

The Actuarial Society of Hong Kong

WORKSHOP : MEASUREMENT MODELS

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Session 6



ACTUARIAL SOCIETY
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Application of the modified GM

Base case definition

Specifications of the insurance contract and assumptions

Contract specifications:

- § A simplified universal life product
- § Policy term: 3 years
- § Annual charge on policyholder account (BOP): 3%
- § Sum assured and cost of insurance: not considered (for simplicity)
- § Death benefit: account value balance only (for simplicity)
- § No cash value (for simplicity)
- § Maturity benefit: remaining account value balance only
- § There is no investment component (for simplicity)

Assumptions:

- § Sold policies: 100
- § Premium payment mode: Single premium of CU 1,600
- § Premium invested in an underlying item measured at FVPL
- § OCI option not applied; no tax and expenses (for simplicity)
- § Expected earned rate on the underlying item: 10%
- § Expected spread on earned rate: 2%
- § Expected crediting rate: 8% (10% - 2%)
- § Accretion of CSM at 4% (discount rate for nominal cash flows that do not vary with the underlying item)
- § Risk adjustment: CU 60 per contract, assumed straight line release
- § Two decrements per year (EOP)

Base case: Growth of the underlying item

Position / Year	Inception	1	2	3
Underlying item BoY	160,000	160,000	172,648	186,401
Investment income		16,000	17,265	18,640
Actual death outgo paid EoY		(3,352)	(3,512)	(3,679)
Underlying item EoY	160,000	172,648	186,401	201,362

Base case: Policyholder account value development

Position	At inception	1	2	3
PH Account value BoY	160,000	160,000	164,264	168,571
Annual charge on PH account value		(4,800)	(4,928)	(5,057)
Crediting amount		12,416	12,747	13,081
Death benefits paid out at EoP		(3,352)	(3,512)	(3,679)
Maturity benefit paid out at EoP		0	0	(172,916)
PH account value EoY	160,000	164,264	168,571	0

- § Crediting rate: At inception, the entity decides to credit the policyholder the actual earned rate less a 2% spread on the earned rate
- § Discount rate: Equal the actual earned rate (reflects characteristics of the liability cash flows applying B74(b))

Application of the modified GM CF, CSM, and RA roll-forward in the base case

Base case: Cash flows, CSM and RA

Position	At inception	1	2	3
CF BoY				
PV of expected cash inflows	(160,000)	0	0	0
PV of expected cash outflows	138,628	149,139	160,541	0
CF EoY	(21,372)	149,139	160,541	0
Position	At inception	1	2	3
CSM BoY 1	15,372	15,372	10,549	5,429
Accretion (discount rate) 2		615	422	217
Delta in assumptions that adjusts the CSM		0	0	0
Release of the CSM [CSM recognised in period for services] 2		(5,438)	(5,542)	(5,646)
CSM EoY	15,372	10,549	5,429	-
Position	At inception	1	2	3
RA BoY	-	6,000	4,000	2,000
Release of RA 3	6,000	(2,000)	(2,000)	(2,000)
RA EoY	6,000	4,000	2,000	0

Base case: Comments on the roll-forward

- § **1** At inception, a CSM of CU 15,372 is set up. PV net cash flows is CU 21,372 minus RA of CU 6,000.
- § **2** This CSM is carried forward by:
 - § using 4% to accrete the CSM; and
 - § amortising the CSM using the number of policy in force as coverage units
- § The Standard states that accretion of the CSM is calculated using the discount rate for nominal CFs that do not vary with the underlying item. However, there would be no impact on the total comprehensive income amount if the entity accrued the CSM using the earned rate of 10%. It only affects the timing of the release of the CSM over the coverage period.
 - § The accretion is captured in the insurance finance income and expenses in the statement of comprehensive income
 - § This accretion is offset by a higher amortisation amount of the CSM captured in the insurance revenue in the SCI
- § **3** The risk adjustment for non-financial risk does not accrete interest in this example for simplicity.
 - § There is no impact on the total comprehensive income if the risk adjustment also accretes interest for the same reason as outlined for the CSM.

