INSTITUTE OF ACTUARIES OF AUSTRALIA

COURSE 2A LIFE INSURANCE **OCTOBER 2011 EXAMINATIONS**

Marking Guide

Level of difficulty

Question	Syllabus Performance Outcome	Units	Knowledge & Understanding	Straight-forward Judgement	Complex Judgement	Total Marks
1 (a)	10.2	3		5		18
1 (b)	10.2	3		6		
1 (c)	7.2,12.4	2,4		7		
2 (a)	8.3	3		3	5	15
2 (b)	9.1	3			4	
2 (c)	11.5	3			3	
3 (a)	5.1	2	4			17
3 (b)	5.3	2	4			
3 (c)	5.2, 5.3	2		4		
3 (d)	9.2	3		5		
4 (a)	3.1, 3.2	1	4			17
4 (b)	3.4	1	7			
4 (c)	6.3	2			6	
5 (a)	3.5	1	8			18
5 (b)	7.2, 12.2,12.3	2,4	2	8		
6 (a)	14.1	4		6		15
6 (b)	14.1	4			9	
TOTAL			**29**	**44**	**27**	**100**
TARGET			**15-30**	**35-45**	**30-45**	**100**

QUESTION 1 **(18 Marks)**

As a consulting actuary, you have been employed to assist in the due diligence review of a recently purchased life insurance company. The company only writes retail risk business and retail unit linked policies which are distributed through independent financial advisers.

The company is small and has not conducted an expense analysis. However, you are required to produce the actual unit costs to be used in the projection model being used to confirm the embedded value and the value of the new business within the next 2 days. You have been provided with the following information:

- **Expenses, extracted from the company accounts and divided into the following categories**
  - **Salaries**
  - **Rent**
  - **Advertising**
  - **IT**
  - **Depreciation**
  - **Medical Fees**
  - **Other**
- **Salaries, divided into the following departments:**
  - **Administration - Initial Processing**
  - **Administration - Regular Processing and Client Service (including claims and unit pricing)**
  - **Underwriting**
  - **Finance, Actuarial**
  - **Investment**
  - **Sales**
  - **Marketing (including Actuarial Pricing)**
  - **IT**
  - **Human Resources**
  - **CEO and support services (e.g. legal, audit)**

a) **Assuming no further information is available, describe how you would allocate the salary expenses for the departments listed above to the following expense functions**
   - **acquisition processing**
   - **acquisition other**
   - **investment**
   - **maintenance**
   - **overhead**

(5 Marks)

b) **Describe how you would allocate the remaining expense categories in preparation for calculating unit costs.** **(6 Marks)**

c) You have completed the expense analysis from a) and b) above and are now working on pricing new products for the same client. The expense analysis resulted in acquisition expenses of $100 per policy and 30% of premium, and maintenance expenses of $20 per policy and 5% of premium. Understandably, your profit tests have shown that small policies are unprofitable (small policies can be defined as policies with an annual premium of $150 or less, including a $20 policy fee). The minimum annual premium for retail risk products is $120 and for retail unit linked policies is $600.

Your client has asked you for your assessment of the impact of the following options for addressing this problem.

- **Increasing the minimum premium**
- **Increasing the policy fee**
- **Changing expense loadings into % of premium based on average policy size**
- **Using marginal pricing to determine the minimum premium, assuming that average costs remain the same**

Draft a memo to the client discussing the impact of the 4 options and which option you would recommend. (7 Marks)

QUESTION 1: SOLUTIONS

a)
KPO: 10.2 Perform an analysis of the expenses and understand the effect of variations in the results

Course Reference: Chapter 15 p270-286

As a first step in the expense analysis salaries need be allocated to the defined functions. This can be done on the following basis:

- **Administration - Initial Processing -** by definition this is acquisition processing.
- **Administration - Regular Processing and service (including claims and unit pricing)** – this is maintenance. Note that this includes unit pricing costs and claims which would be separated in a full analysis.
- **Underwriting –** this is acquisition processing (acquisition other is also acceptable), but keep it separate as this is unlikely to be the driver for the remaining acquisition expenses.
- **Finance, Actuarial –** this is overhead.
- **Investment –** by definition this is the investment function.
- **Sales** – in the absence of other information treat as acquisition other, although some time is probably spent on policy maintenance.
- **Marketing (including Actuarial Pricing)** – under accounting rules this is a maintenance expense as it is incurred each year and does not vary with volume over the short term. However, over the longer term it does vary with volume so for pricing it should be regarded as acquisition. (Markers, either category is acceptable)
- **IT –** split in proportion to Initial Processing and Maintenance Processing salaries.
- **Human Resources** – to overhead or split according to other salaries. Either is acceptable.
- **CEO and support services (e.g. legal, audit)** – overhead.

In summary:

Department	Expense Function
Administration - Initial Processing	Acquisition Processing
Administration - Regular Processing	Maintenance
Underwriting	Acquisition Processing or Acquisition Other
Finance, Actuarial	Overhead
Investment	Investment
Sales	Acquisition Other
Marketing	Acquisition Other or Maintenance
IT	Acquisition Processing and Maintenance in Proportion to salaries
Human Resources	Overhead
CEO and support services (e.g. legal, audit)	Overhead

(5 Marks)

Marking Guide

- **Allocation of Salaries ½ mark for each of 10 items to a maximum of 5 marks.**

To a maximum of 5 marks (SJ)

b)

KPO: 10.2 Perform an analysis of the expenses and understand the effect of variations in the results

