

# **INSTITUTE AND FACULTY OF ACTUARIES**

## **EXAMINERS' REPORT**

September 2017

### **Subject ST1 – Health and Care Specialist Technical**

#### **Introduction**

The Examiners' Report is written by the Principal Examiner with the aim of helping candidates, both those who are sitting the examination for the first time and using past papers as a revision aid and also those who have previously failed the subject.

The Examiners are charged by Council with examining the published syllabus. The Examiners have access to the Core Reading, which is designed to interpret the syllabus, and will generally base questions around it but are not required to examine the content of Core Reading specifically or exclusively.

For numerical questions the Examiners' preferred approach to the solution is reproduced in this report; other valid approaches are given appropriate credit. For essay-style questions, particularly the open-ended questions in the later subjects, the report may contain more points than the Examiners will expect from a solution that scores full marks.

The report is written based on the legislative and regulatory context pertaining to the date that the examination was set. Candidates should take into account the possibility that circumstances may have changed if using these reports for revision.

Luke Hatter  
Chair of the Board of Examiners  
December 2017

**A. General comments on the *aims of this subject and how it is marked***

1. The aim of the Health and Care Specialist Technical subject is to instil in successful candidates the ability to apply, in simple situations, the principles of actuarial planning and control needed in health and care matters on sound financial lines.
2. Candidates who approached the questions, especially the more substantial elements of each question, in a methodical and detailed manner were far more likely to satisfy the examiners and receive a pass in the subject. Candidates will gain few marks if they do not address the question asked. The mark allocation for each question part gives an indication of the relative length of answer or number of points to be made to gain full marks.
3. It is often helpful to use subheadings when answering long part questions.
4. Candidates who give well-reasoned points, not in the marking schedule, are awarded marks for doing so.

**B. General comments on *student performance in this diet of the examination***

Well-prepared candidates scored well across most of the paper.

Questions that focussed on knowledge of the Core Reading were well answered by those who had prepared thoroughly. However, the paper included several part questions requiring wider thinking or application of core reading to specific circumstances, such as questions 3 and 6. Students should recognise that these are generally the questions which differentiate those students with a good grasp and understanding of the subject. The comments that follow the questions concentrate on areas where candidates could have improved their performance. Candidates approaching the subject for the first time are advised to concentrate their revision in these areas.

**C. Pass Mark**

The Pass Mark for this exam was 55.

## Solutions

### Q1

- (i) The four main objectives are:
- |  |     |
|--|-----|
| Protecting the nation's health                     | 1/2 |
| Subsidising the poor                               | 1/2 |
| Balancing the budget                               | 1/2 |
| Following social culture and/or political promises | 1/2 |
| <i>Extras, please describe</i>                     | 1/2 |
- [Max 2]**
- (ii) **Advantages**
- |   |     |
|---|-----|
| The system has 100% coverage  | 1/2 |
| And provides a safety net to those who are most vulnerable.   | 1/2 |
| The system seems fair as every legal citizen of Country A has access to the healthcare services provided by the government and there is no exception.   | 1   |
| Those who cannot afford healthcare or will be rejected treatments owing to financial incapacity will now get treated.   | 1/2 |
| Similarly, those who were uninsurable will also be covered.   | 1/2 |
| Universal coverage will meet the objective of protecting the health of its population.  | 1/2 |
| This system will help the government safeguard a healthy and productive workforce.  | 1/2 |
| Increased productivity could lead to greater competitiveness with other countries   | 1/2 |
| And also lead to higher tax revenues helping fund the healthcare system in the future, or fund other government schemes.  | 1/2 |
| It also helps safeguard those who are not currently in the work force, such as children and pensioners.   | 1/2 |
| There may be a wide variation in the level of healthcare between different area/socio-economic groups, the new system would remove these disparities and help with social integration between the different groups. | 1/2 |
| The new system may help prevent illnesses which could ultimately be cheaper than curing them once they have arisen and reduce e.g. incapacity payments.   | 1/2 |
| This seems to be a generous and ethical system.   | 1/2 |
| Implementing this system enables the government to meet its political promises.   | 1/2 |
| This system will ensure that the poorest have access to primary medical assistance (doctors and medicines) and hospitalisation where necessary.   | 1   |
| Priorities in health services are often extended also to children and the aged.   | 1/2 |
| Funding by general taxation helps redistribute wealth   | 1/2 |
| Since, in general, the wealthier will pay more  | 1/2 |
| Although poorer citizens may use the services more.   | 1/2 |