Application of the modified GM SCI in the base case

Base case: Statement of comprehensive income ("SCI")

Item	Year 1	Year 2	Year 3	Total
Insurance revenue 1	10,790	11,054	184,241	206,085
Insurance service expense 2	(3,352)	(3,512)	(176,595)	(183,459)
Insurance service result 3	7,438	7,542	7,646	22,626
Investment income 4	16,000	17,265	18,640	51,905
Insurance finance income and expenses 5	(14,478)	(15,336)	(16,271)	(46,085)
Net financial result	1,522	1,929	2,369	5,820
Other income, expenses, taxes	0	0	0	0
Profit after tax	8,960	9,471	10,015	28,446
Other comprehensive income	0	0	0	0
Investment income	0	0		
Insurance finance income and expenses	0	0	0	0
Total other comprehensive income	0	0	0	0
Total comprehensive income	8,960	9,471	10,015	28,446

Base case: Comments on SCI

- § **1** In this example, the insurance revenue (IR) contains the following components:
 - § Amortisation of the CSM
 - § Amortisation of the RA
 - § Expected pay-out amounts estimated at inception
- § **2** In this example, the insurance service expense contains the following component:
 - § The actual pay-out amounts
- § **3** Since everything goes as expected, the expected pay-out amounts captured in the IR cancel out the actual pay-outs amount captured in the insurance service expense. Thus, the insurance service result is the sum of the CSM amortisation and the RA amortisation amounts
- § **4** The investment income is the actual investment income of the underlying item
- § **5** In this example, the insurance finance income and expenses (IFIE) consist of the following components:
 - § Interest accretion on the present value of cash out flows (using the 10% discount rate recognised initially)
 - § CSM accretion (calculated using 4%)

Application of the modified GM

Scenario 1: reduced earned rate

Scenario 1: Change in earned rate in year 2 and year 3

Assumptions:

- § At beginning of year 2, there is a change in the expected earned rate to 7% for year 2 and for year 3.
- § The entity credits the policyholder's account the earned rate less a 2% spread which is equal to 5% in year 2 and year 3.
- § All other assumptions remain unchanged.

Scenario 1: Growth of the underlying item

Position / Year	Inception	1	2	3
Underlying item BoY	160,000	160,000	172,648	181,319
Investment income		16,000	12,085	12,692
Actual death outgo paid EoY		(3,352)	(3,414)	(3,478)
Underlying item EoY	160,000	172,648	181,319	190,533

Scenario 1: Policyholder account value development

Position	At inception	1	2	3
PH Account value BoY	160,000	160,000	164,264	163,888
Annual charge on PH account		(4,800)	(4,928)	(4,917)
Crediting amount		12,416	7,967	7,949
Death benefits paid out at EoP		(3,352)	(3,414)	(3,478)
Maturity benefit paid out at EoP		0	0	(163,443)
PH account value EoY	160,000	164,264	163,888	0

- § **1** Instead of earning 10% in investment income in year 2 and year 3, the entity only earns 7% in those years. Thus, the value of the underlying item is lower in year 2 and year 3 compared to the base case.
- § **2** Since the crediting rate drops from 7% to 5% in year 2 and year 3, the credited amounts are reduced accordingly.
- § **3** Consequently, the death and maturity benefits paid are reduced as they are determined based on the account value.

