COURSE 2B LIFE INSURANCE MAY 2013 EXAMINATIONS

Answer two questions.

QUESTION 1 **(30 MARKS)**

You are the Valuation Actuary for a life insurance company located overseas. The company has been established for 5 years and during that time the only business written has been a participating limited payment endowment policy which pays a maturity benefit after 8 years and has 5 years of premium payments. Details of the policy are:

- The payment of a Guaranteed Maturity Benefit equal to the accumulation of 96% of premiums at 2% interest.
- A bonus is declared each policy year and added to the previous bonuses declared. The latest bonus was 4% of the annual premium and this has not changed since the company started. The bonus is paid on maturity or death before maturity and is declared by the company after consideration of actuarial advice.
- There is no regulation of commissions but your company pays total distributor compensation of 10% of the first premium, much of which is rebated by the distributor to the policyholder.
- The death benefit is equal to the Guaranteed Maturity Benefit plus any bonuses already declared.
- The policy is defined as life insurance for IFRS and there is no tax payable by life insurance companies.
- Premiums are paid annually and for personal income tax reasons policies are only issued on 1 January each year. There are no withdrawal benefits available and, due to cultural values, all polices are renewed as they are regarded as a personal promise.

The country's financial markets are limited and only government debt is available. Government debt is offered for a term of 3 years only and only issued to financial institutions. The issued yield on government investments has always been, and is currently, 3.5%. The limited market between institutions reflects a 3.5% yield for all outstanding durations up to 3 years. The country follows Australian regulations for profit reporting and all earnings are allocated 80/20 to policyholders and shareholders respectively. Transfers into the fund are also allocated 80/20 regardless of their source. Transfers to shareholders must be made ensuring that the 80/20 policyholder/shareholder ratio is maintained after transfer. The currency is dollars ($).

Minimum capital requirements mean that a company must, at the end of each calendar year, have assets at least equal to 102% of the Minimum Amount which is calculated as the accumulation of premiums less charges (currently premiums less charges is 96% of premium) using the guaranteed interest rate.

The end of the calendar year is less than 2 weeks away and you are preparing the year end forecasts. You have been provided with the following data:

	Liability Movements	Actual Statistics
Policies at End of Previous Year	39,779	39,779
New Policies	10,000	10,000
Deaths	122	109
Policies at End of Current Year	49,657	49,670
Premium ($m)	99.559	99.559
Interest ($m)	10.199	10.452
Expense and Commission ($m)	3.854	3.969
Mortality Claims ($m)	1.335	1.202
S/H Dividend ($m)	0.840	0.840
Expected Cost of Bonus ($m)	3.360	
Liability at the end of the previous year after the declared Bonuses have been added ($m)	195.701	

Other Items

Minimum Amount at End of Previous Year ($m)	199.020
Minimum Amount at End of Current Year ($m)	300.980
Assets at End of Previous Year ($m)	203.000
Assets at End of Current Year after Transfer ($m)	307.000
Assets on expected movements ($m)	308.064
Assets on actual movements ($m)	307.000

a) Using the above data, calculate the forecast policy liability (excluding cost of bonus) at the end of the year and the total earnings (before cost of bonus and dividend) for the year. You should present your results in a file note showing all relevant calculations. (12 Marks)

b) Because of the short term of assets available, your company rebalances the portfolio just before the end of each year so that all assets have 3 years until maturity. Immediately after this rebalancing the yield on government bonds has dropped to 2%. For all other items, the actual result has been equal to forecast.

You do not have time to run extra numbers as the board meeting is tomorrow at 8am. However you do know that:

- the current value of assets has increased to $320m.
- the present value of future benefits (including the current year bonus and future bonuses and shareholder transfers) less premiums at a 2% discount rate has increased to $327.9m at the current bonus rate or $315.6m if there is no current or future bonus.
- the value of existing bonuses (excluding bonuses for the current year end) is $6.9m at 3.5% interest and $7.3m at 2.0% interest.
- the current product has a profit margin of 0.5% of premiums if there is no commission and no bonus and the earnings assumption is 2%. However transfers are required to finance the product in each policy year except for the final policy year. The sales for the latest year are $20m of annual premium.

The Chief Actuary has asked you to prepare a briefing note which will be used by the Chief Actuary to prepare for the Board discussion tomorrow morning. The briefing note should:

i) outline the key issues arising from the current situation. (10 marks)

ii) give your advice, with reasons, for the current end of year bonus rate assuming that no new capital is available to the fund. Your advice should include the actual bonus rate recommended and describe what will happen to future bonus rates if the situation remains unchanged. (8 marks)

Draft your briefing note. All documentation should be contained within the note as the Chief Actuary will only be referring to a printed copy of your note.