This will also help protect individual savings, reducing the burden on the state elsewhere (e.g. pensions). 1/2  
It may be a more efficient way of funding healthcare. 1/2  
Government run healthcare providers are non-profit making organisations which helps to keep costs down. 1/2

### **Disadvantages**

This system is likely to discourage citizens from getting private insurance and thus they cannot choose the physician or the kind of treatment that they would ideally want. 1/2  
The healthcare system of the government may not be as good as what private healthcare providers offer. 1/2  
The government-run healthcare organisations might have poorer facilities e.g. older technology, shared bathrooms etc. 1/2  
The scope of the universal healthcare policy may not be as diverse and comprehensive as private insurance. 1/2  
People who have private insurance will be much better placed to get appropriate medical intervention. 1/2  
There is the lack of options where the luxury to choose is not available for those under this system. 1/2  
There are also likely to be long waiting times for consultation. 1/2  
People may often end up waiting for months for treatment. 1/2  
This system might be unpopular amongst healthy tax payers if the increase in tax rates are quite high. 1/2  
Government run healthcare providers may not operate as efficiently as privately owned companies 1/2  
Or provide services more cheaply than privately owned companies. 1/2  
This may be because of lack of competition, so there is no reason to provide high quality care. 1/2  
This may be the result of better quality staff being attracted by working for profit making organisations. 1/2  
The limited budget could result in rationing 1/2  
e.g. expensive drugs not available. 1/2  
The budgeting issues could mean that patients may not receive the best treatment and medication. 1/2  
If the working population is in decline the government might not be able to meet the increased healthcare cost. 1/2  
Funding by general taxation is unlikely to provide the citizens with a clear idea of the actual costs of this system. 1/2  
They are therefore less likely to compare the price (through taxation) they paid against the cover they received. 1/2  
This is likely to lead to increased demand for health care, not all of which may really be required. 1/2

It is unclear whether the burden on public finances caused by this funding method is affordable 1/2  
 particularly if it is the intention to build new hospitals and other infrastructure etc. 1/2

It may take a long time to set up the new organisations etc. 1/2  
 Nationalisation can be a costly and complex process 1/2

This could have significant adverse implications on the insurers who are currently writing health insurance business in country A. 1/2

This may lead to uncertainty in the PMI market, even before any change is implemented, 1/2

e.g. it would lead to lower NB volumes and therefore higher premiums or lower profits. 1/2

It is not clear what happens to those with PMI insurance – would they receive a refund? 1/2

Also, those with PMI insurance may effectively be paying twice for the same services. 1/2

There could be a loss of tax revenue if less PMI business written. 1/2

It is unclear what will happen to the existing privately owned healthcare providers and their assets. 1/2

[Max 10]

[Total Max 12]

*Parts (i) was standard bookwork and was very well answered*

*Part (ii) was generally very well answered with candidates generally giving a wide range of both advantages and disadvantages although only the better candidates discussed these from the point of view of insurers and private health providers and people with private PMI insurance.*

## Q2

- (i) An inception/disabled life annuity approach considers two functions, namely the claim inception rate and the disabled life annuity. 1/2  
 The “claim inception rate” is the probability that a claim will become payable to an individual in the year of age  $x$  to  $x + 1$ , for a given deferred period. 1/2  
 The individual will have become sick and remained so until the end of the given deferred period for the benefit payment to commence. 1/2  
 “Claim inception rates” are derived from “sickness inception rates” by multiplying the probability of sickness inception by the probability of remaining sick throughout the deferred period. 1/2

The “disabled life annuity” is the present value at the date of claim inception of expected claim payments to individuals disabled after the deferred period until policy expiry. 1/2

Allowance is made for any escalation of the claim amount, interest and the probabilities of death and recovery between the end of the deferred period and expiry date. 1/2

Within the cash flow program, the claims outgo in any period is taken as the lump sum value of the benefit (annual benefit amount x disabled life annuity) multiplied by the probability of becoming eligible for claim (claim inception rate). 1/2

Cashflows should be discounted back to the start of the policy and the calculation needs to be carried out for all possible years of cover 1/2

**[Max 3]**

(ii) Under the multi-state modelling approach, policyholders are separately tracked through the various stages of “healthy” and “claiming”. 1/2

