantages of using the holistic corporate balance sheet approach in (b) versus the traditional balance sheet approach used in (a).

Commentary on Question:
Generally this part was done well. Candidates could have earned more grading points by relating their answer to Companies A and B.

The inclusion of the net pension obligation only in the balance sheet does not reflect the risk of pension plan investments because it does not adequately account for the size of the pension plan relative to the company.

When adding pension liability and pension assets to the corporate balance sheet, the pension plan of Company A has a significant effect on the ratios showing that the pension plan is relatively important compared with the other operations of the company, which is not the case for Company B.

Using the holistic approach consolidates the asset and liability information for determination of financial ratios commonly used for corporate leverage.

All ratios increase when pension plans are consolidated into the corporate balance sheet. The ratios of company A and B increase by 0.9177 and 0.1249 respectively.

When pension liability and assets are added, The Debt-to-Equity ratio and Asset-to-Equity ratio of company A become above company B which was not apparent from the unadjusted balance sheet.

Company A is more leveraged than company B when taking into account the pension liabilities.

Liabilities are understated on the balance sheet when using the traditional approach. It only shows the pension deficit (i.e. AL minus assets).

RETDAC/U, Fall 2022, Q5

Learning Outcomes:
a) Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations

Sources:
RET201-108-25: Alternative Approaches to Calculating Service and Interest Cost under FASB ASC Topic 715, KPMG

Commentary on Question:
This question tested the candidates' knowledge of how the shape of the yield curve affects the Net Periodic Pension cost under both approaches and required candidates to calculate the Projected Benefit Obligation, Interest Cost and discount rates that would be disclosed in the ASC 715 report. Candidates generally did well on this question, and most were able to correctly calculate the disclosure items in part b under both approaches.

Solution:
(a) Describe the short-term impact of an upward sloping and downward sloping yield curve on the Net Periodic Pension Cost under U.S. Accounting Standard ASC 715 (ASC 715) using the following:

(i) Traditional Approach

(ii) Spot Rate Approach

No calculations required.

(i) Under the traditional approach, a single weighted average discount rate is used to determine the Service Cost and Interest Cost. It will be the same as the PBO discount rate and will not vary depending on the shape of the yield curve.

(ii) If the spot rate approach is adopted and the yield curve is upward sloping, the discount rate will be lower than the traditional approach discount rate, which produces a lower Interest Cost. This will increase the Net Gain/Loss and the resulting Net Gain/Loss amortization component of the Net Periodic Benefit Cost.

If the yield curve is downward sloping, the discount rate will be higher than the traditional approach discount rate, which produces a higher

Interest Cost. This will decrease the Net Gain/Loss and the resulting Net Gain/Loss amortization component of the Net Periodic Benefit Cost.

(b) Calculate the following using both the Traditional and Spot Rate Approaches:

(i) Projected Benefit Obligation under ASC 715

(ii) Interest Cost under ASC 715

(iii) Equivalent discount rates that would be disclosed in the ASC 715 report

Show all work.

The model solution for this part is in the Excel spreadsheet.

RETDAC, Fall 2022, Q9

Learning Outcomes:
a) Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

RET201-112-25: Accounting for Plan Splits & Plan Mergers Under U.S. GAAP

RET201-107-25: Introduction (A58), IFRS1 (paragraphs 1-40 & Appendix A), IAS19, IFRIC 14

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Describe three advantages and three disadvantages of merging the two plans from the perspective of Company ABC

Commentary on Question:
Many candidates did not provide three distinct advantages and three distinct disadvantages. Most candidates were able to identify there would be a reduction in cost, but credit was only provided for this answer once. If candidates identified reductions in three separate costs, that was not credited as being three separate advantages.

Also, many candidates indicated that the benefit formula would have to be changed to be the same for both groups after the merger or that the same demographic assumptions would need to be used for each covered group after the merger. Neither of these suppositions is true.

Advantages
- Merging the two plans can minimize costs associated with maintaining multiple plans (plan audit costs, plan filing costs, actuarial valuation costs).
- The overall benefit structure will not change, which should minimize any potential plan disruption.
- Assets from both predecessor plans can be used to satisfy previously existing obligations of the other.

Disadvantages

- Company ABC should consider how plan participants will be impacted, including what communications are required.
- Agreements reached through collective bargaining considerations with unions must be considered as certain levels of funding may be required in the contract.
- Objectives of the plans may be different. For example, the union benefit may be collectively bargained, and the salaried plan may be used for attraction and retention. May not be able to meet both objectives with a merged plan

(b) Calculate the 2023 Defined Benefit Cost under International Accounting Standard IAS 19, Rev. 2011 (IAS 19) for the merged plan.

Commentary on Question:
Most candidates did well on this part.

The model solution for this part is in the Excel spreadsheet

(c) Calculate the revised 2023 Defined Benefit Cost under IAS 19 reflecting the annuity buy-out.

Show all work.

Commentary on Question:
Most candidates did well on this part.

The model solution for this part is in the Excel spreadsheet

RETDAU, Fall 2022, Q9

Learning Outcomes:
a) Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

RET201-111-25: FASB Accounting Standards Codification Topic 715

RET201-112-25: Accounting for Plan Splits & Mergers Under U.S. GAAP

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Describe three advantages and three disadvantages of merging the two plans from the perspective of Company ABC.

Commentary on Question:
Many candidates did not provide three distinct advantages and three distinct disadvantages. Most candidates were able to identify there would be a reduction in cost, but credit was only provided for this answer once. If candidates identified reductions in three separate costs, that was not credited as being three separate advantages.

Also, many candidates indicated that the benefit formula would have to be changed to be the same for both groups after the merger or that the same demographic assumptions would need to be used for each covered group after the merger. Neither of these suppositions is true.

Advantages
- Merging the two plans can minimize costs associated with maintaining multiple plans (plan audit costs, plan filing costs, actuarial valuation costs).
- The overall benefit structure will not change, which should minimize any potential plan disruption.
- Assets from both predecessor plans can be used to satisfy previously existing obligations of the other.

Disadvantages

- Company ABC should consider how plan participants will be impacted, including what communications are required.
- Agreements reached through collective bargaining considerations with unions must be considered as certain levels of funding may be required in the contract.
- Objectives of the plans may be different. For example, the union benefit may be collectively bargained, and the salaried plan may be used for attraction and retention. May not be able to meet both objectives with a merged plan.

(b) Calculate the 2023 Net Periodic Pension Cost under U.S. Accounting Standard ASC 715 (ASC 715) for the merged plan.

Show all work.

Commentary on Question:
Most candidates did well on this part. To receive full credit, candidates needed to show all work, which included the total merged net gain/loss and prior service cost at 1/1/2023.

The model solution for this part is in the Excel spreadsheet

(c) Calculate the settlement charge/(credit) under ASC 715 due to the retiree annuity buy-out as of March 31, 2023.

Show all work.

Commentary on Question:
Many candidates did not correctly calculate the gain/loss at the remeasurement date or include the $20,000 loss from the annuity buyout in gain/loss.

The model solution for this part is in the Excel spreadsheet

RETRPIRM, Fall 2022, Q4

Learning Objectives:
c) Demonstrate the sensitivity of financial measures to given changes in plan design

Sources:
Corporate Pension Risk Management and Corporate Finance: Bridging the Gap between Theory and Practice in Pension Risk Management

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Recommend an approach to consolidating pension positions into a balance sheet analysis that is appropriate on an economic basis.

Justify your recommendation.

Commentary on Question:
Candidates generally did well in this part. Those that did not do well generally did not explain why one approach was better than the other.

-Holistic balance sheet approach is appropriate for economic basis.
- Including just the net pension obligation does not reflect the risk of pension plan investment.
- Including just the net pension obligation does not adequately account for the size of the pension plan relative to operating part of business.

(b) Calculate the debt to equity ratios, long-term debt to equity ratios and asset to equity ratios for each Company by filling out the table in Excel.

($ millions)	Total Asset	Total Liability	Equity	Long-term debt	Pension asset	PBO
Company A	50.50	40.60	9.90	20.10	6.57	8.70
Company B	200.30	160.40	39.90	30.20	30.60	27.80
Company C	10.50	9.80	0.70	0.50	0.42	0.29
Company D	800.80	600.90	199.90	150.90	240.24	210.32
Company E	100.70	90.20	10.50	10.70	5.04	5.61

Commentary on Question:
This part tests the holistic corporate balance sheet. The areas where candidates struggled the most were Adjusted Pension Asset and Adjusted Pension Liabilities. They did not adequately account for the buyout liability for all companies, pension buyout for Company B and the hedge against interest rate risk for Company D.

Pension deficit	Adjusted pension asset	Adjust pension liabilities	Adjusted pension deficit	Adjusted total asset	Adjusted total liabilties	Adjusted long term debt	Debt to equity ratio	Long term debt to equity ratio	Asset to equity ratio
-2.14	6.57	9.57	-3.01	57.07	52.31	29.67	5.28	3.00	5.76
2.80	0.00	0.00	0.00	200.30	157.60	30.20	3.95	0.76	5.02
0.13	0.42	0.32	0.10	10.92	10.00	0.82	14.28	1.18	15.60
29.93	48.05	46.27	1.78	848.85	617.24	197.17	3.09	0.99	4.25
-0.58	5.04	6.18	-1.14	105.74	96.95	16.88	9.23	1.61	10.07

(c) Recommend the acquisition of either Company B or Company E, taking into account the risk involved for Company MNO.

Justify your recommendation.

Commentary on Question:
Candidates generally did well in this section. Those that did not do well generally did not correctly explain why they were recommending one company over the other, or recommended the wrong Company.

-Recommend acquiring Company B.
-The debt to equity and long term debt to equity ratios for company B are lower than that for company E, which means company B is not as leveraged and is considered less risky.

(d) Calculate the change in equity capital and debt-to-equity ratio for Company XYZ if the pension plan's equity allocation were changed to 30%, 15% or 0%, by filling out the table in Excel.

Commentary on Question:
Participants generally did not do well in this section, particularly in calculating the Pension asset beta, Equity, and Change in equity capital.

Pension asset beta	Change in pension asset beta	Equity	Change in equity capital	Debt to equity ratio
0.45	n/a	17.1	n/a	2.05
0.3	-0.15	14.4	-2.74	2.44
0.15	-0.3	11.6	-5.47	3.01
0	-0.45	8.9	-8.21	3.94

RETDAC/U, Spring 2023, Q3

Learning Outcomes:
a) Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations

Sources:
RET201-107-25: Introduction (A58), IFRS1 (paragraphs 1-40 & Appendix A), IAS19, IFRIC14

Commentary on Question:
Parts (a) and (b) of the question tested the candidates' knowledge on the concepts of IFRIC14. This question was not well done overall. Many candidates gave incomplete, or even blank responses. See additional commentary in each individual part below.

Solution:
(a) Explain the concept of an economic benefit under IFRIC Interpretation 14: IAS 19 – The Limit on a Defined Benefit Asset, Minimum Funding Requirements and their Interaction.

Commentary on Question:
This was the best answered part of the three. Most candidates received credit for recognizing that economic benefits are related to future contributions and had to take into consideration minimum funding requirements.