MARKING GUIDE: QUESTION 1

a) For the policy liability calculation we need to calculate the VSA.

For the VSA calculation we need to calculate the liability experience profit excluding investment experience on the liabilities.

Expense Experience		
Expected	3.854	
Actual	3.969	
Sub Total	-0.114	
Interest for year	-0.004	
Expense Experience	-0.118	2 marks

Claims		
The expected MoS liability is		
Liability at Start ($m)	195.701	
Premium ($m)	99.559	
Interest ($m)	10.199	
Expense and Commission ($m)	-3.854	
Mortality Claims ($m)	-1.335	
S/H Dividend ($m)	-0.840	
Expected MoS Liability ($m)	299.429	
Policies at End	49,657	
Expected Liability Per Policy at End ($m)	0.006030	
Expected Death Claims ($m)	1.335	
Expected No. of Deaths	122	
Liability on Expected Deaths ($m)	0.735	
Expected Strain ($m)	0.600	
Actual Death Claims($m)	1.202	
Actual Deaths	109	
Expected Liability on Actual Deaths ($m)	0.657	
Actual Strain ($m)	0.545	
Expected Strain ($m)	0.600	
Actual Strain ($m)	-0.545	
Mortality Profit ($m)	0.055	3 marks
If difference is cash flow only then 1 mark		

Total experience Profit		
Expense ($m)	-0.118	
Mortality ($m)	0.055	
Total Non Investment Experience Profit ($m)	-0.063	

Investment Income on Excess Assets		
Actual Interest	10.452	
Expected Interest	-10.199	
Interest Profit for Expenses	0.004	
Total	0.256	1 mark

Interest on Excess Assets can be also calculated as	
Excess Assets at Start ($m)	7.299
Interest at 3.5%	0.255

The above data can then be used to calculate the forecast policy liability (excluding cost of bonus) and shareholders earnings at the end of the year.

VSA		
Liability at Start after COB ($m)	195.701	
Actual Cash Flows (add + and subtract -)		1 mark for correct method
Premium ($m)	99.559	
Investment Income ($m)	10.452	
Expenses ($m)	-3.969	
Mortality Claims ($m)	-1.202	
Cash Flows	104.840	1 mark
Experience Profit ($m)	0.063	1 mark
Exclude Interest on Excess Assets	-0.256	
VSA ($m)	300.347	1 mark
Policy Liability Excluding CoB and Dividend		
VSA ($m)	300.347	
Cost of Bonus ($m)	-3.360	
Dividend ($m)	-0.840	
Policy Liability Excluding CoB ($m)	296.147	
Profit		
BOY Liability after Bonus added ((($m)	195.701	
Actual CF ($m)	104.840	
Policy Liability Excluding CoB ($m)	-296.147	
Earnings ($m)	4.393	2 marks

Analysis of Policy earnings (not marked but a check)	
Expected Cost of Bonus ($m)	3.360
Expected S/H Dividend ($m)	0.840
Expense Profit ($m)	-0.118
Interest ($m)	0.256
Mortality Profit ($m)	0.055
	4.393

b)

The briefing note should:

i) outline the key issues arising from the current situation

ii) give your advice, with reasons, for the current end of year bonus rate assuming that no new capital is available to the fund and describe what will happen to future bonus rates if the situation remains unchanged

Key Issues

Adequately describe at least two components of each issue for 2 marks.

- 2 marks - The ability to cut bonus rates will depend on what the customers have seen in the marketing material and also on what agents have told the customers. If bonus rates cannot be cut the cost is $25m. If bonuses are cut s/h dividends are also cut.
- 2 marks - Overall assets have a shorter term than the liability. This means that a reduction in interest rates has an adverse effect on the financial position. The bonus rate can partially offset but there is a floor of the guaranteed rate. The mismatch is lowest for business issued 5 years ago and greatest for business issued recently. This means that all business will need a cut in bonus rates but the cuts should be highest for the business issued in recent years.
- 2 marks - The bonus is financed by interest profit. Interest profit increases each year in proportion to the number of premiums paid. However the bonus declared is a level percentage of premiums and hence the cost of bonus is higher than the profit earned for the first three policy years and lower after that. This could be used as justification for a negative bonus but would have a serious impact on the company's reputation and be difficult to explain.
- 2 marks -The existing product is not viable under current market conditions. A new product is needed immediately which should reflect lower guarantees, a better shape of bonus and lower commission.