Course Reference: Chapter 15 p270-286

Answer

- Rent – higher salaries often imply high floor space so an indirect allocation in proportion to salaries is a good basis here
- Advertising is often for brand support rather than a specific product and it could therefore be regarded as an overhead until further information is available. It could also be argued that advertising supports sales and is therefore an acquisition expense.
- IT expense is required to support the business so in the absence of other information an indirect allocation in proportion to salaries is appropriate. An allocation in proportion to processing salaries could also be justified.
- Depreciation – same as IT as this item often includes IT hardware or amortised IT projects as well as depreciation for office fit out
- Medical Fees are part of Underwriting Expenses and can be directly allocated to Acquisition Processing (Acquisition Other is also acceptable)
- Other expenses – as for salaries

In summary those expenses which are not allocated directly can be allocated indirectly in proportion to salaries:

Expense Category	Allocation Rule to Expense Function
Rent	In the same split as salaries
Advertising	Overhead or Acquisition expense
IT	In proportion to acquisition processing and maintenance salaries
Depreciation	In proportion to processing salaries
Medical Fees	To Acquisition Processing (Acquisition Other is also acceptable)
Other	In the same split as salaries

(6 Marks)

Marking Guide
- **1 mark for each allocation basis with a reasonable justification**

To a maximum of 6 marks

c)
KPO: 7.2 Understand the interrelationship of certain risks, particularly lapse, sales volume and expense. KPO: 12.4 Compare, contrast and apply the methods used to determine pricing (historical and modern techniques, as well as detailed and top-down techniques).

Course reference: Textbook Chapter 15 p 286-291. Chapter 18 p334

Dear Client
You have asked for my advice on how to deal with the low profitability of small policies. My advice is given below, dealing with each of the areas you have asked me to consider.

Increasing the minimum premium
As long as the minimum premium is less than the average, profitability for small policies will be less than average. Increasing the minimum premium only reduces the problem but does not eliminate it. There may be some extra new business premium from increasing the minimum premium but there will also be some lost sales which may have been profitable on a marginal basis. This step is also often unpopular with the sales force.

Increasing the policy fee
This would apply to all policies including larger policies. The current policy fee only covers renewal expenses and does not offset any initial expenses so there is scope to increase the policy fee. The impact for larger policies would be small and if the policy fee is commissionable there should not be too much resistance from the distributors. Customers and rating houses however do not like fees.

Changing expense loadings into % of premium based on average policy size
Moving the expense assumptions from per policy to per cent of premium does not change the real underlying expenses which are causing the low profitability.

Using marginal pricing to determine the minimum premium, assuming that average costs remain the same
Profitability for small policies should be calculated on the full unit costs but the minimum size should be set using marginal expenses. Provided marginal expenses are covered then the business would be adding value.

The full expense investigation should identify marginal expenses and then the minimum policy size can be adjusted so it can cover marginal expenses. If not, then per policy expenses could be a reasonable proxy.

In conclusion, I would recommend using a marginal pricing approach to determine the minimum size as this means that all business written will add value to the company as the extra income will be more than the extra expense.

(7 Marks)

Marking Guide
- **Up to 2 marks for minimum premium and policy fee**
- **1 mark for others**
- **Maximum of 1 mark for appropriate format, introduction and wording (plain English i.e no jargon)**
- **1 mark for recommendation**

To a maximum of 7 marks SJ as points are given

QUESTION 2 **(15 Marks)**

You are the Chief Actuary for a large, well established, Australian financial services group. Your department is responsible for preparing the five year business plan projections using a best estimate basis.

a) **List the experience assumptions (apart from the investment return assumption) needed to project the asset fee income for a closed block of existing single premium unit linked superannuation business where the policy owners are now aged 50 to 59. Explain how each assumption affects the fee income and how each assumption varies with age and duration. You should consider each cause of decrement from the policyholder's perspective. (For example, just specifying discontinuances is too broad). You can ignore the interaction between assumptions but be specific about each different mode of decrement.** **(8 Marks)**

b) **The fee income from the unit linked portfolio over the previous year was less than forecast even though sales and investment returns were above target. List two possible causes of this and give, with reasons, two recommendations to restore profitability without increasing fees.** **(4 Marks)**

c) **One of the top selling units is a Capital Stable Unit which provides a guaranteed return of the single premium paid at the end of seven years. The investment policy is at the discretion of the company. However, at least 35% of assets will be invested in equity investments with the balance invested in government bonds. Explain why this is an example of asymmetric returns and discuss the alternative methods you would use to reflect this asymmetry in your investment return assumptions.** **(3 Marks)**

QUESTION 2: SOLUTIONS

a)
KPO: 8.3 Identify and be able to set the assumptions that might be required for modelling the business

Course Reference: Textbook Chapter 11. Product descriptions in Chapter 1

Answer

Fee income will be affected by the size of assets and the rate of asset fee charged. The experience assumptions which drive this are:

- Asset Class Switches: High asset fees tend to be associated with riskier asset classes such as shares and lower asset fees with lower risk asset classes such as fixed interest. Market cycles tend to affect asset class selection with policyholders often choosing low risk investment options (and therefore lower fees) when markets are volatile. Policyholders may also choose more conservative investments close to and after retirement.

- Transfers to Other Fund Managers: Customers are able to transfer to other fund managers. This may be due to poor performance or high fees of existing fund managers, a wider range of funds offered by other fund managers or perhaps the efforts of a financial adviser. It would be expected that this risk declines with duration and age.

- Transfer to Pension mode: This would happen when the customer retires or is in transition to retirement. Typically this would be after age, 55 increasing to age 60 and reducing from 65.

- Partial Withdrawal of funds: This would happen when the customer retires or is in transition to retirement which would be after age 55 (although there may be extra tax) but more after age 60 when lump sum tax is less. Partial withdrawals may also occur in the few years before retirement as customers seek to improve their tax position.

- Full withdrawal of funds: This would be affected by retirement from age 55 but more so from 60 (with a peak here) and then again at 65 (with another peak).