- an economic benefit is available if the entity can realize it at some point during the life of the plan or when the plan liabilities are settled
- an entity shall determine the maximum economic benefit available from refunds, reductions in future contributions, or combination of both
- if there is no minimum funding requirements for contributions relating to future service, the economic benefit available as a reduction in future contributions is the future service cost to the entity
- If there are minimum funding requirements
    - analyze minimum funding contributions required to cover (a) any existing shortfall for past service on the minimum funding basis and (b) future service

- o if an entity has an obligation under a minimum funding requirement to pay contributions to cover an existing shortfall on the minimum funding basis in respect of service already received, the entity shall determine whether the contributions payable will be available as a refund or reduction in future contributions after they are paid into the plan
- o To the extent that the contributions payable will not be available after they are paid into the plan, the entity shall recognize a liability when the obligation arises
- o The liability shall reduce the net defined benefit asset or increase the net defined benefit liability

(b) List the considerations used to test whether an entity has an unconditional right to a refund under International Accounting Standard IAS 19, Rev. 2011 (IAS 19).

Commentary on Question:
This part of the question was poorly answered by candidates.

• Refund is available to an entity:
- o during the life of the plan, without assuming that the plan liabilities must be settled in order to obtain the refund (eg. In some jurisdictions, the entity may have a right to a refund during the life of the plan, irrespective of whether the plan liabilities are settled); or
- o assuming the gradual settlement of the plan liabilities over time until all members have left the plan; or
- o assuming the full settlement of the plan liabilities in a single event (eg. Plan wind-up)

• An unconditional right can exist, whatever the funding level of a plan, at the end of the reporting period

(c) Describe the disclosure requirements under IAS 19 for defined benefit pension plans.

Commentary on Question:
The question asks for disclosure requirements per IAS 19, meaning what is to be presented in the financial statement results. Majority of candidates instead listed the items required for a funding actuarial report and did not reference items specifically listed in IAS 19.

• explain the characteristics of the defined benefit plan and risks associated
- o nature of benefits (i.e. final salary, contribution based with guarantees)
- o regulatory framework (i.e. minimum funding requirements, asset ceiling)
- o description of risks, with focus on unusual, entity/plan-specific risks
- o description of amendments, curtailments, settlements

- Identify and explain the amounts in its financial statement arising from the plan
    - net defined benefit liability (asset)
    - show: current service cost, interest income/expense
    - show: remeasurement (return on assets, actuarial gains/losses from change in demographic, and economic assumptions)
    - disclose significant actuarial assumptions
- Describe how the plan may affect the amount, timing, and uncertainty of the entity's future cash flows
    - sensitivity analysis for each significant actuarial assumption
    - description of asset-liability matching strategies, including annuities, longevity swaps, etc.
    - expected contribution to plan for next annual reporting period
    - information about maturity profile of defined benefit obligations (i.e. weighted average duration)

RETDAC/U, Spring 2023, Q6

Learning Outcomes:
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations

Sources:
RET201-106-25: Accounting for Buy-Ins

RET201-105-25: IFRS and US GAAP: Similarities and Differences, Ch. 5 only

Commentary on Question:
This question requires candidates to demonstrate their understanding of the accounting impact of an annuity buy-in and whether or not it triggers any special accounting events. Successful candidates were able to demonstrate such understanding and compare how the accounting treatments are different between IAS 19 and ASC 715

Solution:
(a) Compare and contrast the accounting implications of an annuity buy-in under International Accounting Standards IAS 19, Rev 2011 (IAS 19) versus U.S. Accounting Standard ASC 715 (ASC 715).

No calculations required.

Both IAS 19 and ASC715 would not consider an annuity buy-in transaction a settlement.

Balance sheet impact:
IAS 19: assets are reduced to reflect the value of the underlying DBO and there is no impact on the DBO
ASC 715: buy-in policy is a plan asset measured at fair value. Relevant PBO may be unchanged (same as under IAS 19) OR it may be potentially valued on the same basis as the policy value.

Profit and loss impact will be different under the two accounting standards.
IAS 19: No immediate impact. However, a lower asset value will feed through into a higher net interest charge in future years.
ASC 715: If the fair value is less than the premium paid, there would be an asset loss to amortize (plus there will be impact on subsequent EROA). Also, there could be assumption losses to amortize if the PBO was determined based on the fair value of the policy (plus impact on subsequent interest cost).

(b) Describe the accounting implications of converting an annuity buy-in to an annuity buy-out under both IAS 19 and ASC 715.

No calculations required.

Under IAS19 a buy-in followed by a buy-out will technically trigger settlement accounting. The settlement charge is expected to be $0 since the PBO associated with the annuity buy-in / buy-out is not changed. There will likely be an immediate asset loss associated with the premium paid for the buy-in vs. the PBO removed.

Under ASC 715 a buy-in followed by a buy-out will trigger a settlement if the amount of the PBO removed is greater than the sum of service cost and interest cost. The settlement gain/loss reflects the pro-rata recognition of previously unamortized gains or losses on the entire plan.

RETDAC/U, Spring 2023, Q9

Learning Outcomes:
a) Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations

Sources:
RET201-106-25: Accounting for Buy-ins

RET201-110-25: Plan Curtailments & Settlements Under FASB ASC Topic 715 Relating to Plan Terminations, Part 2

Duration and Convexity for Pension Liabilities, Pension Section News, Sep 2013

Pension Risk Transfer: Evaluating Impact and Barriers for De-Risking Strategies, 2014, pp. 16, 17 & 20-27 (REPLACED ON SYLLABUS WITH LATER VERSION)

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Calculate the 2023 Net Periodic Pension Cost under U.S. Accounting Standard ASC 715 (ASC 715).

Show all work.

Commentary on Question:
This numerical question was answered well. Successful candidates showed detailed calculations of the 2023 Net Periodic Pension Cost. The model solution uses simple interest; calculations using compound interest approach are also acceptable and received credit.

The model solution for this part is in the Excel spreadsheet.

(b) Calculate the following values under ASC 715 reflecting the annuity buy-out:

(i) 2023 Net Periodic Pension Cost

(ii) 2023 Other Comprehensive Income

Show all work.

Commentary on Question:
To receive full credit for Part (i), candidates were required to show the following calculations:

- *Remeasurement of liabilities as at July 1, 2023 prior to the annuity buy-out*
- Impact of the annuity buy-out on liabilities: settlement loss
- Revision to 2023 Net Periodic Pension Cost after the annuity buy-out, including fully recognizing the gains/losses due to remeasurement and settlement

Although the question specifies that gains/losses are recognized immediately in the period in which they arise, many candidates spent time to calculate the 2023 Other Comprehensive Income and thus did not receive credit for Part (ii). Successful candidates were able to explain that the 2023 Other Comprehensive Income is 0.

The model solution uses simple interest; calculations using compound interest approach are also acceptable and received credit.

The model solution for this part is in the Excel spreadsheet.

(c) Describe how the values in part (b) would change if the transaction was an annuity buy-in rather than an annuity buy-out.

No calculations required.

Commentary on Question:
Candidates are expected to explain in words how Part (b) would change if this were instead an annuity buy-in. Candidates who performed well indicated how gains/losses would differ and how subsequent Net Periodic Pension Cost would be impacted.

- No settlement would be triggered under a buy-in.
- The policy is a plan asset, measured at “fair value”, i.e. the surrender value or possibly the premium that would be paid currently. Asset loss to be recognized immediately if “fair value” less than the premium paid.
- PBO may be unchanged or potentially valued on the same basis as the policy value. No immediate impact if PBO is unchanged. If PBO is based on fair value of the policy, liability loss will be recognized immediately.
- Subsequent EROA and interest cost would be impacted.

RETDAC/U, Fall 2023, Q5

Learning Outcomes:
a) Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations
c) Demonstrate the sensitivity of financial measures to given changes in plan design

Sources:
Duration and Convexity for Pension Liabilities, Pension Section News, Sep 2013

RET201-105-25: IFRS and US GAAP: Similarities and Differences, Ch. 5 only

RET201-106-25: Accounting for Buy-ins

RET201-107-25: Introduction (A58), IFRS1 (paragraphs 1-40 & Appendix A), IAS19, IFRIC14

Pension Risk Transfer: Evaluating Impact and Barriers for De-Risking Strategies, 2014, pp. 16, 17 & 20-27 (REPLACED ON SYLLABUS WITH A NEWER VERSION)

Commentary on Question:
Parts (a) and (b) of this question were designed to test candidates' knowledge of liability sensitivity to interest rate change and application of such sensitivity. Part (c) of this question was designed to test candidates' knowledge of settlement accounting under the various accounting standards. Part (d) of this question was designed to test candidates' knowledge of an annuity buy-in.

Solution:
(a) Calculate the following for the retiree DBO:

(i) Effective Duration

(ii) Convexity

Show all work.

Commentary on Question:
Candidates generally did not understand how to calculate duration or convexity. Candidates who provided commentary about the calculations received partial credit.

The model solution for this part is in the Excel spreadsheet.

(b) Determine the settlement credit/(cost) of the annuity buy-out under International Accounting Standard IAS 19, Rev. 2011 (IAS 19).

Show all work.

Commentary on Question:
Successful candidates applied the duration of a rate increase to determine the settled obligations and the settlement cost.

The model solution for this part is in the Excel spreadsheet.

(c) Compare and contrast the accounting implications of an annuity buy-out under IAS 19 versus U.S. Accounting Standard ASC 715.

No calculations required.

Commentary on Question:
Successful candidates who provided a full comparison between the two accounting standards when settlement accounting is triggered received full credit.

US GAAP	IAS 19
An annuity buy-out triggers settlement accounting. However, an employer may elect an accounting policy whereby settlement gain or loss recognition is not required if the cost of all settlements within a plan year does not exceed the sum of the service and interest cost components of net benefit cost for that period.	An annuity buy-out always triggers settlement accounting.
Under US GAAP, a settlement gain/loss reflects the pro-rata recognition of previously unamortized gains or losses on the entire plan.	Under IFRS, a settlement gain or loss generally reflects the difference between the settlement price and the actuarial valuation liability of the obligation that has been settled.

The proration is based on the ratio of the obligation settled to the total obligation of the plan.	
The unrecognized gain/loss subject to recognition includes the effect of the remeasurement.	Gain/loss with respect to the effect of the remeasurement is recognized immediately through OCI.

(d) Critique an annuity buy-in as an alternative de-risking strategy.

No calculations required.

Commentary on Question:
Successful candidates who provided an exhaustive list of both the strengths and weakness of an annuity buy-in as a de-risking solution received full credit. Candidates did not generally do as well on this part of the question.

Strengths	**Weakness**
Protects against longevity risk.	Pension obligations of affected annuitants remain on Company balance sheet.
Protects against market and interest rate risk.	Administration responsibilities remain with the Plan Administrator.
A buy-in annuity purchase does not trigger settlement accounting.	Cost (premium) of buy-in is comparable to that of a buy-out without the settlement charge.
A buy-in annuity policy may be converted to a buy-out. Therefore, the policyholder has the ability to control timing of the settlement charge if later desired.	Ontario PBGF premiums on the buy-in liabilities continue to be required.

RETDAC/U, Fall 2023, Q8

Learning Outcomes:
a) Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs

Sources:
RET201-105-25: IFRS and US GAAP: Similarities and Differences, Ch. 5 only

RET201-107-25: Introduction (A58), IFRS1 (paragraphs 1-40 & Appendix A), IAS19, IFRIC14

RET201-109-25: Plan Curtailments & Settlements Under FASB ASC Topic 715 Relating to Plan Terminations, Part 1

Commentary on Question:
This question was trying to test the candidates' ability to calculate the NPPC and AOCI for year-end purposes and also their understanding of the accounting treatment of a plan freeze. Candidates who performed well generally provided all their calculations in detail, understood how to roll forward the plan's obligations/assets, and the consistency of those underlying components with the NPPC (e.g. service cost, interest cost, EROA).

Solution:
(a) Calculate the following under ASC 715:

(i) 2023 Net Periodic Pension Cost

(ii) AOCI as of December 31, 2023

Show all work.