There are more subclasses of policyholders than the inception / disabled life annuity approach, as set out below: 1/2

healthy premium payers 1/4

lives falling sick within deferred period 1/4

lives becoming claimants following deferred period 1/4

lives recovering, reverting to premium payers 1/4

lives dying 1/4

Each subclass will have its own set of transition probabilities: 1/2

sickness inception 1/4

lapse 1/4

mortality 1/4

recovery 1/4

policy expiry 1/4

The specific rates required for a multi-state model are unlikely to be tabulated 1/2

unlike the claim inception / disability annuity approach. 1/2

Depending on the sophistication of the model, probabilities may vary according to the number of previous times that the cohort has been ill and all transition rates may be a function of the duration within that stage. 1/2

The multi-state approach thus requires more granular level of data to be available for setting the various assumptions. 1/2

As such, the actuary needs to recognise that the available data may not permit this degree of sophistication of the method in practice. 1/2

Pricing using a multiple-state modelling approach requires determination of the proportion of lives in each status, using the relevant duration-based intensities. 1/2

The value of claims outgo will thus depend on the number of lives within (one of) the benefit-receiving subcohorts, in a given month, multiplied by the relevant average sum insured. 1/2

Against this will be balanced: the premium coming from those in a premium-paying state, plus the investment income, less all relevant expenses and other outgoings in the appropriate month. 1/2

Transition intensities will be applied to each status to determine the numbers appropriate to various cells for the next month. 1/2

In theory the model could be very complex, with hundreds of sub-cohorts open at any time. 1/2

In practice, the lack of detailed statistics to estimate all of the transition intensities and the avoidance of spurious accuracy will necessitate a more straightforward and meaningful approach, 1/2

Such as the combination of various sub-cohorts and reduction of number of transition intensities required. 1/2

Even with these approximations, the multi-state model will provide more insight into the robustness of any rating and reserving structure. 1/2

Allows for more complex features of IP insurance such as linked claims or proportionate claims more easily 1/2

And allows sensitivity testing to be performed. 1/2

These are more difficult with the inception/annuity approach. 1/2

**[Max 5]**

**(iii)** The key driver of decision is the benefits versus the costs of adopting the multi-state approach. 1/2

The inception / disabled life annuity approach is a more simplistic approach. 1/2

It is therefore well established in the pricing processes. 1/2

A significant level of expertise has already been built up on the operation and modelling of the inception / disabled life annuity approach. 1/2

It has been used by the insurer for a number of years and there had been no indications that the results produced were inadequate. 1/2

In contrast, the multi-state approach is much more complex. 1/2

Additional expertise will therefore be required for the implementation of the new approach. 1/2

The Chief Actuary would need to consider whether expertise and resourced were available internally 1/2

Or will external expertise be required. 1/2

Setting up this approach could be costly 1/2

And time consuming. 1/2

Consultants could be used to help develop the new model, but this would add cost. 1/2

The size of IP portfolio would be considered. 1/2

There will be additional data requirements. 1/2

The availability of additional data could be problematic if data collected historically was only adequate for the inception / disabled life annuity approach. 1/2

The suitability of past experience to set the assumptions would need to be considered, for example due to changing claims management processes, product features or economic changes.	1/2
Other sources of data could be considered although this may add cost.	1/2
The existing model will have to be modified so that it is able to carry out the multi-state modelling.	1/2
A completely new pricing model may be required if the existing model is not flexible enough for modifications.	1/2
New hardware or system upgrade may also be required due to the increased demand on processing powers caused by the complexity of modelling.	1/2
Robust and extensive change controls will have to be followed before the implementation.	1/2
Documentation will also have to be updated, both in terms of the IT and pricing processes.	1/2
The new pricing approach should also be independently reviewed.	1/2
The review could be carried out using internal or external resources, depending on management and regulatory requirements.	1/2
The overall project will necessarily involve stakeholders from a number of functions, including:	1/2
Project management	1/4
Actuarial	1/4
Pricing	1/4
IT	1/4
Underwriting	1/4
Claims management	1/4
Senior management	1/4
The costs, both in terms of human and financial resources, of development and implementation could thus be significant.	1/2
These costs should be measured against the potential benefits of adopting the new approach.	1/2
The results produced by the new approach should be material enough to make a difference in the premium rates.	1/2
The tolerance levels for changes on premiums would need to be decided	1/2
And the impact on different pricing points	1/2
And the impact on profitability.	1/2
The premium rates produced by the new approach could be less competitive than those produced under the previous approach.	1/2
In practice, the lack of detailed statistics to estimate all of the transition intensities and the avoidance of spurious accuracy will necessitate a more straightforward and meaningful approach.	1/2
This may involve the combination of various sub-cohorts and reduction of number of transition intensities required.	1/2
Even with these approximations, the multi-state model will provide significant insight into the robustness of any rating and reserving structure	1/2



and will allow a wider range of sensitivity and scenario testing to be performed.