To a maximum of 8 marks.

Other Issues for 1 mark each.

- 1 mark - The current regulatory and working capital position of the company will need to be reassessed as the margin provided by future bonuses has changed

- 1 mark - There is a risk of future premiums not being paid. In this case the government may require a surrender value to be paid but the existing surrender values are more than covered by existing assets and would leave the company in a stronger financial position
- 1 mark - There will be considerable reputation damage so the reaction of competitors will be important
- 1 mark - Expense Overruns are not significant yet but could be a problem increasing the liability in the future
- 1 mark for other valid points.

To a maximum of 4 marks.

To a maximum of 10 marks overall

Bonus Recommendation

Important Issues to be considered

If the current bonus is declared in full then there is little room for future bonuses as is shown below

	Before	After with Support-table Bonus	After Full Bonus
Assets	307.000	320.000	320.000
Rf Liability	292.810	308.296	308.296
Rf Existing Bonus	6.928	7.342	7.342
Old Dividend		-0.840	-0.840
New Dividend		0.890	0.890
COB	3.360	3.560	3.560
Rf Future Bonus	5.199	0.752	8.741
	308.296	320.000	327.939
Dividend	0.840	0.890	0.890

- Policies issued 5 years ago should be almost fully matched as these policies have 3 years to run and are invested in three year assets (only the interest earnings will roll up at low interest). However there will be significant future reductions in bonus so not making a cut would create unrealistic bonus expectations.
- A uniform bonus rate has applied and been illustrated and is probably the expectation of all policyholders. The illustrated bonus does not reflect the shape of profits earned.
- The 25% shareholder dividend should be maintained as they have provided past capital and are responsible for future losses. If a student makes a good argument for say 10% then it should be given marks.
- New business should be closed as it is not possible to have a policy with nil commission and no dividends to shareholders but a need for finance.
- The total of current bonus and future bonus needs to have a value of $4.4m. A cut of 50% seems too high but 60%-80% seems preferable but there will be future cuts, perhaps even to zero bonus. Possible Options are shown below:

	Before	After with Support-table Bonus	After Full Bonus	Not Acceptable	Option 1	Option 2	Option 3
Assets	307.000	320.000	320.000	320.000	320.000	320.000	320.000
Rf Liability	292.810	308.296	308.296	308.296	308.296	308.296	308.296
Rf Existing Bonus	6.928	7.342	7.342	7.342	7.342	7.342	7.342
Old Dividend		-0.840	-0.840	-0.840	-0.840	-0.840	-0.840
New Dividend		0.890	0.890	0.890	0.623	0.445	0.534
COB	3.360	3.560	3.560	3.560	2.492	1.780	2.136
Rf Future Bonus	5.199	0.752	8.741	0.752	2.087	2.977	2.532
	308.296	320.000	327.939	320.000	320.000	320.000	320.000

The recommendation should

- consider specifics (what it means) for at least two issues (4 marks)
- mention the dividend, not maintain the current bonus, give and justify a specific cut to the current bonus (20-60%) consistent with the asset value and give an indication of future additional bonus cuts (4 marks).

To a maximum of 8 marks but a maximum of 6 marks if no specific recommendation.

QUESTION 2 **(30 MARKS)**

You are the valuation actuary for **SafeGuard** Life Insurance which specialises in life, accident and critical illness cover. As preparation for the 31 December 2012 valuation, the Research Actuary has performed an accident claim experience study for the first time in three years. The results are set out below:

Actual to Expected Accident Claims

Age	2009	2010	2011	2012
20	184%	243%	279%	303%
30	143%	181%	207%	225%
40	98%	110%	120%	127%
50	80%	80%	80%	80%
60	80%	80%	80%	80%
Total	107%	126%	140%	151%

Based upon this study, the Research Actuary has recommended that the accident claim assumption be increased to 150% of the previous assumption. No other assumptions have been changed.

Gross present values of accident product cash flows (in $m) on the old assumptions as at 31 December 2012 are set out below:

PV Premium	51.2
PV Claims	23.1
PV Expenses	12.8
PV Commission	10.2

The portfolio is reinsured on a quota share arrangement with 60% of the risk being reinsured and 40% of the risk retained by **SafeGuard.** Life Reinsurance rates are 55% of **SafeGuard** Life's gross premium rates.