Commentary on Question:
Candidates understood the components of the NPPC generally well, but the majority did not subtract the employee contributions from the service cost to only represent the employer portion.

The model solution for this part is in the excel spreadsheet. Simple interest is used in this model solution; answers that used compound interest also received credit.

(b) Calculate the 2023 Net Periodic Pension Cost under ASC 715.

Show all work.

Commentary on Question:
Candidates were generally able to determine the NPPC for the first half of the year and recognize the service cost is $0 effective July 1st due to the plan freeze. However, some candidates did not properly account for the impact of the plan freeze on the NPPC (i.e. curtailment).

The model solution for this part is in the excel spreadsheet. Simple interest is used in this model solution; answers that used compound interest also received credit.

RETDAC/U, Fall 2023, Q10

Learning Outcomes:
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations

Sources:
RET201-105-25: IFRS and US GAAP: Similarities and Differences, Ch. 5 only

Commentary on Question:
This question tested knowledge of the differences in accounting implications between IAS 19 and ASC 715 for this plan freeze scenario. Candidates generally had good knowledge of the material.

Solution:
(a) Describe the accounting implications of the freeze under the following:

(i) International Accounting Standard IAS 19, Rev. 2011 (IAS 19)

(ii) U.S Accounting Standard ASC 715 (ASC 715)

Commentary on Question:
To receive full credit, candidates needed to demonstrate sound knowledge of the accounting treatment under both IAS 19 and ASC 715 and justify their response. Many candidates focused their answer on the specific impact to each of the expense components without providing overall justification for any special accounting implications (eg curtailment) in this scenario. Other valid responses not shown below also received credit, including justification for selecting the measurement dates.

IAS 19:

- Under IAS 19, a curtailment takes place when there is a significant reduction in the number of employees covered by the plan.
- Although all active participants are impacted and future accruals are frozen, this scenario is not considered a curtailment because it does not significantly reduce the number of employees covered by the plan.
- Under IAS 19, plan amendments are recognized when realized, in this case December 31.
- Deferral of any gains/losses is not permitted under IAS 19.
- Pension expense will be impacted including decreased liability and service cost.

ASC 715:

- Under ASC 715, an event that eliminates the accrual of defined benefits for some or all future service and for a significant number of employees qualifies as a curtailment.
- This event is a curtailment given all employees will have their future accruals eliminated.
- Curtailments resulting from plan amendments are recognized when realized, in this case December 31.
- Under ASC 715, must consider certain offsets of any unamortized gains/losses in a curtailment as does not permit pro rata recognition of the remaining unamortized gains/losses.
- Pension expense will be impacted including decreased liability and service cost.

(b) Explain how to determine whether settlement accounting applies under the following:

(i) IAS 19

(ii) ASC 715

Commentary on Question:
This question was well understood with most candidates reflecting on the difference in applying settlement accounting between IAS 19 and ASC 715.

IAS 19:

- Under IAS 19, if settlements are due to lump sum elections by employees as part of the normal operations of the plan, settlement accounting does not apply.
- In this case, given that lump sums are permitted under plan rules, this would not be a settlement event under IAS 19.

ASC 715:

- Under ASC 715, lump sum settlements are considered a form of settlement. However, an employer may elect an accounting policy whereby the settlement recognition is not required if the cost of all settlements within a plan year does not exceed the sum of the service cost and interest cost components of the net benefit cost for that period.
- If the total lump sums paid exceed this sum, settlement accounting is required under ASC 715. If the total lump sums are less than the sum of service cost and interest cost, settlement accounting is only required if the above policy was not elected.

RETDAC, Spring 2024, Q5

Learning Outcomes:
a) Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations

Sources:
RET201-105-25: IFRS and US GAAP: Similarities and Differences, Ch. 5 only

RET201-109-25: Plan Curtailments & Settlements Under FASB ASC Topic 715 Relating to Plan Terminations, Part 1

RET201-110-25: Plan Curtailments & Settlements Under FASB ASC Topic 715 Relating to Plan Terminations, Part 2

Commentary on Question:
The model solution for this question is in the Excel spreadsheet. While simple interest approach is used in the model solution, calculations using compound interest approach are also acceptable.

Solution:
(a) Calculate the 2024 Net Periodic Pension Cost under ASC 715.

Show all work.

Commentary on Question:
This numerical question was answered well. Successful candidates showed calculations for all components of the 2024 Net Periodic Pension Cost. Candidates who included Prior Service Cost when determining amount of gains/losses to be amortized outside of the 10% corridor only received partial credit.

The model solution for this part is in the Excel spreadsheet.

(b) Calculate the Accumulated Other Comprehensive Income as of December 31, 2024.

Show all work.

Commentary on Question:
Candidates who performed well understood how to roll forward the plan's obligations/assets and provided all their calculations in detail. Candidates who failed to include Unrecognized Prior Service Cost as part of AOCI only received partial credit.

The model solution for this part is in the Excel spreadsheet.

(c) Calculate the following:

(i) Revised 2024 Net Periodic Pension Cost

(ii) Funded status at December 31, 2024

(iii) Accumulated Other Comprehensive Income at December 31, 2024

Show all work.

Commentary on Question:
This part was the most difficult for candidates to answer. To receive full credit, candidates were required to:

- *Identify that lump sums are considered settlements and perform the SC + IC test to check if immediate recognition of gains/losses is required*
- *Demonstrate their understanding of the accounting treatment of settlements (i.e., determine the settlement loss and calculate the amount of gains/losses immediately recognized due to settlement) by properly reflecting its impact on the 2024 Net Periodic Pension Cost*
- *Show calculations of funded status and AOCI after the settlement at December 31, 2014*

The model solution for this part is in the Excel spreadsheet.

(d) Calculate the revised 2024 Defined Benefit Cost under International Accounting Standard IAS 19, Rev. 2011 (IAS 19).

Show all work.

Commentary on Question:
Generally, candidates did well on this part of the question. Candidates received partial credit if they failed to account for immediate recognition of Prior Service Cost and settlement loss per the requirements under IAS 19. The model solution reflects interest on SC being a part of the SC component; candidates who instead reflected that interest as part of the IC also received credit.

The model solution for this part is in the Excel spreadsheet.

RETDAC/U, Spring 2024, Q7

Learning Outcomes:
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations

Sources:
RET201-106-25: Accounting for Buy-ins

Pension Risk Transfer: Evaluating Impact and Barriers for De-Risking Strategies, 2014, pp. 16, 17 & 20-27 (REPLACED ON SYLLABUS WITH A NEWER VERSION)

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Describe the advantages and disadvantages of the following pension risk transfer strategies from the perspective of an employer:

(i) Annuity buy-in

(ii) Annuity buy-out

Commentary on Question:
Candidates did very well on part (a) of this question providing many relevant points for each risk transfer strategy.
The model solution below is an example of an answer that would receive full credit; it does not include all possible answers. Other reasonable answers also received credit.

(i) Annuity buy-in

Advantages	Disadvantages
Settlement accounting not triggered	Employer retains administrative responsibilities related to the payment of benefits
May convert to annuity buy-out when employer is better situated to handle settlement costs	could be administratively complex to true up the population each year with the insurance company
Effectively immunizes the pension liability associated with the individuals that form part of the annuity buy-in contract	Employer still required to pay PBGF fees for impacted participants.

(ii) Annuity buy-out

Advantages	Disadvantages

Relieves administrative responsibilities which may result in cost reductions	Settlement accounting triggered
Liability completely removed from the balance sheet which reduces the risk the company holds	Premium for annuity buy-out is likely above liability held on balance sheet and may outweigh the unrecognized gains
Employer no longer has to pay PBGF fees	Communication will have to be sent out to participants included in the buy-out, which may create incertitude and questions

(b) Explain why an annuity buy-out premium may exceed the projected benefit obligation (PBO) under U.S. Accounting Standard ASC 715.

Commentary on Question:
Candidates did not do as well on part (b) of this question, as answers were sometimes very short and did not include enough information to explain the reasons why annuity buy-out premiums exceeded the PBO.

- Insurer may use a more conservative discount rate with different credit spreads or default risk adjustments than that used by the plan sponsor to value the PBO.
- Insurer may use a different mortality assumption than the plan sponsor based on the insurer's experience which is quite large and more up to date. Recent longevity improvements are not fully captured in the mortality tables and improvement scales most commonly used by plan sponsors.
- An insurer may add additional premiums for plans that have less retirees and larger proportions of deferreds because of the uncertainty of the payment stream timing in the future.
- Premiums include loads for administration fees, investment fees, profit, etc.
- An insurer may add additional premiums for complicated plan provisions such as COLAs, cash balance provisions with interest crediting rates, lump sum payment forms, or other complex payment forms and may assume that all participants elect the most valuable form of payment.
- Additional liabilities and risks held by the plan sponsor as a result of maintaining the pension plan may not be included in the balance sheet liability.
- An insurer may add additional premiums if the plan is particularly small, where the set up of the ongoing administration of the plan outweighs the appeal of taking on the plan assets.

(c) Describe the advantages and disadvantages of adding a permanent lump sum option at retirement to a defined benefit pension plan from the perspective of the following:

(i) Employer

(ii) Plan participants

Commentary on Question:
To obtain full credit, candidates had to provide advantages and disadvantages from both the employer and plan participant perspective. Candidates did well overall.

The model solution below is an example of an answer that would receive full credit; it does not include all possible answers. Other reasonable answers also received credit.

(i) Employer

Advantages	**Disadvantages**
Relieves employer of longevity risk for those who elected the lump sum option	Subject to anti-selection – those who are healthy more likely to take annuity and live longer than expected, while those who are unhealthy will take the lump sum that may be valued at a longer life expectancy
Attracts younger employees due to flexibility with payments at retirement as they may be more mobile	can be tough to manage the investment management when you're not sure when large distributions will occur from the asset pool - can sometimes lead to larger variances in expected cash flows and actual cash flows

(ii) Plan participants

Advantages	**Disadvantages**
Provides member with individual control over how the lump sum is invested	Risks outliving their assets (i.e., longevity risks) and risk of poor investment decisions in retirement (i.e., investment risks) if they elect a lump sum option
If participant knows they are less healthy and will die sooner than projected, will receive a larger value from their retirement plan with a lump sum since the money is accelerated to an upfront payment	Risks of unfavorable interest rates (i.e., interest rate risks) used for valuing their lump sum entitlement

RETDAC/U, Spring 2024, Q8

Learning Outcomes:
a) Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations
d) Perform and interpret the results of projections for short-term planning including the effect of proposed plan changes

Sources:
RET201-105-25: IFRS and US GAAP: Similarities and Differences, Ch. 5 only

RET201-107-25: Introduction (A58), IFRS1 (paragraphs 1-40 & Appendix A), IAS19, IFRIC14

RET201-109-25: Plan Curtailments & Settlements Under FASB ASC Topic 715 Relating to Plan Terminations, Part 1

Commentary on Question:
This question was a mathematical question that tested knowledge of IAS 19 and ASC 715. The model solution for this question is in the Excel spreadsheet. While simple interest approach is used in the model solution, calculations using compound interest approach are also acceptable. For IAS 19, the model solution reflects interest on SC being a part of the SC component; candidates who instead reflected that interest as part of the IC also received credit.

Solution:
(a) Calculate the following:

(i) 2024 Defined Benefit Cost under IAS 19

(ii) 2024 Net Periodic Pension Cost (NPPC) under ASC 715

Show all work.

Commentary on Question:
Candidates did very well on part (ii) and generally poorly in part (i), demonstrating a good familiarity with the calculations and projections under ASC 715, and a lesser knowledge of IAS 19.