- Mortality or TPD (other than own occupation, which is not covered by the SIS definition and therefore may not qualify for compassionate early release) Claims: Whilst these will increase with age and duration this decrement is not as important as the others until well over age 75.

Note: Access to super at age 55 is being affected by the government gradually increasing the preservation age from age 55 to 60 so allowance needs to be made for this.

(8 Marks)

Marking Guide

- **½ mark per assumption listed to a maximum of 3 marks SJ**
- **Up to an additional 1 mark for discussion on each assumption which should include a comment on age/duration for full marks. To a maximum of 5 marks CJ**

To a maximum of 8 marks. 3 SJ and 5 CJ as this is not straightforward application and not listed in text book.

b)
KPO: 9.1 Analyse the various types of discontinuances with reference to industry experience, and set assumptions based on this analysis.

Course Reference: Textbook Chapter 11 and 12.

Answer

Markers Note: Whilst any of the items covered in (a) can be included here, the item must be capable of being influenced by the company. The important point is that the student has a recommendation to improve profitability.

Possible causes of loss are:

- Lower fees from customers moving to more conservative asset mixes. Customer education should emphasise that it is "time in" not timing that counts. New units could also be developed that have higher fees and provide some extra guarantees. For life insurance products they could introduce extra guarantees as options. It is more difficult to do this for existing products for unit trusts as the manager can't provide a guarantee nor can the units of the unit trust be redeemed at the guaranteed price.

- Loss of business to other fund managers could also be reduced by the steps mentioned above. In addition customer focus groups could identify what customers are expecting. This could include lower fees or a wider range of investment options. The company could focus on ways to build a closer bond with customers by providing better service levels. Cross selling of other product lines also helps improve retention.

Marking Guide

- **1 mark for each cause to a maximum of 2**
- **1 mark to each solution to a maximum of 2**

Maximum of 4 marks CJ

c)
KPO: 11.5 Identify and discuss the consequences of asymmetric return distributions

Course Reference: Textbook Chapter 16 p 303. The example is from the textbook but the text is not specific on how assumptions should reflect asymmetry. The other examples in the textbook are not for unit linked products.

Answer

Capital stable units are an example of asymmetric returns. The value of the unit after a period (for example 3 years) is guaranteed. If investment returns are high, then the higher unit value apples. If investment returns are low, and the unit value falls below the guarantee after 7 years, then the guarantee applies.

This is a put option and the option can be priced using a Black-Scholes model or an over the counter price (although over the counter price may be expensive for such a long option). In this case the cost of the option should be deducted from the best estimate return.

However the best approach would be a replicating or matched investment portfolio. This guarantee could be matched by a zero coupon bond with the balance of assets being invested in riskier assets with growth potential. The best estimate return would be the return from this portfolio.

(3 Marks)

Marking Guide
- **1 marks for explaining why**
- **1 mark for deducting the cost of an option**
- **1 mark for replicating portfolio**

To a maximum of 3 marks CJ

QUESTION 3 **(17 Marks)**

You are an actuary working in the Marketing Department of a large Australian life insurance company which has a significant volume of trauma insurance (also called dread disease insurance or critical illness insurance) in force. You are responsible for determining the price for new products. This price will be used for focus group research and, subject to Marketing Department approval, will then be forwarded to the Chief Actuary for final approval.

Your marketing colleague wants to add a new disease to the current list of trauma conditions covered under the product. The new disease has had a lot of media attention lately, due to celebrity involvement in fund raising for research. The disease is an untreatable progressive disease with a delay between diagnosis and disability but the disease eventually results in total disability and then death. However, as your colleague points out, published statistics show that the disease is diagnosed in less than 0.2% of population under age 70. Published statistics are subdivided into 10 year age bands as well as by sex.

The trauma benefits offered by your company expire at age 70, are issued on a yearly renewable basis with premium rates varying by age, sex and smoking status and the trauma benefit is paid in addition to any death benefit.

a) **List four qualitative factors which you would consider when adding a new trauma condition to a trauma product. How do these factors apply in the case of the new disease?** **(4 Marks)**

b) **List four issues you would consider when determining the appropriate evidence required for assessing claims. How would each of these issues apply to the new disease?** **(4 Marks)**

c) **List four non actuarial resources you would consult when determining the benefit wording for the policy and explain why you would consult them.** **(4 Marks)**

d) **Describe how you would derive the final claim rate assumption for the new disease, assuming the benefit is paid on diagnosis of the disease. Your description should include the adjustment to the base incidence rates and the formula you would use, as well as the other factors. The Chief Actuary requires a specific claim rate for each trauma condition, not just a percentage increase in assumptions. Profit testing covers the period from sale of the benefit to benefit expiry.** **(5 Marks)**

QUESTION 3: SOLUTIONS

(a)
KPO: 5.1 Identify the information required when assessing an individual risk
Course Reference: Gratton and Fabrizio pp294

Answer

If a benefit is to be added to the trauma benefit then it should (p294)

- Be perceived by the public as a disease that could afflict them and require a lump sum to meet their needs as a result of the disease. This seems to be met by the current public interest, although the focus groups will confirm this.
- Be capable of clear and precise definition. Statistics exist for diagnosis, so this condition seems to be met.
- Have adequate data for costing. Published data seems to be sufficient, with the exception of smoking status.
- Not allow anti-selection by the life insured. If the disease is hereditary then the disease may be uninsurable.

(4 Marks)

Marking Guide

- **½ mark for each qualitative factor and ½ mark for discussing how these relate to the new trauma condition**

Maximum 4 marks KU

(b)
KPO: 5.3 Compare the relative merits of underwriting and claims management in mitigating claims risk.