Application of the modified GM CF, CSM, and RA roll-forward in scenario 1

Scenario 1: Cash flows, CSM and RA

Position	At inception	1	2	3
CF BoY				
PV of expected cash inflows	(160,000)	0	0	0
PV of expected cash outflows	138,628	149,139	156,000	0
CF EoY	(21,372)	149,139	156,000	0
Position	At inception	1	2	3
CSM BoY	15,372	15,372	10,549	5,429
Accretion (discount rate)		615	422	217
Delta in assumptions that adjusts the CSM		0	0	0
Release of the CSM [CSM recognised in period for services]		(5,438)	(5,542)	(5,646)
CSM EoY	15,372	10,549	5,429	0
Position	At inception	1	2	3
RA BoY	0	6,000	4,000	2,000
Release of RA	6,000	(2,000)	(2,000)	(2,000)
RA EoY	6,000	4,000	2,000	0

Scenario 1: Comments on the roll-forward

- § Assume that we are at end of year 2.
- § **1** The change in the earned rate from 10% to 7% changes the present value of expected cash outflows. The death and the maturity benefits are not only reduced, but also discounted at the lower 7% earned rate now.
- § The CU 156,000 is made up of CU 3,250 for death benefit and CU 152,750 for maturity benefit.
- § **2** The drop in the earned rate has no impact on the CSM since:
- § the CSM accretes interest using the locked-in rate of 4%; and
 - § there is no change in non-financial assumptions or number of policies in force which defines the coverage units
- § **3** There is no change in the RA (for simplicity)

Application of the modified GM SCI in scenario 1

Scenario 1: Statement of comprehensive income

Item	Year 1	Year 2	Year 3	Total
Insurance revenue	10,790	10,956	174,566	196,313
Insurance service expense	(3,352)	(3,414)	(166,920)	(173,687)
Insurance service result	7,438	7,542	7,646	22,626
Investment income	16,000	12,085	12,692	40,778
Insurance finance income and expenses	(14,478)	(10,698)	(11,137)	(36,313)
Net financial result	1,522	1,388	1,555	4,465
Other income, expenses, taxes	0	0	0	0
Profit after tax	8,960	8,930	9,201	27,091
Other comprehensive income	0	0	0	0
Investment income	0	0	0	0
Insurance finance income and expenses	0	0	0	0
Total other comprehensive income	0	0	0	0
Total comprehensive income	8,960	8,930	9,201	27,091

Scenario 1: Comments on SCI

- § **1** The insurance service result in scenario 1 is unaffected by the change in the financial assumption in year 2 as compared to the base case:
 - § **2** There is no change in the CSM & RA amortisation.
 - § The (revised) death and maturity benefits in the Insurance Revenue offsets the actual death and maturity benefits captured in the insurance service result as there is no deviation between actual and expected.
- § **3** Both the investment income as well as the IFIE change under scenario 1
 - § The investment income is the actual investment income of the underlying item.
- § The insurance finance income and expenses (IFIE) consist of the following components:
 - § The interest accretion on the present value of cash outflows to reflect the change in the financial assumption to using the reduced rate.
 - § Insurance finance expense on the CSM (calculated using 4%). This component remains unchanged.

Application of the modified GM

Scenario 2: scenario 1 and exercising discretion

Scenario 2: Change in earned rate in year 2 and year 3 and the effect of exercising discretion

Assumptions:

- § At beginning of year 2, there is a change in the expected earned rate : 7% (for year 2 and for year 3) as in scenario 1.
- § At its discretion, the entity credits 6% instead of 5% in year 2 and in year 3 to the account value of the policyholder.
- § All other assumptions remain unchanged.

Scenario 2: Growth of the underlying item

Position / Year	Inception	1	2	3
Underlying item BoY	160,000	160,000	172,648	181,286
Investment income		16,000	12,085	12,690
Actual death outgo paid EoY		(3,352)	(3,447)	(3,544)
Underlying item EoY	160,000	172,648	181,286	190,432

Scenario 2: Policyholder account value development

Position	At inception	1	2	3
PH Account value BoY	160,000	160,000	164,264	165,449
Annual charge on PH account value		(4,800)	(4,928)	(4,963)
Crediting amount	①	12,416	9,560	9,629
Death benefits paid out at EoP		(3,352)	(3,447)	(3,544)
Maturity benefit paid out at EoP	②	-	0	(166,571)
PH account value EoY	160,000	164,264	165,449	0

- § ① Since the crediting rate is increased from 5% in scenario 1 to 6% in scenario 2 at the entity's discretion, the policyholder account grows faster as compared to scenario 1.
- § ② Consequently, the death and maturity benefits paid are slightly increased compared to scenario 1 as they are determined based on the account value.