Few candidates were able to calculate the correct end results and earn full credit. However, small calculation or formula errors were minimally penalized. Accordingly, most candidates did fairly well on part (a).

Please refer to the Excel spreadsheet for the calculations.

(b) Company ABC is closing one of its plants, eliminating 30% of their workforce, effective December 1, 2024. Lump sum payments related to this event are not paid in 2024.

Describe how the values in part (a) would change for this scenario.

No calculations required.

Commentary on Question:
Most candidates correctly indicated that the plant close caused a curtailment and not a settlement. The knowledge of ASC715 was far better than IAS19. Many candidates had limited knowledge of IAS19.

Candidates who commented on the increase or decrease of the components of service cost received no credit for those comments. Candidates who answered on how NPCC is recalculated and how gains are accounted for under each standard for the question's scenario received full credit.

General

- the scenario described is a curtailment under both accounting standards since a significant number of employees have been eliminated from accruing future service.
- On curtailment, the impact will be calculated on the effective date under both accounting standards
- the curtailment gain calculated is the difference between the PBO and ABO for the affected group of employees
- the DB cost/NPPC is recalculated/remeasured at the new assumptions on the effective date for periods beyond the effective date (i.e. from December 1, 2024)

- final 2024 expense will be 11/12 of amount previously calculated plus 1/12 of amount based on December 1, 2024 PBO and assets plus one-time curtailment (credit)
- There is no settlement

Under IAS19:

- entire impact/gain goes through P&L in 2024

Under US GAAP:

- since this curtailment results in a net gain, it must be recognized when the event occurs (i.e. Dec 1, 2024)
- if the absolute value of curtailment gain is less than the unrecognized loss, it would reduce the unrecognized loss amount in AOCI (in that case there would be no separate curtailment (gain) included in expense)
- curtailment would lead to immediate recognition of proportionate amount of unrecognized PSC (if that existed). Not applicable for this plan

RETDAC/U, Fall 2024, Q5

Learning Outcomes:
a) Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

RET201-108-25: Alternative Approaches to Calculating Service and Interest Cost under FASB ASC Topic 715, KPMG

ASOP 4 - Measuring Pension Obligations

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) You are calculating the Net Periodic Pension Cost (NPPC) under U.S. Accounting Standard ASC 715 (ASC 715).

Compare and contrast the following approaches:

(i) Bond Matching

(ii) Traditional Yield Curve

(iii) Spot Rate

No calculations required.

Commentary on Question:
To earn full credit, candidates needed to explain how each approach affects each component of the Net Periodic Pension Cost. While many candidates detailed how the discount rate is determined under each approach, they often failed to address the specific impacts of each approach on all components of the Net Periodic Pension Cost.

Contrast

Bond Matching Model

- A portfolio of bonds is identified that is expected to generate cash flows from principal and interest that results in a good *fit* to the estimated benefit payments of the plan. The market value of the identified bonds is viewed as the equivalent to the present value of the benefit obligation.
- Bond matching discount rate expected to differ from the Traditional yield curve.
- Bond matching discount rate used to determine interest cost and service cost.

Traditional Yield Curve Approach

- Projected benefit payment cash flows for each future period over the life of the plan are discounted back to the measurement date using the spot interest rate associated with each period in the high-quality corporate bond yield curve.
- The discount rate is effectively an output of this benefit obligation calculation, rather than a rate that was used to discount the projected cash flows.
- This rate is the discount rate that would be disclosed as the discount rate used to measure the benefit obligation at year end, as well as determine interest cost and service cost

Spot Rate Approach

- Projected benefit payment cash flows for each future period over the life of the plan are discounted back to the measurement date using the spot interest rate associated with each respective period in the high-quality corporate bond yield curve.
- Interest cost under the Spot Rate Approach is determined by multiplying the individual spot rates from the exact same yield curve by each year's present value of future projected benefit payments. The sum of those products is the interest cost for the period.
- The service cost is the present value of benefits attributed by the benefit formula to services rendered by employees during that period determined using the same yield curve as the PBO and IC

Compare

- Bond Matching Model and Traditional Approach both use the effective PBO discount rate for measuring service and interest cost.
- The Internal Rate of Return from the calculated benefit obligation is the single weighted discount rate.
- No impact on EROA
- No impact on PSC
- PBO is the same under traditional yield curve and spot rate approaches

- Variation in the SC and IC will be offset by a change in the gains and losses. Therefore, the amortization of G/L will also be impacted based on the approach used
- If SC and IC are lower due to the approach, settlement accounting could be triggered more often since settlement accounting is triggered if SC + IC is less than settlement

(b) Compare and contrast the Traditional Yield Curve approach versus the Spot Rate approach in a downward sloping yield curve environment on the following under ASC 715:

(i) NPPC

(ii) Funded Status

Commentary on Question:
To earn full credit, candidates needed to clearly explain how the two approaches in a downward sloping yield curve environment affect each component of the Net Periodic Pension Cost. Many candidates focused only on the Interest Cost and Service Cost component, overlooking other elements. However, most candidates performed well on part (b)(ii).

(i) NPPC

- SC may be higher under Spot Rate Approach
- IC will be higher under Spot Rate Approach
- Amortization of gain/loss will be lower (assuming outside corridor) under Spot Rate Approach
  - Due to higher expected liability when rolling forward with higher SC & IC
- Total NPPC will be higher under Spot Rate approach
- With lower SC & IC, the settlement threshold is lower and may result in settlement accounting in more instances under the Traditional Approach or require remeasurement earlier in the year
- EROA component not affected
- Amortization of PSC not affected

(ii) Funded Status

- There is no difference in PBO under the two approaches since the PBO is a result of discounting the expected cash flows at the yield curve rates

RETDAC/U, Fall 2024, Q7

Learning Outcomes:
a) Perform calculations in accordance with applicable accounting standards, including:
• Annual accounting valuations
• Plan curtailment and termination/windup
• Plan mergers, acquisitions and spinoffs
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations.

Sources:
RET201-105-25: IFRS and US GAAP: Similarities and Differences, Ch. 5 only

Commentary on Question:
This question tests candidates' knowledge on the preparation and calculation of accounting disclosures under U.S. Accounting Standard ASC 715. Specifically, candidates must possess the required knowledge to calculate the Net Periodic Pension Cost while the defined benefit pension plan is a going-concern and under the scenario where the sponsor transfers risk by purchasing annuities through an annuity buy-out contract.

Solution:
(a) Calculate the 2024 Net Periodic Pension Cost.

Show all work.

Commentary on Question:
Generally, candidates successfully calculated the Net Periodic Pension Cost while the defined benefit pension plan is a going-concern.

The model solution for this part is in the Excel spreadsheet.

(b) Calculate the 2025 Net Periodic Pension Cost.

Show all work.

Commentary on Question:
Candidates struggled to calculate the Net Periodic Pension Cost under this settlement scenario. Specifically, candidates generally failed to calculate the settlement charge to be included in the Net Periodic Pension Cost, which is the immediate recognition of the Unrealized Gain based on the percentage of the Projected Benefit Obligation that is being settled at the settlement date (i.e., March 31, 2025).

The model solution for this part is in the Excel spreadsheet.

RETDAC/U, Fall 2024, Q9

Learning Outcomes:
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations

Sources:
ASOP 4, Measuring Pension Obligations and Determining Pension Plan Costs or Contributions

RET201-105-25: IFRS and US GAAP: Similarities and Differences, ch. 5 only

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Describe considerations when selecting an amortization method under Actuarial Standard of Practice No. 4, Measuring Pension Obligations and Determining Pension Plan Costs or Contributions (ASOP 4).

Commentary on Question:
Candidates generally did well on this question if they were able to provide the considerations under the standards.

For purposes of determining a reasonable time period or a reasonable amount, the actuary should take into account factors including, but not limited to, the following, if applicable:

- whether the amortization method is open or closed
- the source of the amortization base
- the anticipated pattern of the amortization payments, including the length of time until amortization payments exceed nominal interest on the outstanding balance
- whether the amortization base is positive or negative
- the duration of the actuarial accrued liability

- the average remaining service lifetime of active plan participants
- the funded status of the plan or period to plan insolvency
- The actuary should assess whether the unfunded actuarial accrued liability is expected to be fully amortized.

(b) Explain the implications of each of the following changes on the 2025 Net Periodic Benefit Cost under U.S. Accounting Standard ASC 715:

(i) Freezing the defined benefit pension plan and implementing a new defined contribution plan for all members after January 1, 2025.

(ii) Implementing post-retirement indexation of 50% of inflation per year for all years of service.

(iii) Reducing the normal retirement benefit by 0.25% per month that early retirement precedes age 60 for service earned after January 1, 2025.

No calculations required.

Commentary on Question:
Candidates that did well on this question were able to identify the impact on all aspects of the 2025 net periodic benefit cost.

(i) Freezing the DB plan and implementing a new DC plan for all members after January 1, 2025

DB SC will be eliminated following DB freeze
DC SC will be employer contributions going forward
PBO will decrease to the ABO
Curtailment accounting triggered due to freeze
No prior service cost exists, so nothing to immediately recognize there
Expect curtailment gain to be recognized immediately in expense: equal to gain in PBO (ABO – PBO) if the plan continues to have unrecognized gain in AOCI
Can consider switching amortization base from AFWL to ARLE
Could impact the d-rate since expected future benefits are impacted

(ii) Implementing post-retirement indexation of 50% of inflation per year for all years of service

SC will increase as a result of the increase in benefits
PBO will increase as a result of the increase in benefits to past benefits
IC will increase as PBO has increased
Will introduce a PSC base equal to liability increase associated with change
PSC will be amortized based on AFWL

(iii) Reducing normal retirement benefit by 0.25% per month that early retirement precedes age 60 for service earned after January 1, 2025

PBO will not change as change is only for future service
IC will not change as PBO has not changed
No PSC as change is prospective
Plan currently has 100% retirement at age 62 assumption, so SC will also not be impacted.

NOC should review whether it should change its retirement assumption due to any of these plan changes.

RETRPIRM, Fall 2024, Q3

Learning Outcomes:
b) Advise plan sponsors on common accounting methods, costs and disclosures for retirement plans under various standards and interpretations

Sources:
Corporate Pension Risk Management and Corporate Finance: (soa.org)

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Describe four adjustments that can be made to the PBO to account for the pension liability under a holistic balance sheet approach.

Commentary on Question:
Many candidates did not respond with enough information to earn full points. The solution below is not exhaustive, points were given for any acceptable answer.

- PBO can be adjusted to represent an economic liability and reflect the real cost of the plan
- If the accounting mortality assumption is inadequate, the mortality and the mortality improvement assumptions should be adjusted
- Reflect the value of embedded options—specifically, options available to participants when interest rates change, such as adjustable cash balance crediting rate for a plan with a hybrid design formula, or interest rate used for lump-sum form of payment options
- Reflect the value of contingent liabilities based on the funded status of the pension plan—for example, additional insurance PBGC premiums or taxes on pension surpluses

(b) Describe the shortcomings of including the Net Pension Obligation instead of separating the pension asset and pension liability in the corporate balance sheet.

Commentary on Question:
Candidates generally performed relatively well on this question.

- The risk of pension plan investments is not reflected. The net pension obligation can be the same even if the portfolios of the pension plans are completely different (more risky or less risky)
- It does not adequately account for the size of the pension plan relative to the operating part of the business. The larger the size of the pension plan relative to the operating part of the business, the more leveraged the corporation is, and the larger the impact of pension plans on the corporation.
- There would be an impact to ratios such as Debt-to-equity, Long-term debt to equity, Asset-to-equity and WACC if using the holistic approach.