The accident product policy liability at 31 December 2012 after reinsurance and using the old assumptions is $(1.5)m i.e. a negative amount. Tax can be ignored.

a) Estimate the impact on the accident product policy liability of the proposed change in assumptions. (4 Marks)

In response to the deterioration in experience, you have sought out the sales experience by agent. You have found that a growing part of the accident cover portfolio is the clients of Road Warriors Insurance Agency. This agency specialises in selling to the insurance needs of motor cycle riders. The sales results for the last four years are set out below:

In Force Policies	2009	2010	2011	2012
Road Warriors Insurance Agency	1,000	2,000	3,000	4,000
Other Agents	10,000	11,000	12,100	13,310
Total	11,000	13,000	15,100	17,310

Further investigations into the experience have produced the following results:

- The experience for RoadWarriors Insurance Agency is far worse than expected due to accidents involving motorcycle riders, whereas the actual to expected rate for other agents has been 80% consistently over the past four years.
- The overall lapse rate has been line with expected at 7.3%, however, lapse rates for policies sold by Road Warrior Insurance Agency have been consistently running at 15% per annum, whereas lapse rates for policies sold by other agents have been running at 5% per annum.

As a result, management has decided to revoke the sales arrangement with Road Warriors and introduce an exclusion for motorcycle accidents for future new business. The marketing manager has confirmed that **SafeGuard** was previously the only company in this market without such an exclusion.

b) Based upon these experience investigation results, describe the changes you would make to the valuation basis and approach. Explain the impact you would expect relative to the policy liabilities calculated in question a) (7 Marks)

c) In the Insurance Risk Charge component of the Prescribed Capital Amount (PCA), you previously allowed for insurance risk margins, including a +50% margin for accident business for 3 years. Given the recent experience for this product the Chief Risk Officer has queried whether this margin was adequate. Draft your response. In your draft explain the following:

   i) What was the justification for the risk margin (4 Marks)

   ii) The appropriateness, in hindsight, of the risk margin (5 Marks)

   iii) What changes, if any, you will be recommending to the risk margin for the future, and the impact these changes will have on the PCA (4 Marks)

d) You had been having discussions with the reinsurer leading up to the valuation date about the experience, explaining the source of the variation in experience. Through these discussions the reinsurer indicated that they were likely to exercise their option to increase reinsurance rates on the existing accident portfolio. In early January 2013, before you have finalised the valuation results as at 31 December 2012, you received written notice from the reinsurer that reinsurance rates will increase by 20% with effect from 30 September 2013.

i) Explain how, if at all, this notice from the reinsurer will affect the reported profit for 2012. (3 Marks)

ii) How would you expect reinsurance arrangements, including the option for the reinsurer to increase reinsurance premium rates, to be reflected in the PCA? (3 Marks)

MARKING GUIDE: QUESTION 2

a)

BEL on old assumptions:

- 0 marks for PV Premium = 51.2
- 0 marks for PV Claims = 23.1
- 0 marks for PV Expenses = 12.8
- 0 marks for PV Commission = 10.2
- 0.5 marks for PV Reinsurance premium = 60% * 55% * 51.2 = 16.9
- 0.5 marks for PV Reinsurance recoveries = 60% * 23.1 = 13.8
- 0.5 marks for BEL = -51.2 + 23.1 +12.8 + 10.2 + 16.9 – 13.8 = -2.0
- 0.5 marks for PV Claims will increase from $23.1m to 150% of $23.1m = $34.6m, an increase of$11.5m

PV Reinsurance Recoveries will increase by 60% (amount reinsured) of the increase in the PV Claims, an increase of $6.9m

- 1 mark - BEL will consequently increase by $4.6m from -$2.0m to $2.6m
- 0.5 marks - PL will increase to the greater of the current PL (-$1.5m) and the new BEL $2.6m. That is increase to $2.6m
- 0.5 marks - Hence policy liabilities will increase by $4.1m (from -$1.5m to $2.5m)

The calculations given above are summarised below:

	Old Assumptions			**New Assumptions**		
	Gross	Reins	Net	Gross	Reins	Net
PV Premium	51.20	16.90	34.30	51.20	16.90	34.30
PV Claims	23.10	13.86	9.24	34.65	20.79	13.86
PV Expenses	12.80		12.80	12.80	0.00	12.80
PV Commission	10.20		10.20	10.20	0.00	10.20
PL			-1.50			2.56
BEL	-5.10	-3.04	-2.06	6.45	3.89	2.56
Profit Margin			0.56			0.00