Application of the modified GM CF, CSM, and RA roll-forward in scenario 2

Scenario 2: Cash flows, CSM and RA

Position	At inception	1	2	3
CF BoY				
PV of expected cash inflows	(160,000)			
PV of expected cash outflows	138,628	149,139	158,986	-
CF EoY	(21,372)	149,139	158,986	-
Position	At inception	1	2	3
CSM BoY	15,372	15,372	10,549	3,976
Accretion (discount rate)		615	422	159
CSM			(2,937)	
Release of the CSM [CSM recognised in period for services]		(5,438)	(4,059)	(4,135)
CSM EoY		10,549	3,976	-
Position	At inception	1	2	3
RA BoY	-	6,000	4,000	2,000
Release of RA	6,000	(2,000)	(2,000)	(2,000)
RA EoY	6,000	4,000	2,000	-

Scenario 2 Comments on the roll-forward

- § Assume that we are at end of year 2.
- § **1** The present value of expected cash outflows increases slightly from scenario 1 due to the increased credited rate from 5% to 6%.
- § **2** The **effect of exercising discretion**, i.e. changing the crediting rate from 5% to 6%, is adjusted against the CSM.
- § Applying paragraphs 44(c) and B98, changes in discretionary cash flows are regarded as related to future service, and accordingly adjusts the CSM.
- § Applying paragraphs B96 and B72(c), the adjustment is calculated by discounting the change in future cash flows using the discount rate determined on initial recognition of 10%.
- § Consequently, the amortisation amount as well as the CSM amount at end of year 2 are changed compared to scenario 1. This also impacts the CSM amount for year 3.
- § **3** There is no change in the RA (for simplicity).

Application of the modified GM SCI in scenario 2

Scenario 2: Statement of comprehensive income

Item	Year 1	Year 2	Year 3	Total
Insurance revenue	10,790	9,505	176,250	196,545
Insurance service expense	(3,352)	(3,447)	(170,115)	(176,914)
Insurance service result	7,438	6,059	6,135	19,631
Investment income	16,000	12,085	12,690	40,775
Insurance finance income and expenses	(14,478)	(13,797)	(11,288)	(39,563)
Net financial result	1,522	(1,712)	1,402	1,212
Other income, expenses, taxes	-	-	-	-
Profit after tax	8,960	4,347	7,537	20,843
Other comprehensive income	-	-	-	-
Investment income	-	-	-	-
Insurance finance income and expenses	-	-	-	-
Total other comprehensive income	-	-	-	-
Total comprehensive income	8,960	4,347	7,537	20,843

Scenario 2: Comments on SCI

- § ① The insurance service result in scenario 2 is affected by the effect of exercising discretion compared to scenario 1:
 - § ② There is a change in the CSM amortisation (smaller amount released as the discretion amount is adjusted against the CSM) while the RA amortisation remains unchanged.
- § ③ Both the investment income as well as the IFIE have changed under scenario 2 compared to scenario 1
 - § The change in the investment income was as covered previously in scenario 1.
 - § There is a change in the IFIE due to the CSM adjustment caused by the effect of exercising the discretion.
 - § Additionally, the financial impact of discounting the change in the discretionary cash flows between the 10% initial recognition rate and the current 7% discount rate is also included in the IFIE.
- § ④ Overall, the income is lower in scenario 2 than in scenario 1 due to the change in the discretionary cash flows which reduces the CSM.