1/2

However, there must be sufficient justifications and explanation underlying the differences.

1/2

This is particular the case where expert judgements have been applied in the modelling, e.g. where data is sparse in certain sub-cohorts.

1/2

The potentially more accurate results produced by the new approach could be hindered by the insufficient / inadequate / inaccurate data.

1/2

The ongoing maintenance of the new system and corresponding resources requirements should also be considered carefully.

1/2

The implications of the new process on the time to run the model should be considered.

1/2

Any potential implications on reinsurance arrangements would be considered, particularly if the insurer currently reinsures a significant proportion of its business.

1/2

The insurer may need reinsurer permission if using an original terms basis.

1/2

The reinsurers may be able to provide assistance, both in terms of modelling and data.

1/2

The reaction of distributors to any new pricing model would be considered, eg it may have an impact on commission if percentage of premium.

1/2

Any implications on compliance would be considered.

1/2

*(half mark for any suitable example)*

1/2

Any implications on the company's own risk policies would be considered.

1/2

*(half mark for any suitable example)*

1/2

Any implications with regulators would be considered.

1/2

*(e.g. is it permitted, can all the required rating factors be used, or any other suitable example)*

1/2

Any implications on using different approaches for pricing and valuation, if the new approach is not rolled out to valuation would be considered.

1/2

*(half mark for any suitable example)*

1/2

Current market practice would be considered.

1/2

*(e.g. are competitors doing this, or any other suitable example)*

1/2

**[Max 10]**

**[Total Max 18]**

*This question was generally not well answered.*

*Part (i) was mainly bookwork but many candidates did not score highly, for instance not mentioning that claim inception rates are derived by multiplying the probability of falling sick by the probability of remaining sick throughout the deferred period or that the disability annuity allowed for any escalation of the claim amount, interest and*

*the probabilities of death and recovery between the end of the deferred period and expiry date.*

*In part (ii) many candidates provided relatively few points, suggesting that they were not familiar with a multi-state modelling approach.*

*In part (iii) although many candidates commented on the potential lack of expertise and the time and cost involved in developing a multi-state model and the data requirements, relatively few candidates discussed whether the inception/disability annuity approach produced good enough results or the more wider practical issues involved in implementing a multi-state modelling approach such as the need to involve other stakeholders within the insurer and the need to document and review the new approach.*

### Q3

- (i) The company is running a potentially large financial risks that could result in a loss of profits or even insolvency because 1
- The premium rates may not support the benefits under the product because 1/2
- The competitor's products may offer limited or reduced number of illnesses compared to the new insurer and 1/2
- Hence the reason for cheap rates. 1/2
- Other products may not offer additional benefits such as children's' cover. 1/2
- The insurer may have different customer service standards. 1/2
- Other policies may have reviewable premiums. 1/2
- Exposed to the risk of errors in competitors pricing. 1/2
- The competitor's may be more efficient companies, 1/2
- And so expense costs lower e.g. more automation, better processes. 1/2
- Lower expense costs of competitors' result in lower per policy expense loadings. 1/2
- Loadings may be lower because they write significantly larger volumes of business than the insurer 1/2
- And so have lower allocation of overhead costs per policy. 1/2
- The other companies may pay lower commission rates than insurer 1/2
- Perhaps due to different distribution channels 1/2
- Or may be better socio economic groups insured. 1/2
- Other companies may have stricter underwriting criteria 1/2
- So less selection, 1/2
- Lower non disclosure 1/2
- Better class of lives with lower expected morbidity. 1/2
- Other companies have better claims management 1/2
- So better claims experience, so lower claim costs. 1/2
- Different (stricter) claims definitions. 1/2