Gratton and Fabrizio p300

Answer

In deciding on appropriate claims evidence the following should be considered:

- What form of diagnosis is acceptable? The definition needs to be clear on whether payment is on diagnosis or on becoming disabled from the disease. The form of diagnosis should be an objective medical test for the new disease.
- What medical qualification or registration is required by the certifying authority? There may be a group of doctors specialising in this disease. In addition to being a member of this group, the medical practitioner should be acceptable to the company.
- Are there any specific diagnostic tests that can be certified? These should exist for the new disease.

- What pre conditions apply? Given the anti-selection risk it would be advisable to have a waiting period, although the market would probably only accept 90 days. Anyone suspecting they had the disease would be able to wait 90 days before going to a doctor for diagnosis.

(4 Marks)

Marking Guide
- **½ mark for each question and ½ mark for relating to the new dread disease**

Maximum 4 marks KU

(c)
KPO: 5.2 Appraise the objectives of both financial and medical underwriting
5.3 Compare the relative merits of underwriting and claims management in mitigating claims risk.

Course Reference: Gratton and Fabrizio: Medical advisers and legal advisers are mentioned on p299 and p300. The collecting organisation and the reinsurers are mentioned elsewhere in the paper.

Answer

For the benefit wording it would be necessary to consult

- The organisation which collected the public statistics to understand the definitions they use and any limitations of the data, including accuracy problems.
- The company's chief medical adviser to ensure that the agreed definition is capable of being understood by the medical profession and is consistent with that used in the statistics. In particular the diagnosis needs to have a clearly recognised test result.
- The company's legal advisers, who will advise on current legal issues with definitions as well as the practicality of using the definitions in a court of law.
- The reinsurers, who will be sharing the risk and may have appropriate evidence from other markets or similar benefits in the current market. They may also know whether or not this benefit has been considered by other companies and rejected. They can allude to this in general terms without breaching the confidence of other companies.

(4 Marks)

Marking Guide
- **1 mark for each non actuarial resource with reason. Only ½ mark if no reason**
- **The marker to use their judgement for other resources given**

To a maximum of 4 marks SJ

(d)
KPO: 9.2 Analyse and apply the range of mortality and morbidity bases, including population, insured lives, group life, annuitant and options experience.

Course Reference: Gratton and Fabrizio

The population incidence rates need to be adjusted to reflect the insured population incidence rates. The adjustment for mortality rates can be used as a proxy for the adjustment for trauma rates. Insured lives experience lower proportions of respiratory diseases than the population which means that the proportion of other diseases must be higher. This means that only a percentage of the improvement from insured lives mortality should be included in the ratio and that the formula should be something like:

.2 + .8 *(ratio of insured lives mortality to population mortality)

A similar formula should have already been used for the existing benefits and there should be enough claims data for an actual to expected ratio to be available. Statistics are available in 10 year age bands and by sex so the above ratio can be used for rates by age and sex, using the mid age of the age band and then smoothing.

Adjustments are then needed for selection, trends and smoking status:

- Selection effects will depend on whether or not the existence of the disease can be detected in underwriting. There is therefore an incentive for the insured to make a false health declaration and then take out insurance. Detecting non-disclosure will be difficult and result in adverse publicity and brand damage. It would be prudent to allow for anti-selection. An indication of the degree could be obtained from analysing other diseases. A longer exclusion period may also be advisable.

- Trends: Past data should be analysed for trends in increasing or decreasing claims rates. Trends could also be affected by changes in technology for diagnosis. Finally the media attention may make more people get the tests and, as a result, be diagnosed with the disease.

- There is probably not enough information to make a different allowance for smoker and non-smoker adjustments.

(5 Marks)

Marking Guide
- **1 mark for general description of the process**
- **1 mark for a formula of the form k +(1-k)*mx**
- **2 marks for discussion on selection**
- **1 mark for trends**
- **1 mark for non-smoker rates, but does not have to be no adjustment**
- **1 mark for other adjustments**

To a maximum 5 marks SJ

QUESTION 4 **(17 Marks)**

The Head of Wealth Management of an Australian bank has approached you, as the Head of Products, with the results of recent marketing research. The research shows that the bank's customers, particularly those with high net worth, are interested in wealth management products that will provide a guarantee over a longer term than existing term deposits and provide some potential for capital gains.

The bank distributes a range of single premium life insurance and unit trust products to its customers. The Head of Wealth Management has asked for your help in reviewing the existing product range and examining how a new guaranteed product can be developed.

a) **Evaluate, from the customer's perspective, the differences in legal structure and capital requirements between life insurance companies and unit trusts as it relates to the security of benefits.** **(4 Marks)**

b) **As part of the product review process, the Manager, Product Training wants to understand how tax (personal income tax, company tax and superannuation fund tax) impacts the final benefit received by the customer and has asked for you to present a training session on this topic. In particular, the presentation should cover how tax is reflected in the unit price as well as any additional tax paid by the customer when the benefit is received. Describe, in general terms, how income tax affects the total after tax benefit received by a purchaser of the following products:**

- **Non Superannuation unit linked life insurance**
- **Superannuation unit linked life insurance, purchased as an employee using after tax contributions**
- **Non Superannuation unit trusts**
- **Pooled Superannuation unit trusts, purchased using after tax employee contributions**

For the purpose of your training presentation, assume the products were purchased on 30 June 2000 on the purchaser's 55th birthday. The products were terminated by the purchaser on 30 June 2011 and all benefits were paid in cash. Assume that the unit charges and fees are the same for all products.