(c) Calculate the Weight Adjusted Cost of Capital (WACC) using:

(i) the accounting balance sheet; and

(ii) the holistic balance sheet

Commentary on Question:
In general, candidates did not perform well on this question. Several candidates knew how to calculate the WACC, but not the asset beta under the accounting and holistic balance sheets. The most common mistake for part i) was to use the equity beta given in the question instead of calculating an asset beta.

The response for this part is to be provided in the Excel spreadsheet.

(d) Explain how the long-term debt-to-equity ratio would be impacted if the pension liability were perfectly hedged, using the holistic balance sheet.

Commentary on Question:
Partial points were given when candidates defined the ratio or mentioned that the pension liability is included in the long-term debt numerator under the holistic balance sheet.

Using the holistic balance sheet, the long-term debt-to-equity ratio is defined as (long-term debt + pension liability) / equity. If the hedging is 100% effective, the pension liabilities can be removed from the formula and therefore, the long-term debt to equity ratio would decrease if perfectly hedged.

(e) Calculate how much equity capital is needed by XYZ Company to maintain the same equity beta if the plan no longer invests in equities.

Commentary on Question:
This question was poorly answered.

The response for this part is to be provided in the Excel spreadsheet.

RET201 Learning Objective 4 Model Solutions

RETRPIRM, Fall 2020, Q5

Learning Outcomes:
c) Describe strategies and techniques for asset/liability management
d) Provide advice and analysis to plan sponsors regarding the mitigation of investment risks

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

RET201-115-25: Charting the Course: a framework to evaluate pension de-risking strategies (excluding Appendices)
RET201-116-25: Practical De-Risking Solutions: Asset Duration and Interest Rate Risk

Commentary on Question:
Part (a) was testing how a candidate can apply their understating of the duration of the fixed income and discount rate and how it affects the assets/liabilities of a pension plan.

Part (b) was testing a candidate's knowledge of different strategies that a plan's sponsor may use to reduce volatility of the funded ratio without reducing the expected return on the assets.

Solution:
(a) Calculate the impact on the funded ratio of a 20 basis point reduction in both the fixed income yields and the liability discount rate.

Show all work.

Commentary on Question:
Most candidates did well on this question. The concept that caused some difficulty was on how to use the interest hedge ratio to calculate the duration of the liabilities.

Given:
Current funded ratio = 100/125 = 80%
20 bp drop by EOP (end of period)
EOP equity = 60, assumed to be unchanged, since not otherwise indicated

(1) EOP bonds = 40 * [1 + (7.7/100)*(20/100)] = 40.62
(1) EOP assets = 60 + 40.62 = 100.62

EOP Liabilities = 125 * [1 + (liability duration/100)].

To find liability duration, we rearrange the formula for interest rate hedge ratio (the proportion of change in liabilities, due to a change in interest rates, that are covered by a change in assets):

(2) Liability duration = FI allocation * FI duration * funded ratio / interest rate hedge ratio

(1) Liability duration = 40% * 7.7 * 80% / 0.1643 = 15

(1) EOP Liabilities = 125 * [1 + 0.15*(20/100)] = 128.75

(2) EOP Funded ratio = 100.62 / 128.75 = 78.15%

(b) Describe potential changes to the investment strategy that achieve the plan sponsor's objective.

Commentary on Question:
A full credit was given to candidates who named two distinct solutions and described how each strategy achieves the plan sponsor's objective. Many candidates failed to provide more than one distinct strategy which resulted in a partial credit. The answer below provides three such strategies; we note that any two strategies would be accepted for full credit.

Possible changes to the investment strategy include:

I. Add duration to assets:

- Increase duration of bonds without changing allocation
  - Assuming longer duration bonds have equal or greater expected return
- Leverage the fixed income (one option is to use derivative overlay strategies) to reduce interest rate risk while maintaining or increasing allocation to equities

II. Diversify growth allocation

- A mix of alternative asset classes could reduce the market risk of the portfolio without reducing expected return
  - For example, a combination of a high return / high risk asset class (e.g. private equity) with a low return / low risk asset class (e.g. certain hedge funds)

III. Buy-in annuities for retirees

- Purchasing a buy-in annuity for all or a portion of retirees using all or a portion of the bond allocation reduces the volatility of the funded status because the risk of both interest rate and mortality experience is shifted to the insurer.
- If the insurer can invest at a higher yield than the current bond allocation, the total return of the portfolio may remain unchanged, even after reflecting the premium charged by the insurer

RETRPIRM, Spring 2021, Q6

Learning Outcomes:
d) Provide advice and analysis to plan sponsors regarding the mitigation of investment risks

Sources:
RET201-113-25: Pensions in the Public Sector, Ch. 9

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Describe the objectives of the following stakeholders with respect to a public defined benefit pension plan:

(i) Taxpayers;

(ii) Elected officials; and

(iii) Plan participants.

Commentary on Question:
Most candidates did well on this question. Full credit was given to candidates who named at least four objectives for each stakeholder.

(i) Taxpayers
- Pay the lowest taxes for the public services that taxpayers require
- Expect state and local governments to hire and retain the best public sector employees
- Tax money should be used wisely, i.e. public pension plan surplus should be minimized
- Reduce future tax burden by keeping assets in the plan instead of paying out for benefits enhancement or other purposes
- Cost for public pension plan is predictable and does not impinge on other public services

(ii) Elected officials
- Re-election is often the primary goal
- Provide rich benefits to public servants
- Deliver the best public services at the lowest cost
- Elected officials want to raid pension assets to use for other projects

(iii) Plan participants
- Desire robust and adequate retirement benefits because many are not covered by social security system
- They do not want any negative surprises with regards to benefit levels as they approach retirement
- Want to make the least contributions for the greatest pension benefits
- Maximize overall compensation package

(b) Explain how an asset liability management framework would affect the stakeholders from part (a) in terms of their objectives.

Commentary on Question:
Most candidates did well on this question. Full credit was given to candidates who provided at least two objectives and described how asset liability management framework would affect these objectives. The answer below provides more objectives than would be needed for full credit.

(i) Taxpayers
- As part of asset liability management framework, better asset liability matching helps taxpayers achieve the objective of paying the lowest and predictable taxes
- Designing assets to move in tandem with liabilities can maintain the funded status of the plan at the same level, regardless of what occurs with capital markets. Thus, no contributions would be required from taxpayers to finance the public pension plan
- Although riskier assets investment could generate higher expected returns in a long-term, funded ratio of the plan could also be substantially lower in many scenarios. If an actuarial funding valuation was performed during the years where funded ratio drops, taxpayers will likely be called on to make contributions
- Public pension plan surplus is minimized with the asset liability management framework. No potential surplus to be used for benefit enhancement or other purposes, and thus reduce future tax burden

(ii) Elected officials

- Asset liability management framework prevents elected officials from raiding pension assets to use for other projects for the purpose of re-election
- Elected officials are no longer able to defer cost recognition on public pension plan. More transparent transfer of risks and costs to future generations through comprehensive stochastic modeling of investment, funding and benefit policies to project the plan going forward many years
- Elected officials are not able to enhance public plan benefits using temporary surplus in the plan

(iii) Plan participants

- Asset liability management framework helps employees achieve the objective of having secured benefit at retirement
- Pension benefits are unlikely reduced or enhanced because more stable funded status of the plan
- Plan participants will be required to make contributions at a stable level and no intergenerational inequity concerns

RETRPIRM, Fall 2022, Q2

Learning Outcomes:
c) Describe strategies and techniques for asset/liability management
d) Provide advice and analysis to plan sponsors regarding the mitigation of investment risks

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

RET201-116-25: Practical De-Risking Solutions: Asset Duration and Interest Rate Risk

RET201-117-25: Pension Plan Immunization Strategies: How Close Can You Get?

Commentary on Question:
*Candidates generally did well on this question, however many failed to **Compare** and to **Contrast** the two strategies in part a); they rather described them.*]

This question was designed to test comprehension of different pension plan risk mitigation strategies.

In part a), the key was to be able to illustrate where the two strategies differed and where they were similar. A few similarities and differences were enough to receive full marks.

*In part b), the main thing was to describe three **key** or **important** considerations of the design phase for the strategy. At least five different considerations were considered as "key" and produced full marks.*

Solution:
(a) Compare and contrast the following strategies for a single employer pension plan:

(i) An immunization investment strategy

(ii) Purchasing buy-in annuities

Compare

For both strategies:

- The plan will be protected against interest rate risk
- The plan administration will remain a responsibility of the plan sponsor
- Settlement accounting will not be triggered

Contrast

- Purchasing buy-in annuities will also protect against market risk and longevity risk, while immunization will not.
- The immunization strategy may create downgrade and default risks, while purchasing buy-in annuities may create counterparty and contractual risks.
- The immunization strategy generally has a high cost (design, implementation, transaction, and strategy management), while purchasing buy-in annuities generally has lower cost (one-time consulting fee for organizing bid).

(b) Describe three key considerations when designing an investment glide path strategy for a single employer pension plan.

Clear determination of the end state:

- should reflect the plan sponsor's strategic objectives
- usually long-term economic sustainability (open plans) or plan termination (closed or frozen plans)
- will typically be associated with a risk profile that best supports the long-term objective

Appropriate trigger points:

- The triggers that will drive the de-risking process should be consistent with end-state objectives.
- The most common triggers are interest rate levels, interest rate spreads, funded status, plan maturity, and time.

Trigger distance and monitoring frequency:

- The distance between triggers and the frequency at which they will be monitored are very important practical considerations.
- If the increments between triggers are too small, the glide path could induce an unnecessarily large number of trades, resulting in excessive transaction costs.
- Conversely, if the increments are too large, good opportunities to capture small gains could be missed.

RETRPIRM, Fall 2022, Q3

Learning Outcomes:
b) Evaluate how factors including cash flow requirements, various plan designs and various economic environments affect setting investment strategy
d) Provide advice and analysis to plan sponsors regarding the mitigation of investment risks

Sources:
Ch. 27 Fundamentals of Private Pensions, McGill, Dan, 9th Edition, 2010

Commentary on Question:
Governance is a critical part of DB and DC plan management. This question was designed to test candidates' understanding of what a good governance structure looks like and how it can be used to enhance the value of these plans to participants and to other stakeholders.

Solution:
(a) Describe how addressing the following elements in a defined benefit governance structure can create value for stakeholders:

(i) Investment beliefs

(ii) Risk management

(iii) Investment time horizon

(iv) Mission

(v) Agency issues

Commentary on Question:
Many candidates struggled with this part of the question. The most common error was a misunderstanding of the difference between "stakeholders" and "stockholders." Candidates who made this error often attempted to answer the question from a financial economics perspective rather than with a governance mindset.

(i) There are several primary sources that can be targeted to generate investment return above the LDI portfolio. These sources can include equity risk, credit risk, liquidity risk, and/or manager skill risk. Investment beliefs add value through defining which sources of return are appropriate for the plan and how to allocate the risk budget across the acceptable sources.

(ii) To create long-term value, a plan must allocate appropriate levels of investment risk across both the LDI and value-creating investment segments. A solid governance structure takes the funded status of the plan and strength of the plan sponsor into account when determining the allocation. To aid with effective risk management, tools such as stress-testing and risk-budgeting can be used.

(iii) Pension funds are generally long-term investors, but corporate or IRS requirements may lead to a desire for a shorter-term investment focus. A DB governance structure can help to manage this conflict of time horizons, balancing the long-term growth goals with shorter-term volatility management and/or liquidity constraints.

(iv) Mission is a critical part of governance as it provides clearly defined goals to which all stakeholders are committed and aligned. A strong covenant offers a framework for determining appropriate investment risks and strategies as decisions around these topics arise.