Other companies will have different reinsurance arrangements, better rates, terms	1/2
So other companies reinsurance costs lower.	1/2
The other companies may have different profitability targets,	1/2
e.g. some companies may be writing business on very low or no margins.	1/2
So the insurer will not achieve the profit margins or return on capital desired.	1/2
Other companies may target specific market segments and cross subsidise with other areas	1
Much less or no scope for new insurer because of the pricing strategy being suggested.	1/2
If another insurer targets a particular market, this insurer will also be targeting it by pricing 2 <sup>nd</sup> /3 <sup>rd</sup> cheapest depending on premiums.	1/2
This lack of control over the market may lead to an unexpected mix of business	1/2
for example, other insurer may target younger lives with lower premiums, or mortgage related business with 25yr+ terms with discounts.	1/2
Any planned cross subsidies may not be achieved.	1/2
The other companies may have lower reserving standards,	1/2
Lower morbidity and expenses	1/2
And also may have lower risk profile due to negative correlation with other business.	1/2
Insurer will have to very regularly change rates to maintain this pricing strategy.	1/2
During times of market dislocation insurer's rates may be out of line with market, i.e. reinsurers all increasing rates	1/2
Then as the insurer reacts to changes in competitor rates it may find that it is exposed and so write business on very unprofitable terms in large volumes.	1/2
There is no allowance for rating by any other factors	1/2
Such as policy size	1/2
Or gender.	1/2
No identification of sub-standard risks.	1/2
It may also lead to uncertainty over volumes of business.	1/2
The insurer is new and so may lack capital that could be required to withstand adverse experience if this method of pricing does not work.	1/2
High new business volumes could cause new business strain which it is not able to cover.	1/2
If other insurers did this there would be a downward cycle of prices	1/2
Regulation may not permit this pricing strategy – risk of regulatory actions such as fines.	1/2
Need to consider fit with brand/strategy.	1/2
Need to consider what will be done if prices are not available or are out of date.	1/2

**[Max 13]**

<b>3(ii)</b>	Company will offer a competitive product in terms of price at all points.	1/2
	More likely to cover the development costs	1/2
	Likely to write substantial new business	1/2
	Which would also decrease per policy expenses (overheads)	1/2
	Reduce the cost of pricing the product initially	1/2
	And on an ongoing basis	1/2
	May raise the profile of the insurer quickly	1/2
	Provides quick response to competitor prices	1/2

**[Max 2]**

**[Total Max 15]**

*This question required students to apply their knowledge to an unusual way of pricing CI products and to consider the risks involved. Part (i) was reasonably answered, although few candidates discussed reserving, risk profiles or not being able to use rating by other factors.*

*Part (ii) was generally very well answered.*

#### **Q4**

<b>i)</b>	Claim inception rates	1/2
	Claim amounts	1/2
	Claim/benefit inflation	1/2
	Pre claim mortality	1/2
	Mortality in claim/longevity	1/2
	Investment risk/liquidity risk	1/2
	Expense risk	1/2
	Expense inflation risk	1/2
	Withdrawal risk - selective withdrawals (better risks choosing to leave)	1/2
	Financial loss on withdrawal	1/2
	Marketing/reputation risk since policyholders' expectations may not be met.	1/2
	Regulatory/political risk	1/2

**[Max 3]**

<b>4(ii)</b>	<b>Risk: Claim inception rates</b>	
	Analyse claim inception rates experience	1/2
	e.g. by duration	1/4
	Age,	1/4
	Amounts and policies	1/4

Distribution channel	1/4
Underwriting status	1/4
And compare to best estimate assumptions or reinsurance rates.	1/2
Also analyse by the level of disability as benefits may also be payable dependent on the level of disability.	1/2
Analyse trend in claim inception rates, i.e. is experience improving or deteriorating overtime compared to best estimate assumption.	1/2
Investigate whether changes in claims experience could indicate changes in underwriting	1/2
And/or claims management may be required.	1/2

**Risk: Pre claim mortality**

If pre-funded plans, analyse mortality experience when before claim	1/2
e.g. by duration	1/4
Age,	1/4
Amounts and policies	1/4
Distribution channel	1/4
And compare to best estimate assumptions or reinsurance rates.	1/2
Analyse trend in mortality rates, experience improvement or deterioration over time compared to best estimate assumption.	1/2