(7 Marks)

c) **It has been decided to introduce a single premium superannuation unit linked life insurance product which has a guaranteed value after 10 years. The unit has an ongoing charge of 2% per annum, no initial charge but an early termination fee of 4% of the account value in year 1, 3% in year 2, 2% in year 3 and 1% in year 4. The guaranteed value is the original premium, less any withdrawals made.**

Investments are limited to Australian government guaranteed instruments and shares listed on the ASX. The company expects that as a result of the investment policy, it will not be expected to meet the cost of the guarantee. Discuss the advantages and disadvantages of managing this guarantee using a fixed asset mix and a variable asset mix (with a minimum allocation to listed shares). How would your answer change if the product was issued as a unit trust?

(6 Marks)

QUESTION 4: SOLUTIONS

(a)

KPO 3.1 Explain the key requirements of the Life Insurance Act 1995 as they affect actuarial practice. KPO 3.2 Describe other relevant legislation and its application to actuarial practice, including Corporations Law, the Trade Practices Act, Mergers and Acquisitions Act, Managed Investments Act, Financial Services Reform Act, Disability Discrimination Act.

Course Reference: Textbook p29, p34

Answer

Life insurance companies are companies which issue insurance contracts to customers under the Life Insurance Act. As such the customer's benefits and obligations are described in the policy document. A life insurance company will typically have a number of separate statutory funds. The assets of these statutory funds are available to meet the fund's liabilities to policyholders. The assets need to cover liabilities determined on best estimate basis as well as assets to cover solvency and capital adequacy risks.

The life insurance company must also meet APRA standards including many financial standards specific to the life insurance industry. The standards place an emphasis on maintaining adequate capital to support the benefits defined in the contract.

Unit trusts are formed under a trust deed which is administered by a responsible entity under the Corporations Act. The unitholders have rights to the assets of the each trust but there are no specific solvency or capital adequacy requirements of the responsible entity other than small paid up capital requirements and a general requirement that they have sufficient resources to operate in the best interests of members.

Importantly, a responsible entity can be changed by a vote of members but a life insurance company cannot be changed.

In summary, life insurance is a contract between the company and the life insured and there is no direct entitlement to the assets behind that contract. A unit trust holder has a right to share in the assets under the trust. The extra mandatory capital requirements for a life insurance company lead to extra security for a life insurance policyholder compared to a unit trust holder. However the policyholder has no direct control over investment performance which, arguably, is the real long term security of the fund. The unit trust holder can change managers when investment performance is unacceptable.

(4 Marks)

Marking Guide

- **½ marks for mentioning Life Act and ½ mark for Corporations Act**
- **1 mark for statutory funds providing security of benefits**
- **1 mark for trust deed providing security of benefits and separate assets**
- **1 mark for life insurance companies requiring extra capital, hence extra security of benefits**
- **1 mark for being able to change responsible entity**
- **Other valid points 1 mark each up to a maximum of 2 marks**

To a maximum of 4 marks KU

(b)

KPO: 3.4 Apply the basis for taxation for both individuals and life insurance companies to the range of life insurance products, and contrast this with the treatment of alternative financial services product. Course Reference: Textbook p29, p34 and Chapter 6 p112 to 124

The customer impact of income tax is:

- **Non Superannuation life insurance:** The unit price will reflect tax on the investment income at the corporate rate of income tax, which is 30%. Investment income includes 100% of realised gains and no capital gains tax provisions apply. Whilst tax is not paid on unrealised gains until they are realised, current accounting rules mean that unrealised gains have a tax provision calculated as if the gain was realised. Hence corporate tax of 30% on 100% of realised and unrealised capital gains is included in the unit price. No personal income tax will be paid by the purchaser as after 10 years the benefit is tax free to the policyholder.

- **Superannuation life insurance**: The unit price will reflect a 15% tax on investment income with 66.67 % of realised gains (if realised after 12 months) also being subject to tax as capital gains. Whilst tax is not paid on unrealised gains until they are realised, current accounting rules mean that unrealised gains have a tax provision calculated as if the gain was realised. Hence super tax of 10% (being 15%*.6667) of realised and unrealised capital gains is included in the unit price. Any capital gains loss must be carried forward to offset against future capital profits. A credit is available for franking credits on dividend income. Because tax is calculated at the company level, full credit is usually given for franking credits.

  Because the lump sum is paid after age 60 and has been purchased by after tax contributions there is no personal income tax payable.

- **Non Superannuation unit trusts:** Provided all income is distributed the unit trust will pay no income tax. However the unit holder will pay personal tax on the annual distributions at personal tax rates on investment income and 50% of distributed gains, assuming that gains were from assets held in the trust for more than 12 months. If assets have been held in the trust for less than 12 months, 100% of gains will be taxed. Distributions would include the underlying franking credits which would be available as a credit on any personal income tax. On withdrawals the withdrawal value would be divided into a return of capital plus any gains. The gains would be taxed as capital gains.

- **Pooled Superannuation unit** trusts would incur tax in the same way as life insurance. However, because unit funds have a tax liability calculated separately there is often some list franking credits as excess franking credits for one trust cannot be transferred to another trust.

(7 Marks)

Marking Guide
- **2 marks for non-superannuation life insurance**
- **3 marks for superannuation unit trusts and life insurance as they are essentially the same basis**
- **2 marks for non-superannuation unit trusts**

To a maximum of 7 marks KU

(c)
6.3 Apply an understanding of various asset classes to select assets that suit the requirements of the liability profile.

Course Reference: Textbook Chapter 10

Answer

Under a fixed asset mix approach the guarantee would be matched by investment in a government guaranteed bond. The investment, including reinvestment of interest would need to earn at least 2.35% to cover tax and the unit asset fee and be equal to the guarantee at maturity. There is a reinvestment risk on the coupons received so a conservative reinvestment assumption should be made. The balance of the investment can then be invested in shares.

Some allowance could also be made for the fact that the amount allocated to shares will also have a maturity value and that this can help meet the guarantee cost and justify a lower allocation to government bonds.