(v) Good governance establishes clear boundaries and controls allowing for management of principal-agent conflicts. It is very common for there to be misalignment of interests between principals (fiduciaries) and agents retained to provide services to the plan, however, the risk can be significantly reduced through governance.

(b) Defined contribution plan governance should address the structural flaws that make these plans less efficient than defined benefit plans at delivering retirement financial security.

Describe three of these flaws.

Commentary on Question:
Most candidates scored well on this section. Those who were able to identify the structural flaws were typically also able to provide sufficient description, leading to full credit for this portion of the question.

There are three primary structural flaws that defined contribution (DC) plans experience relative to their DB counterparts:

1. Many employees lack sufficient time or skill to make the complex investment decisions that can be required to achieve an adequate investment return on a DC portfolio. Even if an employee contributes to the plan at an appropriate level to produce the desired income replacement ratio, if too much (or too little) risk is taken within the portfolio, the replacement ratio may still not be achieved.

2. Many plans offer a sub-optimal investment option lineup. There can be fee structures (such as for actively managed options) that are not in the participants' best interests, incorrectly designed Target Date Funds, or a lineup of options that either provides too many or too few choices for employees to achieve optimal outcomes.

3. As DC plans gradually become the primary source of retirement income for new retirees, there has been increasing concern about the plans' lack of a lifetime income option. Unlike a DB plan, which can nearly eliminate the risk of participants outliving their retirement funds, DC participants are often left to manage their entire retirement based on a single account balance. Many DC plans do not provide an adequate lifetime income option for participants.

RETRPIRM, Fall 2022, Q5

Learning Outcomes:
d) Provide advice and analysis to plan sponsors regarding the mitigation of investment risks

Sources:
Pension Risk Transfer – evaluating impact and barriers for de-risking strategies

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Describe potential barriers associated with de-risking through the purchase of a group annuity buy-out.

Commentary on Question:
Successful candidates both listed potential barriers and described how/why they are barriers to de-risking. No credit was given for answers which outlined how buy-out annuities are constructed or the selection process. Successful candidates provided examples of barriers suited to the number of exam points. Credit was given where warranted for additional examples.

Demographics	Pricing for actives and deferred vested members are generally more expensive due to elevated longevity and investment risk
Anti-selection	Plans which offer lump sums at or during retirement can be subject to anti-selection risk from insurers as uncertainty in future cash flows will increase pricing
Optionality	Uncertainty regarding date of retirement and early retirement subsidies also increased risk for insurers making the cost of a group annuity buy-out more expensive for plans with these provisions
Asset Portfolio	For very large annuity purchases where the payment of premium is done via a transfer in kind of existing assets, the asset portfolio would need to look attractive to an insurer
Plan Size	The size of monthly retiree payments per member effect the willingness of an insurer to take on the liabilities. Very large monthly payments may be too much of a risk to take on A very small plan or liability base may not be profitable enough to attract attention from insurers
Reputational Impact / Employee Relations	Transferring pensions to an insurer can draw negative attention and even legal action from retirees who feel that the plan sponsor is abandoning their responsibility or if the chosen insurer fails
Liquidity	If a plan is in a deficit on a funding basis the plan sponsor may not have the additional cash liquidity necessary to cover the insurer premium or the cash is needed elsewhere in the business
Capacity Constraints	The number of insurers and personnel capable of transacting on group annuity buy-outs is limited so in periods of high volume the market may experience short-term strains in available of backing assets
Labor Unions	For plans that have collective bargaining a group annuity buy-out may need to be negotiated with the union which can be very contentious and can lead avoidance of the topic altogether
Financial Statements	Potential for significant accounting impact if there are large differences between annuity pricing and liabilities being held on the balance sheet

(b) Describe the advantages and disadvantages of group annuity buy-outs for:

(i) Plan members; and

(ii) Plan sponsors

Commentary on Question:
Successful candidates provided at least one advantage and disadvantage for both plan members and sponsor. Successful candidates also provided clear answers which separated advantages and disadvantages between member and sponsor. Credit was given where warranted for additional examples.

Plan Members	
Advantages	Insurers have additional protections through a guaranty association protection which provides some backstop for member benefits should the insurer fail Group annuity buy-outs are fully funded at the time of purchase which can be beneficial if the plan was in a deficit prior to purchase The chosen insurer may have a higher credit rating than the plan sponsor
Disadvantages	Benefits and provisions are locked-in at the time of contracting so there is no potential for any improvements to be granted The chosen insurer may have a lower credit rating than the plan sponsor Can cause relationship / administration issues with members having to deal with unfamiliar third party
Plan Sponsor	
Advantages	Group annuity buy-outs eliminate funded status volatility and therefore the likelihood of falling into deficits and requiring additional cash commitments Pension de-risking activities are looked at favorably by analysts and transferring volatile liabilities to an insurer can may improve credit ratings Sponsor would no longer have to make insurance premiums (PBGC in the U.S., PBGF in Ontario) or administer the benefits associated with the liabilities purchased Can be favourable in terms of costs if there are deals to be had in the group annuity marketplace
Disadvantages	Can be very expensive depending on the types of provisions offered in the pension plan and result in large one-time contributions Can have significant financial statement impacts from different liability valuation bases and actual purchase premium Lose the ability to invest assets to generate higher returns / yield and help pay for remaining benefits / deficits

RETRPIRM, Spring 2023, Q4

Learning Outcomes:
c) Describe strategies and techniques for asset/liability management
d) Provide advice and analysis to plan sponsors regarding the mitigation of investment risks

Commentary on Question:
*This question was intended to test candidates' understanding of how various de-risking opportunities might affect a DB plan under a significant market shock. The expectation was that candidates would consider **both** the interest rate increase and 25% equity shock together as a single market event. However, many candidates misunderstood the wording of the question and considered the events separately.*

*Because the wording of the question was determined to be slightly ambiguous, it was possible to achieve full credit for the question regardless of whether candidates considered the two events together or separately. What was most important was that candidates understood how each of the de-risking options would affect the plan's response to a change in interest rates **and** a change in equity markets (whether considered together or separately).*

The distribution of scores for this question skewed slightly lower than some other questions, primarily due to a lack of sufficiently detailed responses. Given that this question was worth 9 of the 40 total exam points, candidates would have been expected to provide quite a bit of qualitative and quantitative detail within their response. However, many responses tended to be on the shorter side and lacked appropriately detailed calculations.

Finally, the graders noted that many candidates used a simplified arithmetic methodology for duration adjustment, rather than the more standard geometric adjustment. While full credit was provided for both approaches, it is generally preferred that candidates use the geometric approach for exam questions.

Solution:
Company ABC's CFO is considering the following de-risking options:

(i) Adopting a glide path that will have an allocation of 100% in liability-hedging assets when the plan is 100% funded on a termination basis.

(ii) Purchasing an annuity buy-out for retired members and keeping the current asset allocation for the remaining assets.

(iii) Purchasing an annuity buy-in for retired members and adopting a glide path for the remaining assets that will have an allocation of 100% in liability-hedging assets when the plan is 100% funded on a termination basis.

Compare and contrast how the following economic event would have affected the three de-risking options:

- A 200-basis point increase in interest rates; and
- A 25% drop in equity markets.

Commentary on Question:
Although the question asks candidates to "compare and contrast," there were a significant number of comparison permutations if candidates misinterpreted the question (and considered the interest rate and equity shocks separately). Credit was therefore provided for appropriate qualitative analysis regardless of whether the answer was presented in a "compare and contrast" format.

(i) Adoption of glide path with 100% liability-hedging allocation at 100% funded status.

The plan is **not** currently 100% funded before the event, so there is no immediate impact on asset allocation.

From the question data provided:
Initial Funded Status = 180M / 190M = 95%

Post-event liability:

Active:	20,833,333
TV:	7,181,844
Retiree:	119,579,082
Total:	**147,594,259**

Sample liability adjustment (shown for Active):
*30M * [(1+(20yrs/100))^(-2% * 100)]*

Post-event assets:
Fixed Income: 61,557,402 = *80M * [(1+(14yrs/100))^(-2% * 100)]*
Equity Assets: 75,000,000 = *100M * 75%*
Total: 136,557,402

New Funded Ratio = 136,557,402 / 147,594,259 = 92.5%

Plan liability duration post-event =

	% Active liab. x Active duration	*((20.8m/147.6m) * 20)*
+	% TV liab. x TV duration	*((7.2m/147.6m) * 18)*
+	% Retiree liab. x Retiree duration	*((119.6m/147.6m) * 12)*
=	13.42 years	

Plan's Hedge Ratio post-event:

[61,557,402 * 14yrs] / [147,594,259 * 13.42yrs] = **44%**

Contribution required to terminate OR funded status deficit:

New Liab. – New Assets = 147.6m – 136.6m = **11.0m**

- Although the 200 bps increase in interest rates has a large decreasing effect on liabilities, the corresponding decrease in fixed income assets combined with the negative equity market shock results in an overall 2.5% funded status decrease and minimal impact on hedge ratio. This means that the plan does not reach the 100% funded threshold needed for the fixed income allocation to move fully to liability-hedging assets
- Should the sponsor wish to contribute additional funds to reach 100% funded status and be fully-funded on a termination basis, the deficit has now increased by 1m from 10m to 11m. Alternatively, the plan could consider re-risking slightly to improve upside outcomes, although the plan is already heavily allocated to equities compared to many plans in a similar funded status position
- Had the 200bps interest rate increase been the only impact, the plan would have experienced a significant improvement in funded status and would have reached the 100% trigger on the glide path. However, the current approach is very risky because, had only the equity shock occurred, the plan would have experienced a very large decrease in funded status that may trigger regulatory required contributions and/or other unwanted events

(ii) Retiree buy-out prior to market event

The buy-out will completely remove all 150m of Retiree liability from the plan. Because the liabilities are stated on a termination basis, we can assume that 150m in assets will also be removed from the plan

Post buy-out liability (before market event):

Active:	30,000,000
TV:	10,000,000
Retiree:	0
Total:	**40,000,000**

Liability duration post buy-out (before market event):

	% Active liab. x Active duration *((30m/40m) * 20)*
+	% TV liab. x TV duration *((10m/40m) * 18)*
+	% Retiree liab. x Retiree duration *(0)*
=	**19.5 years**

Post buy-out assets (before market event):

180m total assets – 150m buy-out assets = 30m in assets remaining in the plan. Assuming assets are taken pro-rata, this leaves 30m/180m = 16.7% of each asset type

Fixed Income: 13,333,333
Equity Assets: 16,666,667
Total: 30,000,000

Liability post market event:
40m * [(1+(19.5yrs/100))^(-2% * 100)] = **28,015,178**

Post market event assets:
Fixed Income: 10,259,567
Equity Assets: 12,500,000
Total: 22,759,567

New Funded Ratio = 22,759,567 / 28,015,178 = 81.2%

Contribution required to terminate OR funded status deficit:
New Liab. – New Assets = 28.0m – 22.7m = **5.3m**

- Because the buy-out decreased the dollar value of liability that was sensitive to interest rates during the market event, the contribution required to terminate the plan after the market event is lower than the contribution required in scenario (i)
- Because the plan liability duration after the buy-out is significantly higher than the duration of the original plan (due to the lower duration retirees being settled with the insurance company), the interest rate impact from the market event decreases the liability sufficiently to offset the market event impact on fixed income assets AND equities. Thus the plan funded status improves from 75% post buy-out to 81% post buy-out and market event (unlike scenario 1 where the market event decreased funded status)

- The plan sponsor will now need to consider how to manage funded status going forward given the percentage drop from 95% (before all events) to 81%. The sponsor may wish to make the relatively smaller (5.3m) contribution needed to terminate the plan, or, may need to evaluate whether the equity allocation and risk profile is appropriate to achieve the ongoing goals of the plan and satisfy any regulatory requirements

(iii) Retiree buy-in prior to market event + glide path

Unlike a buy-out, the retiree liability will **remain in the plan,** however, any change in the liability value will be fully protected by the annuity contract. The plan will still consider the buy-in annuity "asset value" as part of plan assets, however, the plan will no longer control the investment of those assets.