**Risk: Mortality in claim**

Analyse mortality experience when in payment	1/2
e.g. by duration	1/4
Age,	1/4
Amounts and policies	1/4
Distribution channel	1/4
And compare to best estimate assumptions or reinsurance rates.	1/2
Analyse trend in mortality rates, experience improvement or deterioration over time compared to best estimate assumption.	1/2
Update pricing assumptions if necessary.	1/2
Review morbidity and mortality stress for capital calculations.	1/2

Investigations into guarantees and options available, value of options must be kept under constant review. 1/2

The reinsurance strategy will be reviewed, 1/2  
 Including retention limits and financing requirements, 1/2  
 To check that the company's exposures are within the company's risk appetite 1/2  
 reinsurers credit rating 1/2  
 And claims payments from reinsurers, so that claim recoveries made timeously. 1/2

Investigate the profitability of new business, 1/2

Including sensitivity analyses, will help assess impact of changes in new business mix and volumes.	1/2
Taking corrective action if investigations reveal a problem.	1/2

Experience analysis would be split by reviewable and guaranteed business so that reviewable business may have premiums and/or benefits reviewed.	1/2
--	-----

**Risk: Claim amounts/inflation**

Analyse claim amounts experience by geographic location,	1/4
Level of care required,	1/4
Provider of care.	1/4
Consider any price details negotiated with the provider.	1/2
Investigate whether claim amounts increase as the level of disability increases and the evidence required to support this.	1/2
Any economic factors that may affect the cost of claims would be investigated.	1/2

**Risk: Investment risk**

These will differ between pre-funded and immediate needs LTCI.	1/2
Investigations will be made into the appropriate asset mix (type and duration) and investment policy,	1/2
including stochastic modelling to test different investment conditions.	1/2
Consideration of the extreme values can help identify what circumstance will cause the company problems and enable management actions/strategy to be formulated.	1/2
Analyse and monitor liquidity to ensure that liability payments can be maintained.	1/2
Sufficient liquid assets held and/or credit facilities in place to draw upon	1/2
Credit risks within corporate bonds are monitored to ensure that credit risks are within risk appetite.	1/2
Investigate any restrictions on the assets that can be held.	1/2

**Risk: Expense risk**

Analyses of expenses split ...	1/2
Initial	1/4
Renewal expenses	1/4
Claim expenses.	1/4
Could assess the extent of any mismatching of expenses and loadings.	1/2
Analyse new business volumes.	1/2
Company may have to review expense loadings	1/2
Increase premium rates and/or,	1/2
Negotiate or manage expenses downwards	1/2
Review expense stress and expense inflation assumptions for capital calculations	1/2

**Risk: Withdrawal risk**

It could be analysed by age	1/4
Distribution channel	1/4
Benefit level (if appropriate) and surrender value (if available).	1/4
Surrender value (if available).	1/4
Trend analysis of morbidity and mortality rates show deterioration over time which is greater than expected	1/2
Coupled with persistency analysis that shows poor persistency experience.	1/2
Analysis of persistency will help management decide whether surrender / termination assumptions need review,	1/2
Analyse by duration, distribution channel, policy size etc.	1/2
And any customer retention activities need to be reviewed.	1/2
The number and amounts of withdrawals at early durations, for prefunded cases as at these durations asset share may be negative.	1/2
Compare any withdrawal benefits paid against asset share.	1/2

**Risk: Marketing/reputation risk since policyholders' expectations may not be met.**

Investigations into complaints will identify TCF issues	1/2
e.g. policyholder may expect the benefits to be enough to cover the eventual costs of care.	1/2
These will help with setting appropriate mis-selling reserves and help manage risks in the sales area, reducing the risk and impact of future litigation.	1/2
Review marketing literature.	1/2

**Regulatory/political risks**

Keep up to date with changes	1/2
And consultation exercises on changes.	1/2
Monitor statements by politicians and regulator	1/2
And election manifesto.	1/2

**General points on Data:**

Data checks to ensure the data used to set rates and assumptions are relevant and accurate.	1/2
This will help identify issues with data which could invalidate the calculations and assumptions.	1/2
Also help with setting appropriate data reserves	1/2

**[Max 12]**

**[Total Max 15]**

*Part (i) was bookwork and well answered, although few candidates mentioned pre-claim mortality risk, marketing/reputation risk or regulatory/political risk.*

*However, part (ii) was generally not well answered, even though credit was given for any sensible comment in taking corrective action under each risk, with many candidates not providing a wide enough range of points to score highly.*