The advantage of this approach is that it is easily understood by the customer and should deliver a narrow range of results. There will be less upside and more downside than the variable asset mix approach.

Under a variable asset mix the proportion of government guaranteed assets is changed to reflect the risk, subject to the minimum allocation to shares listed on the ASX. The starting mix of assets may be similar to the fixed asset mix, with perhaps slightly more in shares. If share prices increase then there is a lower chance of the guarantee being called so government bonds would be sold and more shares purchased. If share prices fall then shares would be sold and government bonds purchased. Determining the minimum allocation to ASX shares will be the issue, but the minimum should be less than would apply to the fixed asset approach. Results from this approach would be more volatile than the fixed asset approach and in poor performing market may result in assets being substantially invested in government bonds with subsequent limited upside if share prices recover. Missing out on the upside may cause customer dissatisfaction.

Managing a fixed asset mix in a unit trust would require some third party to provide the guarantee. Managing a variable asset mix in a managed fund would be difficult in a managed fund as all members must be treated equally. The fund would need to have a fairly short opening period and then be closed. In this way the unit holders would all have similar guarantee risk. The termination date should also be a fixed date rather than a fixed period from the unit purchase date.

(6 Marks)

Marking Guide
- **1 mark for risks of fixed asset mix**
- **1 mark for advantage/disadvantage of fixed asset mix**
- **1 mark for risks of variable asset mix**
- **1 mark for advantage/disadvantage of variable asset mix**
- **1 mark for comment on fixed asset mix in a managed fund**
- **1 mark for comment on variable asset mix in a managed fund**
- **1 mark for other valid points to a maximum of 2**

To a maximum of 6 marks CJ

QUESTION 5 **(18 Marks)**

You are a consulting actuary who has received an assignment from a medium size Australian life office, BestPrice Life. BestPrice Life only sells risk business and only distributes through independent financial advisers. The life office is currently undertaking a major strategic review and as part of that review is considering the outsourcing of major functions. In particular you have been asked to review a proposal to outsource the actuarial functions to a third party provider located overseas. The actuarial function has two areas.

- **The Financial Reporting Department which includes the role of Appointed Actuary and reports to the Chief Financial Officer**
- **The Pricing Department which reports to the Head of Sales and Marketing who is responsible for the sales budget**

The overseas provider is situated in a time zone which is 3 hours behind the head office of BestPrice Life, conducts all business dealings in English and has qualified and experienced staff members who are Fellows of the Institute of Actuaries of Australia as well as many actuarial students studying actuarial exams with the major actuarial bodies in the UK and US.

a) **Prepare bullet points covering what the company needs to do to meet minimum APRA standards under LPS231, LPS510 and LPS520 which cover outsourcing, governance and fit and proper persons. The bullet points will be used as a discussion document in a "breakout group" for a strategic planning day which will consider the outsourcing proposal along with other strategic issues. For each standard you also need a single bullet point to identify the "Implications for Outsourcing the Actuarial Function". (8 Marks)**

b) **Evaluate the likely impact that outsourcing will have on each step of the product development process once the proposal to develop a new product has been approved. You can assume that there will be a small Appointed Actuary function reporting to the Chief Financial Officer and located in the head office in Australia. The Appointed Actuary will review the final product and provide experience assumptions. (10 Marks)**

QUESTION 5: SOLUTIONS

(a)
KPO 7.3 Identify risks that may affect the ability of suppliers to supply goods and services.

Course Reference: LPS231 Outsourcing, 510 Governance, 520 Fit and Proper Persons

Answer

LPS231 deals with outsourcing. The requirement which impact the proposal are

- Consult with APRA before entering into any outsourcing agreements with service providers outside Australia.
- Have sufficient monitoring in place to manage the outsourcing of material business activities.
- Conduct a tender process. The more important items include having a business case for outsourcing and conducting due diligence (1 mark as two KU items)
- The company needs to develop a specific policy for outsourcing.
- Have a legally binding agreement. LPS232 includes a list of items that must be in the agreement.
- Board approval is needed for the outsourcing contract.

Implications for the strategy:

- The overall implication of LPS231 is that there will still need to be some actuarial resources in the company.

LPS 510 deals with governance

- The board will need to have performance criteria, and outsourcing could be one of the criteria.
- The Audit Committee needs to have access to the Appointed Actuary.
- The Appointed Actuary needs to have access to the board.
- Whistleblowing requirement will be harder to handle from foreign country.

Implications for the strategy:

- There will still need to be some actuarial resources in the Australia, in particular the Appointed Actuary.

LPS 520 deals with fit and proper persons

- The Appointed Actuary needs to be resident in Australia.
- There is a risk that mismanagement of outsourcing could affect the “fit and proper person” status of senior management and the board.

Implications for the strategy:

- The Appointed Actuary should be resident in Australia.

(8 Marks)

Marking Guide
- **1/2 mark for each point given under each standard subject to a maximum of 5 marks**
- **Note that the list of points given is not exhaustive. Other points from the standard are allowable provided they are relevant to the outsourcing project. The marker can use their judgement**
- **1 mark per standard for each summary point on "implications for the strategy". This means a total of up to 3 points. The summary points given are for illustration only. Marks can be allocated for other valid points. The markers can use their judgement**

To a maximum of 8 marks KU

(b)
KPO 12.2 Apply the various steps involved in product development; 12.3 Identify and discuss the main issues involved in product development.

Course Reference: Textbook Chapter 17 p316. Note that the order of the process is given on P316 but project organisation and design are switched in the textbook narrative.

Once the recommendation to develop a product has been made there are 7 remaining steps in the product development process – initial decision, project organisation, design, final decision, implementation, product launch and feedback.