Post buy-in liability (before market event):

Active:	30,000,000
TV:	10,000,000
Retiree:	150,000,000
Total:	**190,000,000**

Liability duration post buy-in (before market event):

	% Active liab. x Active duration *((30m/180m) * 20)*
+	% TV liab. x TV duration *((10m/180m) * 18)*
+	% Retiree liab. x Retiree duration *((150m/180m) * 12)*
=	**13.6 years**

Post buy-in assets (before market event):

Similar to part (ii), the non buy-in assets will be 30m, split between fixed income and equities.

Fixed Income:	13,333,333
Equity Assets:	16,666,667
Buy-in Asset:	150,000,000
Total:	**180,000,000**

Liability post market event:

None of the liability characteristics have changed relative to part (i) because the retiree liability has remained in the plan, so the calculation is the same

Active:	20,833,333
TV:	7,181,844
Retiree:	119,579,082
Total:	**147,594,259**

Post market event assets:

*The Fixed Income and Equity assets move the same way they moved in part (ii) as they have the same starting values as part (ii). The buy-in asset will **always** be equal to the retiree liability.*

Fixed Income:	10,259,567
Equity Assets:	12,500,000
Buy-in Asset:	119,579,082 *(equal to retiree liability)*
Total:	**142,338,649**

New Funded Ratio = 142,338,649 / 147,594,259 = 96.4%

Contribution required to terminate OR funded status deficit:
New Liab. – New Assets = 147.6m – 142.3m = **5.3m**

- With the retiree liability fully protected by the annuity contract, the dollar value of funded status at-risk from the market impact is significantly decreased. Thus the funded status remains fairly steady after the market event (moving from 95% to 96.4%) and the 100% glide path trigger is not reached
- Due to the buy-in asset having a duration equal to the Retiree liability, the effective asset duration is significantly increased, and the corresponding hedge ratio would also be higher. This explains why the buy-in approach provides the best percentage funded status outcome (which may be helpful from a regulatory perspective). However, it is important to note that the $ funded status after the market event is the same after the buy-in as it was under the retiree buy-out, and thus the sponsor's decision around ongoing asset & liability management is very similar to the decision in part (ii)
- Unlike a buy-out, liabilities covered through a buy-in are still subject to PBGC premiums, which is why many sponsors prefer a buy-out approach

RETRPIRM, Spring 2024, Q3

Learning Outcomes:
c) Describe strategies and techniques for asset/liability management
d) Provide advice and analysis to plan sponsors regarding the mitigation of investment risks

Sources:
RET201-115-25: Charting the Course: a framework to evaluate pension de-risking strategies

RET201-116-25: Practical De-Risking Solutions: Asset Duration and Interest Rate Risk

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Describe the benefits of implementing a glide path liability-driven investment (LDI) strategy.

Commentary on Question:
Candidates were expected to list and describe each benefit.

- **Objective decision framework**: formal investment policy decision that is a function of a predefined set of circumstances that are both logical and tangible.

- **Reduces point-in-time risk**: De-risking occurs incrementally based on pre-established triggers, effectively mitigating the risk of mistiming or second-guessing a decision. Locking-in gains as they occur. Don't need to sacrifice too much return because de-risking is done gradually (reasonable compromise between lost upside and undesirable downside).

- **Avoids inaction**: Formal commitment to de-risk, backed by a systematic process that will ensure it actually happens, helps staying away from ambiguity (e.g. sponsor wants to de-risk when more favorable circumstances arise – circumstances that are often vaguely defined, and ultimately never occur).

- **Manages regret risk**: Removes emotions from the equation and avoids being distracted by short-term noise, constant reminder of long-term risk management goals.

- **Ease of customization**: Each solution can be tailored to the circumstances and objectives of the plan sponsor, taking into consideration plan's

maturity, status, funded position, risk tolerance, … Examples of parameters that can be customized: end state, trigger points, triggers distance and monitoring frequency.

- **Interest rate risk mitigation:** Risk must be addressed regardless of current interest rate levels to preserve long-term sustainability of a DB pension plan. Closes gap between asset and liabilities duration. If interest rates go down, pension plans can represent significant cost to the sponsor, etc.

(b) Recommend one of the following LDI strategies considering Company ABC's primary objective.

Justify your recommendation.

	Option 1	**Option 2**
Initial asset allocation	No immediate change	35% Equity / 65% Bonds
Triggers	Interest rate level (long term bond index) increases by 0.50%	Funded status improves by 2%
Monitoring frequency	Quarterly	Monthly
% of equity replaced with bonds when a trigger is reached	15%	5%
Duration of bonds added to the portfolio	14.9 years	7.2 years
End state objective	Hedge ratio = 100%	Funded status = 100%

Commentary on Question:
Candidates were expected to pick an option and describe how it meets Company ABC's objectives. Full credit was available for both options. Candidates were not required to perform calculations, but could, to help them justify their recommendation. Partial credit was awarded when a candidate did not make a clear recommendation.

Sample answer for Option 1:

- Initial asset allocation
  - No immediate restructuring = avoid massive allocation shift that can be done at an inopportune time

- Triggers:
  - Triggers are easy to understand and simple to monitor (no need to perform any calculations)
  - Interest rate increases means that the funded status would improve as well (which is the Company ABC's main objective): the current hedge ratio is 25%, meaning that when the liabilities decrease by $100, the asset will only decrease by $25
  - Hedge ratio = 86% x 40% x 7.2 / 9.8 = 25%
  - This type of glide-path would therefore lock-in improvements in funded status by purchasing bonds and increasing the hedge ratio only when the sponsor feels comfortable extending duration
  - Note: The distance between triggers (0.50%) might be too big and could result in inertia (i.e. never being able to reach the next trigger if interest rates don't increase enough) so would probably be better to have an increment of 0.25%

- Starting Point of the Asset Allocation:
  - The risk-seeking asset allocation could help improve the funded status of the plan if stock market performs well

- Monitoring Frequency:
  - Potential reduction of costs associated with the strategy (fewer trades, therefore lower transaction costs, lower costs associated with monitoring)
  - Note: Monitoring frequency is a bit low, which could lead to missed opportunities to capture gains

- Duration of Bonds Added to the Portfolio
  - The bonds currently held in the portfolio have a shorter duration than the plan's liabilities, so the bonds that will be added to replace equity will help achieve a better asset-liability match (increase the hedge ratio) more quickly which is suitable giving the short investment horizon (5 years)

- End State Objective:
  - Increasing the hedge ratio means that we are reducing risk and thus the funded status volatility before termination occurs
  - The plan sponsor wants to terminate the plan in 5 years, so a hedge ratio of 100% would protect the funded status from unexpected interest rate swings right before termination

Sample answer for Option 2:

- Starting Point of the Asset Allocation:
  - Immediate restructuring of the plan's asset allocation would help to partially lock in the plan's financial position (funded status = 86%)
  - The interest rate hedge ratio is low (25%) so if the interest rates decrease, the plan's financial position will be significantly affected if the plan assets are not immediately reallocated
  - Hedge ratio after the immediate restructuring = 41% (86% x 7.2 x 65% /9.8)
  - The risk-seeking asset could create a large deficit if the stock market does not perform well, and the investment horizon is short (5 years) so it's best to protect the current assets
  - But this option still leaves enough exposure to equity (35% in risk-seeking assets) to close the funded status gap

- Triggers:
  - Consistent with the end-state objective and Company ABC's main objective to increase the funded status and to stay fully funded until termination occurs
  - The distance between triggers is reasonable (2%): the triggers can be realistically reached
  - Sponsor has a certain control over the triggers (can make special contributions to increase the funded status)

- Monitoring Frequency:
  - Not too low and not too high, would result in a reasonable number of trades without missing good opportunities to capture gains
  - Reduce timing risk as we will move towards bonds more gradually than with Option 1

- Duration of Bonds Added to the Portfolio
  - At the end of the glide-path, assuming that the duration of the liability will remain the same, the hedge ratio will be 73% which would protect the funded status from unexpected interest rate swings right before termination
  - That said, since the plan is closed and frozen, the duration of liability will likely decrease over time

- End State Objective:
  - Consistent with Company ABC's primary objective which is to become fully funded and reduce cost at termination

RETRPIRM, Fall 2024, Q1

Learning Outcomes:
a) Evaluate the interaction of plan investments with various valuation methods and assumptions
c) Describe strategies and techniques for asset/liability management
d) Provide advice and analysis to plan sponsors regarding the mitigation of investment risks

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

RET201-115-25: Charting the Course: a framework to evaluate pension de-risking strategies (excluding Appendices)

Pension Risk Transfer: Evaluating Impact and Barriers for Derisking Strategies

Commentary on Question:
Candidates generally did well on this question , which was aiming to test their understanding of risk transfer strategies (buy-ins and buy-outs). In part a), many candidates failed to compare (show similarities) and contrast (show differences) the two strategies, but rather described them. In part b), we accepted effective duration calculations with different differential ranges (i.e. 1bp, 50bps, 100bps, etc.) as long as the proper formula was used (Effective duration = (P(1) - P(2)) / (2 x P(0) x Y)).

Solution:
See excel spreadsheet.

RETRPIRM, Fall 2024, Q4

Learning Outcomes:
a) Evaluate the interaction of plan investments with various valuation methods and assumptions
b) Evaluate how factors including cash flow requirements, various plan designs and various economic environments affect setting investment strategy
c) Describe strategies and techniques for asset/liability management

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

RET201-115-25: Charting the Course: a framework to evaluate pension de-risking strategies (excluding Appendices)

RET201-116-25: Practical De-Risking Solutions: Asset Duration and Interest Rate Risk

Pension risk transfer: evaluating impact and barriers for de-risking strategies

Commentary on Question:
Most candidates performed well on this question. Candidates generally scored higher on part a) than on part b). For both parts, candidates were expected to provide enough items to receive full marks.

Solution:
(a) Describe the risks associated with investing in fixed income securities.

Commentary on Question:
Some candidates listed risks but did not describe the risks as requested in the question.

Interest rate risk: Risk that the yield of a bond will change (and its value) due to changes in risk-free bond with the same cashflows.

Yield curve risk: Risk that the bond value will change due to a change in the shape of the yield curve (e.g. non-parallel curve movements)

Sector risk: Volatility of returns due to yield changes derived from changes in spread between the sector in question and the baseline yield curve (government). Changes in sector returns.

Credit risk: Changes in credit rating of the instrument will affect bond price.

Default (counterparty) risk : Risk that cash flows not paid due to the inability of the issuer to do so. Possibility that the issuer will go bankrupt and might not repay the loan.

Volatility (duration) risk: Bond value is impacted by how much interest rates move in either direction. Can be broken down into 1) Gamma exposure 2) Vega risk

Inflation risk: Some fixed income pays fixed payments and it does not take inflation into consideration. Fixed income securities are vulnerable to the erosion of purchasing power caused by inflation, which can reduce the real return on investment.

Currency risk: When investing in an investment denominated in a different currency. Changes in value of fixed income as currency changes. Can mitigate/eliminate risk using currency hedging techniques such as currency forward contracts.