To a maximum of 4 marks.

b)

- I mark - Given the fact that there are, at least, two identifiable segments of the portfolio that exhibit different experience, it is worthwhile modelling the two segments separately with different assumption sets.
- 1 mark - The valuation assumptions for the policies sold by Road Warrior Insurance

Agency would have the accident assumption based upon its experience (higher than 150% of the current assumption) and with a the higher lapse rate exhibited by this portfolio (15% per annum)

- 1 mark - The valuation assumptions for the remainder of the portfolio would be 80% of the current assumption (in line with experience) and a lapse rate of 5% per annum.
- 1 mark - The average accident rate in year 1 of the valuation projection would be 150% of the current assumption, based upon the experience investigation.
- 1 mark - However, as the policies sold by Road Warrior Insurance Agency would be assumed to lapse at a higher rate than other policies, we would expect that the average accident rate over the term of the projection would decline as the proportion of policies sold by Road Warrior Insurance Agency would decline.
- 1 mark - Compared with the approach adopted in part a), the average assumed accident rate over the term of the projection, would not be as severe.
- 1 mark - Consequently, the PV claims would not increase by as much, the BEL would not increase by as much and hence the PL would not increase by as much.
- 1 mark for other valid points to a maximum of 2 marks

To a maximum of 7 marks.

c) i)

- 1 mark - The margin is set in accordance with LPS 115
- 1 mark – The +50% margin was to allow for various risks including:

  · Random stress

  · Event stress

  · Future stress
- 1 mark - The limitation of the margin for a period of three years is to allow for the fact that typically, management would have the discretion to increase premium rates for the portfolio.
- 1 mark - A delay of three years is assumed given the time required to identify the deterioration, decide to take action and implement the increase in premium rates
- 1 mark for other valid points to a maximum of 2 marks

To a maximum of 4 marks.

c) ii)

- 1 mark - The quantum of the margin proved to be adequate. A +50% margin is equal to the extent of the deterioration in experience.
- 1 mark - However, the limitation of the margin to only three years is inadequate as it has taken already three years, just to identify the issue

- 2 marks - Management discretion to increase premium rates is likely to be very limited. If this was a deterioration experienced by the market as a whole, an increase in premium rates would be easier to implement to the market. However, SafeGuard is likely to be the only company facing this issue, as it was the only company exposed without the exclusion on motorcycle riders. As such a premium rate increase will be difficult to implement without risk of losing all of the policies (those sold by Road Warrior Insurance Agency and those sold by other agents). Even worse would be keeping only the high claim policies.

- 1 mark - Given that new business will have the motorcycle exclusion, there will be no need to increase rates on new business. Increasing the premium rate for in force business will only create a risk of churning business leaving only the high risk insured in the old product. The average experience will then continue to deteriorate.

- 1 mark for other valid points to a maximum of 2 marks

To a maximum of 5 marks.

c) iii)

- 1 mark - The inappropriateness of the risk margin was due to a particular product feature that was different from the similar products in the market; the absence of an exclusion on motorcycle accidents. If there are no other differences from the market, the existing risk margins applied to the new valuation assumptions would be appropriate.

- 1 mark - Adding further margins would not be appropriate if an analysis of risks showed that there is no exposure to similar risks. Doing so, would be to "lock the door after the horse has bolted".

- 1 mark - However, given that experience investigations are currently only conducted once every three years, a three year risk margin is inappropriate. Given the company's practice for experience investigations, a 5-year risk margin would be more appropriate.

- 1 mark - Increasing this risk margin to 5 years would increase the prescribed capital amount.

- 1 mark for other valid points to a maximum of 2 marks

To a maximum of 4 marks.

d) i)

- 2 marks - That the written notice came after the valuation balance and that the change is not planned until 9 months after the valuation date should be irrelevant. There had already been discussions about a planned increase in reinsurance rates. Hence, this increase should be factored into the policy liability calculations

- 1 mark - Given that the product is in loss recognition from the other assumption changes , bringing in reinsurance premium changes will result in further loss recognition in 2012

To a maximum of 3 marks.

d) ii)

- 1 mark - The PCA can be calculated on a net of reinsurance basis
- 1 mark - Counter party risks should be considered in the PCA
- 1 mark - The option to increase reinsurance rates could be allowed for in a similar way to deterioration in experience. That is, as a temporary increase in reinsurance costs, offset by an increase in reinsurance recoveries, for a limited period of time until the product can be repriced.

To a maximum of 3 marks.

END OF PAPER