The first challenge faced by the feedback process is the time zone difference. A time zone difference of 3 hours means that there is not a lot of overlap during the normal business hours of the day. There will need to be some arrangement for core times when people must be available in both countries.

With regard to the remaining steps in the process:

- Initial decision: Much of the actuarial work in pricing a product occurs here. There is a lot of interaction and feedback between marketing and actuarial, which is why the Pricing Department was placed in the Sales and Marketing area. This will be the most difficult area to handle on an outsourced basis. Clear timelines will need to be communicated to the outsourced provider and regular meetings held (perhaps daily), to measure progress. Even though pricing is only provisional at this stage, the customer and market analysis is based on the product design determined here. In practical terms the product can get better, but not worse!
- Project organisation: There will normally be a project manager to co-ordinate the whole project so there should be no issue here, but the project manager will need to consider the time zone difference when communicating and holding project meetings.

- Design: This is a detailed stage. Included in this will be the data required for actuarial valuations. It may be possible to use the Appointed Actuary function for advice here but communication by electronic means with the outsourcer should be suitable, depending on what other functions are outsourced.
- Final decision: This is a company decision and the Appointed Actuary function is needed here. The problem will be that it will be difficult to have advocacy from the Actuarial Pricing team if any issues arise, but they should have been decided already.
- Implementation: The outsourced function should have expertise here so this should not be an issue.
- Product launch: It will be impractical for the outsourced team to be at the launch. This is not critical for the business.
- Feedback: With an outsourced function there will need to be a more formal feedback process.

Additional valid points:

- Data loss needs to considered when outsourcing.
- The outsource agreement should cover intellectual property issues as well as level of documentation and ability for external and internal auditors to review the processes and controls.

(10 Marks)

Marking Guide

- **1 marks for identifying at least 5 steps and 2 for all seven - this is book work**
- **1 mark for identifying time zone problem**
- **1 mark for discussion on each of the 7 steps. Markers to give credit for reasonable comments**
- **1 mark for each additional item to a maximum of 2**

To a maximum of 10 marks, 2 marks KU and 8 marks SJ

QUESTION 6 (15 Marks)

A life insurance company has been very successful in writing two products, regular premium yearly renewable term insurance and single premium unit linked investment business.

The sales executive responsible for the regular premium yearly renewable term insurance product has commented that the minimum profit margin required by the company is much stronger than that required for single premium investment linked business and consequently does not enable the company to maximise the value of new business. The CEO of the life insurance company has asked for you, in your role of Chief Actuary, to advise on this comment. Whilst the Actuarial Pricing Department does not report to you, company policy is that the final premium rates cannot be issued without your approval.

Both products are in position number 3 in their market segment with a market share of around 10%. The top selling product in each market segment has a market share of around 11%. The minimum profit requirements for both products are:

Profit Requirements	Regular Premium	Single Premium
Minimum After Tax Profit Margin	10%	2.00%
Maximum Strain as % Premium	100%	0.50%
Maximum Breakeven Period with Target Surplus	8	2
Minimum IRR on after Tax Profits	12%	12%

The actual profit results are:

Actual Profit Results	Regular Premium	Single Premium
Sales $M	60	1000
Number of Policies	100,000	50,000
Value of New Business (VNB) $M	35	17.5
Premium Per Sale	600	20,000
VNB per Sale	350	350
After Tax Profit Margin	10.0%	2.1%
Strain as % Premium	80%	0.50%
Breakeven Period with Target Surplus	8.0	2
IRR on after Tax Profits	16%	85%

a) Draft your reply to the CEO covering your advice on the sales executive's comment. (6 Marks)

b) For many years the company's vision has been to be the market leader for risk products. The product team that works for the sales executive has developed a new series of risk premium rates with premiums that are an average of 5% lower than the current premium rates. The sales executive expects a 15% increase in sales which will make the company the market leader. As the proposal increases the value of new business and still meets minimum return on capital requirements, the board should be willing to approve the proposal. The new business profitability results (shown below) have been calculated on existing assumptions but with higher sums insured and lower premium rates.

Actual and Forecast Profit Results	Regular Premium	New Regular Premium
Sales $M	60	69
Number of Policies	100,000	115,000
Value of New Business (VNB) $M	35	35.9
Premium Per Sale	600	600
VNB per Sale	350	312.2
After Tax Profit Margin	10.0%	8.9%
Strain as % Premium	80%	82%
Breakeven Period with Target Surplus	8.0	9.2
IRR on after Tax Profits	16%	12%

Critically evaluate the above results and the likely impact of the proposal on the profitability of new business and the profitability of in force business. Identify any further information you would request before making your final decision. (9 Marks)

QUESTION 6 SOLUTIONS

a)
KPO 14.1 Plan a profit-testing exercise and compare and discuss the potential profit measures KPO 11.7 Define the terms capital efficiency, return on capital, return on equity, return on assets and return on embedded value and describe their relevance for life insurance business.

Course Reference: Textbook Chapter 18

Dear CEO,

You have asked me to comment on whether or not our current minimum profitability requirements disadvantage the risk business product line.

I assume that the disadvantage arises because if the profitability requirements were lower, prices would be lower, sales could be higher and the annual profits would therefore be higher. First some background.

Yearly renewable term insurance (YRT) is a capital intensive business as shown by the initial strain which can be up to 100% of premium and takes up to 8 years to repay the capital as shown by the break even period requirement. Whilst we can estimate the profits earned after this period, the longer our estimation period, the more uncertain our estimates. This means that a product with a long break even period has more risk than a product with a short break even period. Products with a higher risk should have a higher profit margin.