Reinvestment risk: If interest risk fall, the coupon and principal may be reinvested at a lower rate

Liquidity risk: This refers to the risk of not being able to sell the bond quickly or at a fair price due to a lack of market demand or limited trading activity.

Prepayment risk: Return volatility arising from the over/under estimation of actual prepayment rates (Mortgage backed securities)

Security-specific risk: Risk that can not be explained by the other risk factors. Risk generally arises due to changes in the supply and demand of that security.

(b) The CFO of Company XYZ anticipates a fall in interest rates and proposes an asset mix of 100% in fixed income securities. The CFO asserts that the proposed asset mix would guarantee a lower and more stable level of employer contributions compared to the current asset mix.

Critique the CFO's assertion.

Commentary on Question:
A critique is analysis that covers both strengths and weaknesses. It may also include listing alternatives. Candidates were expected to base their critique on the information given in the question (funded status, open plan, salary average formula, etc.).

- If the CFO's prediction of future interest rate movements is inaccurate and interest rates actually rise, there is potential for an increase in the plan shortfall (if the decrease in assets is greater than the decrease in liabilities) and this could lead to higher contributions.
- The proposed 100% fixed income asset mix lacks diversification, potentially resulting in missed opportunities for returns attributable to diversification effects.
- As final salary pensions are linked to employees' earnings, any increase in wages due to inflation or promotions will lead to higher pension payments. Therefore, final salary plans are linked to inflation, and rising inflation rates would increase the plan's liabilities. Bonds providing only fixed income would not align well with the increasing liability cashflows.
    - Company XYZ could consider investing in inflation-linked bonds.
    - Historically, equities have been viewed as an effective hedge against inflation.
- The plan is not frozen/closed, meaning that the plan is probably not mature and that the duration of the plan is high.
    - There may be a scarcity of suitable long-dated bond assets available
    - A long investment horizon makes equities more attractive (current asset mix more attractive)
- The asset mix often determines the expected return used to discount the liabilities.
  100% fixed-income securities, having lower long-term expected returns, would decrease the discount rate, consequently decreasing the funded status and increasing the plan's cost.
- Growth assets such as equities are expected to yield higher long-term returns. By moving to 100% fixed income, the plan sacrifices potential performance, especially considering the current plan deficit. This sacrifice may result in the shortfall needing to be met by increasing the employer's contributions.
- An asset mix of 100% in fixed income would reduce the overall interest rate risk of the plan. May include a certain level of diversification among the fixed-income portfolio, such as a mix of corporate bonds, government bonds, real return bonds, fixed income derivative, etc.
- Replacing equities with fixed-income effectively reduces overall plan risk, and therefore contribution volatility, but need to keep in mind that bonds also carry risks (see part a)). Those risks mean that plan's liabilities won't necessarily move in the same magnitude as the plan's assets.

RET201 Learning Objective 5 Model Solutions

RETRPIRM, Fall 2021, Q6

Learning Outcomes:

b) Given a context, such as regulatory environment, plan asset composition, stakeholders' interests, sponsor goals, the candidate will be able to analyze and defend an appropriate funding policy for various types of retirement income plans, including:

- Single-employer plans
- Multi-employer plans
- Government-sponsored plans

Sources:

RET201-119-25: Benefit Security Pension Fund Guarantee Schemes (pp. 4-13)

Commentary on Question:

Candidates were tested on the general principles of pension guarantee schemes. Commentary is provided separately for parts (a) and (b) below.

Solution:

(a) Describe the advantages of pension guarantee schemes for the following:

(i) Sponsors of defined benefit pension plans; and

(ii) Members of defined benefit pension plans.

Commentary on Question:

Candidates were expected to clearly articulate how a pension guarantee scheme benefits each of the key stakeholders (both sponsors and members). Candidates who received full credit were able to explain the difference between realized advantages for both sponsors and employees and described multiple advantages for each party.

(i) The existence of a pension guarantee scheme protects plan sponsors from the risk that employees will consider the long-term health of the sponsor when making long-term career decisions. Employees will be guaranteed to receive their retirement income, regardless of whether the employer is financially healthy and executing a sustainable business model, which gives employees less leverage in salary negotiations and helps employers retain needed talent.

In addition, employers may view the existence of a guarantee scheme as a license to take-on riskier investment strategies for their plan, given that the guarantee scheme provides a backstop in case of an adverse event. Taking on additional risk can help sponsors close funding deficits with minimal

added contributions.

(ii) Member benefits are protected in the event the sponsor goes bankrupt and cannot otherwise provide the promised retirement income. Given that many employees have concentrated risk with the plan sponsor (i.e., both the current wages and future/pension income are derived from the same source) the guarantee scheme can offer a source of risk diversification and help employees avoid a "double blow" if the company goes bankrupt.

In many cases, plan members also do not have sufficient information regarding the financial health of the plan sponsor to make fully-informed decisions on long-term retirement plan risk. The existence of the guarantee scheme lowers the consequences for plan members of this information asymmetry.

(b) Describe the challenges that pension guarantee schemes face.

Commentary on Question:
Many candidates did well on this section. High-scoring responses noted and described 4+ significant and distinct challenges faced by guarantee schemes

The current regulatory and financial environments expose guarantee schemes to a number of significant challenges. Among these are:

- Moral hazard – Because the guarantee scheme provides a backstop should the company or plan go bankrupt, some sponsors choose to adopt riskier investment practices because of the asymmetric risk/reward tradeoff offered by the underlying guarantee. These practices can expose the guarantee scheme to higher levels of risk than would have been faced if the sponsor was responsible for the downside-risk consequences.
- Adverse Selection – In the traditional pension guarantee structure, premiums received from stronger sponsors tend to subsidize the guarantee provided to weaker sponsors. Because financially stronger plan sponsors are likely to also have the resources to shrink or terminate their plan, there is a risk that the stronger players will leave the market/guarantee scheme, leaving only the weaker plans to pay into the guarantee fund.
- Mispricing of underlying risks – Due to the number of plans covered by a traditional guarantee scheme, it is difficult or impossible for the scheme to assess the true underlying sponsor financial condition (e.g. solvency/debt levels) when setting guarantee premiums. This can lead to mispriced guarantee "insurance."
- Systemic risks – Many of the sponsors covered by a typical guarantee scheme are subject to similar market risk factors. It is difficult/impossible for guarantee schemes to manage these macro/market factor risks, which could lead to a large number of sponsors suffering insolvencies at the same time

during a significant market disruption, creating an unmanageable burden on the guarantee scheme.

RETRPIRM, Spring 2022, Q3

Learning Outcomes:
a) Describe the options available to plan sponsors for funding their retirement plans
b) Given a context, such as regulatory environment, plan asset composition, stakeholders' interests, sponsor goals, the candidate will be able to analyze and defend an appropriate funding policy for various types of retirement income plans, including:
• Single-employer plans
• Multi-employer plans
• Government-sponsored plans

Sources:
THIS QUESTION WAS ORIGINALLY BASED ON A DIFFERENT READING THAT IS NO LONGER ON THE SYLLABUS, BUT SOME OF THE CONCEPTS ARE IN:

RET201-121-25: Introduction to Retirement Plan Funding

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Describe four advantages of counter-cyclical funding regulations for defined benefit pension plan sponsors.

Commentary on Question:
Candidates generally performed well on this question, though many repeated the same advantage twice. To receive maximum points, candidates had to list 4 distinct advantages. Points were given for reasonable advantages not listed below. Points were not given if a candidate provided more than 4 advantages.

- Can help make defined benefit plans more attractive pension schemes to plan sponsors by providing additional flexibility around contribution requirements, benefit reductions, surplus utilization, and benefit improvements. This may deter plan sponsors from moving DB plans to DC designs.
- Can promote the long-term viability, stability, and security of member benefits as the burden on plan sponsors may be eased during times of economic instability.
- Can encourage deficit reduction contributions and appropriate build-up of surplus when plan sponsor finances are strong. In doing so, plan sponsors may be better able to withstand market fluctuations and may be better positioned to utilize corporate capital more effectively.
- Can help maintain predictable costs and dampen volatility as plan sponsors are able to align pension plan security and contribution requirements with corporate objectives.

- Can give plan sponsors more control to manage risks and costs, especially for financial reporting purposes, where DB plans are accounted for based on market conditions at the time of valuation and fluctuations in the market can make DB plans appear to be more expensive due to timing of the valuation.
- Other relevant advantages not described above

(b) Describe four regulatory incentives that could promote the counter-cyclicality of funding rules.

Commentary on Question:
Candidates generally performed well on this question. To receive maximum points, candidates needed to describe, not just list, four distinct regulatory incentives. Candidates were not given points if more than 4 incentives were stated. Almost all candidates noted the reliance on market value of assets, and suggested the use of smoothing to counteract market value related issues. Many candidates outlined restrictions or changes to the PBGC or PGBF premiums, and were given points for reasonable explanations.

1. Avoid excessive reliance on current market values for purposes of determining contributions
   - Regulators should enable pension funds and plan sponsors to dampen the volatility of market prices
   - Regulators should promote increased contribution levels and build-up of surplus during strong economic times, allowing for reduced contributions and surplus drawdown during weak economic times
   - Funding regulations could permit the use of smoothed valuation of assets to avoid volatility of market values
   - Funding regulations could permit the averaging of discount rates to avoid spot market discount rates

2. Set minimum funding levels or targets that are consistent with the goal of benefit security
   - Funding levels could be set relative to a plan's investment strategy, thereby making a quantitative assessment of the plan's risk profile to determine required contribution levels and funding buffers
   - Funding levels should also be viewed in conjunction with other country security mechanisms, such as pension guarantee funds or insurance schemes
   - Funding levels should take into account the relative degree of conservatism in the valuation methodology

3. Allow appropriate levels of over-funding in good economic times via more flexible tax ceilings
    - Maximum contribution limits could be smoothed over a multi-year period, promoting high funding levels in good economic times and permits cash-flow management for the plan sponsor
    - Regulators could consider raising maximum level of surplus before contributions must be suspended
    - Regulators could introduce smoothing into the maximum contribution limits, perhaps by setting the maximum funding limit as a specified percent above the smoothed minimum funding requirement

4. Limit contribution holidays and plan sponsor access to surplus
    - Regulators could consider restricting plan sponsor's ability to take contribution holidays
    - Regulators could only allow benefit improvements or withdrawal of surplus once a certain level of funding is achieved
    - Regulators should limit a plan sponsor's access to surplus, or require a gradual drawdown of surplus
    - Regulators should permit the use of buffer accounts, or "Pension Security Trusts" to provide additional flexibility to plan sponsors

5. Encourage stability of long-term contribution patterns via appropriate actuarial methods
    - Regulators should permit the use of sensible actuarial funding methods
    - Different actuarial methods can produce different contribution requirements from a funding valuation
    - Different actuarial methods can lead to different volatility of contribution levels
    - Regulators should promote the use of actuarial methods that lead to greater stability of contribution levels

6. Incorporate flexibility into funding rules to reflect the overall volatility of funding valuations
    - Funding regulations should be structured to avoid plan sponsor strain during times when plan sponsor profitability is under stress
    - The amortization periods to eliminate funding deficits should reflect the overall volatility of funding levels
    - If no smoothing is permitted, regulators should allow for longer amortization periods

- If smoothing is permitted, shorter amortization periods may be more appropriate
- Regulators could grant plan members priority creditor status
- Plan sponsors could allocate corporate assets for the pension plan without locking those assets into the pension fund through contributions
- Regulators should permit the use of letter of credits to secure otherwise required deficit reduction contributions

7. Avoid over-regulation and maintain a stable regulatory environment
    - Regulators should avoid continuous change of regulations
    - Regulators should avoid overly complex funding regulations