In addition, capital is expensive and our shareholders require at least a 12% return on their capital. YRT requires a much higher capital investment than unit linked and a higher profit margin is needed to repay this is investment at 12% return. Typically annual profits need to be at least 10% of premium to meet shareholder requirements for the return on capital.

Single premium unit linked business is, on the other hand, relatively capital efficient with a low strain and short payback period. This means that less profits are required to repay capital financing and hence the after tax profit margin is lower at 2% as is the present value of profit margins at 2.2%. The cost of capital (IRR) is not really a relevant measure for single premium business as the capital requirements are small. The 85% return on capital received is not on a significant base. Moreover the capital is paid back in 2 years.

If we were to lower profit requirement and reduce the price of risk products then we would make less profit per sale as we will provide more benefits for each dollar of premium received. Of course, there may be expense savings from these volumes that may improve our position but extra sales will be required just to maintain the current value of new business. Once premiums are lowered, they are difficult to increase, even if increased sales have not been realised.

We also need to consider the impact on our in force business as existing healthy policyholders will be able to replace their policies with a lower premium by using the new rates. This will reduce the value of the in force business and may more than offset the increase in the value of new business.

In addition the profit per sale is $350 for an investment linked sale and also $350 for a risk product sale. Whilst I have no data on the time taken for a sale this seems to be further evidence that profit requirements for risk products are not too strong.

From the above analysis, I believe that the current requirements reflect the capital requirements of the business and can therefore be regarded as reflecting the risk and capital requirements of each product. However, if you require further work on this matter we will need to investigate how sales would vary with product pricing and how our expenses would vary with increased volumes. In addition, we can examine the impact on existing business as well as the value of new business. Please let me know if this is required.

(6 Marks)

Marking Guide
- **Maximum of 1 mark for appropriate format, introduction and wording (plain English i.e no jargon)**
- **2 marks for comments on risk business**
- **1 mark for comment on unit linked business**
- **1 mark for comments on sales volumes and expenses**
- **1 marks for each other valid comment to a maximum of 2 marks**
- **1 mark for summary comment and opinion**

To a maximum 6 marks SJ

b)
KPO 14.1 Plan a profit-testing exercise and compare and discuss the potential profit measures KPO 11.7 Define the terms capital efficiency, return on capital, return on equity, return on assets and return on embedded value and describe their relevance for life insurance business.

The proposal from the sales executive shows
- An increase in the number of sales of 15% and sales volumes of 15% which means that the company will be the market leader
- An increase in sales volumes of 15% as the premium remains the same. If rates have been reduced by 5% this implies an increase in cover of slightly more than 5%
- An after tax profit margin of 8.9% which is less than the minimum profit margin of 10%
- A longer breakeven period with 9.2 years exceeding the guideline of 8 years
- IRR has reduced from 16% to 12% but still meets minimum requirements of 12%
- An increase in capital strain from 80% to 82%, but still within the maximum strain target of 100%

Each of these items is analysed below

- An increase of 15% is a significant increase. The sales executive should identify if this comes from more distributors or more sales per distributor. If there are more distributors then the extra costs will need to be reflected in VNB.
- Maintaining the same premium per sale relies on the fact that distributors will be able to justify an increase in cover to their clients. The sales executive should demonstrate how this will be achieved through the sales process.

- If distributors focus more on risk sales there may be a decline in unit linked sales and the sales executive for unit linked sales should be asked to examine this. On the other hand if there are more distributors selling risk business there may also be an increase in unit linked sales from these distributors.
- The after tax profit margin is lower than minimum requirements which results in the breakeven period being longer than required. Most importantly this indicates higher risk for the product as the profitability is more dependent on assumptions more than 10 years away. These assumptions are always the most uncertain.
- The minimum IRR requirements are met but the IRR of products should reflect the inherent risk in products. Riskier products such as this product should have a higher IRR.
- The increase in capital strain is small. This reflects the fact that most of the strain comes from paying commissions which are a percentage of premiums. When premiums reduce commissions also reduce.

The profit results presented have used the existing expense assumptions. If the higher volumes are realised then unit costs should reduce if expenses are contained. The sales executive would need to confirm sales support costs associated with the increased volumes and the Actuarial Pricing department should assess the net impact of higher volumes and fixed expenses on the value of new business.

In addition, sensitivities should be prepared showing what would happen to the value of new business if the premium per sale reduced by 5%.

Higher volumes may be associated with worsening lapse experience as well, although it would be difficult to assess this. However, a sensitivity of say a 5% increase in year 1 lapses should be examined.

As the portfolio is yearly renewable there is likely to be some churning of existing business into the new policies with the lower rates. The company will need to consider how to handle this as it does not want to offer both lower rates and first year commissions. One possible response is to apply the rates to existing business. This reduces the existing profitability but arguably the profitability would be even worse if the business was recycled. The sales executive should also identify the impact of this “cannibalisation” and how this business is reflected in the sales assumptions. If the increase comes from churning existing business then not all of the new business may be reported as new business, depending on the reporting rules used by the company.

Finally an assessment would need to be made of the likely response of competitors. They may also reduce their rates which may remove the competitive advantage leaving the company with lower rates and no increase in sales, although there is often a benefit in being an early mover even when the market catches up. The market may also cut rates in any event.

(9 Marks)

Marking Guide

- **1 mark for each point on profit results to a maximum of 5 marks**
- **1 mark for each sensitivity up to 2 marks**
- **Up to 2 marks for cannibalisation (recognising it exists, need to specify impact and have a policy etc)**
- **1 mark for competitors**
- **1 mark for comment on unit linked business**
- **1 mark for comments on sales volumes and expenses**
- **1 marks for each other valid comment to a maximum of 2 marks**
- **1 mark for summary comment and opinion**
- **1 mark each for other valid points**

To a maximum 9 marks CJ

END OF PAPER