## Q5

- (i) A passive valuation approach is one that uses a valuation methodology that is relatively insensitive to changes in market conditions. 1/2  
 The valuation basis is updated relatively infrequently. 1/2  
 However, that non-economic assumptions are updated if experience worsens, 1/2  
 in order to recognise the related loss and the need for higher reserves at that time. 1/2  
 Passive valuation approaches tend to be more straightforward to implement, 1/2  
 involve less subjectivity and (to the extent that they are used for accounting purposes). 1/2  
 It results in relatively stable profit emergence. 1/2  
 An active approach would be based more closely on market conditions, 1/2  
 with the assumptions being updated on a frequent basis. 1/2  
 Active valuation approaches are more informative in terms of understanding the impact of market conditions on the ability of the company to meet its obligations, 1/2  
 particularly in relation to financial guarantees and options. 1/2  
 Results are potentially more volatile using an active value approach. 1/2  
 Under adverse equity market conditions (e.g. a stock market crash), an active valuation approach using risk-based capital would indicate that higher capital requirements are needed. 1/2  
 There is also systemic risk, as this would be the case for all health and care insurance companies at the same time. 1/2  
 Therefore it may be the case that regulators include amendments to the valuation approaches under such conditions, to avoid this situation. 1/2  
**[Max 5]**

- 5(ii)** Embedded value is the present value of future shareholder profits in respect of the existing business of a company (PVPF), including the release of shareholder-owned net assets. 1/2  
 For the purposes of this question Embedded Value earnings is taken as the



change in embedded value over the year. 1/2

Therefore to determine the impact on Embedded Value earnings of moving from a Passive Embedded Value (PEV) basis to a Market Consistent approach it is necessary to look at the impact of the change in assumptions between each basis. 1/2

### **Impact on PVFP**

#### **Risk Discount Rate**

For both immediate needs and critical illness insurance, one of the main changes will be moving to a risk-free discount rate under a market-consistent approach. 1

This is likely to be based on government bond yields (with a possible deduction for credit risk) or swap rates if the market is sufficiently deep and liquid. 1/2

For the immediate needs annuities, the insurer may be able to use an adjusted corporate bond yield. 1/2

Corporate bonds typically have a higher yield than risk-free bonds, where this reflects both the greater default risk and the relative illiquidity of such assets. 1/2

The latter contributes the “illiquidity premium” to the yield and credit may be taken for this, i.e. the yield would be reduced for default risk (only) if the bonds are held to maturity. 1/2

For both products, it would be expected that the discount rate used under the market-consistent approach would be less than the current discount rate, 1/2

Leading to an increase in the insurer's PVFP. 1/2

So the change in RDR would contribute to an increase in earnings in the year of introduction of the basis change then followed by small negative contributions to future earnings as the unwind of the risk discount rate will be less under the market consistent basis. 1

#### **Other assumptions**

The PVFP for the insurer's immediate needs business will be the present value of future investment income less claims and expenses plus the release of supervisory reserves. There is no future premium income to take account of for immediate needs business. 1/2

The investment income component of the PVFP would change for both products as it would now be determined using a risk-free rate of return. 1/2

This may be based on government bond rates (or swap rates) so may not make a significant difference to the investment income earned on some of the assets backing the immediate needs business. 1/2

However, the risk-free rate used may be less than the return on government bonds to allow for any credit risk of the government bond. 1/2

The investment return used on corporate bonds would be lower under a risk-free approach compared to a passive approach. 1/2

Moving to risk-free rates would therefore reduce the investment income earned on the assets backing the immediate needs business, reducing the PVFP. 1/2

Moving to a market consistent basis will not affect the claim element of the PVFP calculation. 1/2

Assuming that this change is not part of a wider regulatory move towards market consistent reporting, it will also not affect the release of supervisory reserves. 1/2

For the insurer's unit-linked critical illness (CI) insurance business, the PVFP will be the present value of future charges (including surrender penalties) less expenses and benefits in excess of the unit fund, plus investment income earned on and the release of any non-unit reserves. 1/2

The investment income earned on the non-unit reserves will change. 1/2

It is likely that the equities backing the CI insurance liabilities are backing the unit fund. So, the non-unit fund will be mostly backed by government bonds. 1/2

If the risk-free rate is less than the current return used for government bonds, the investment income would reduce slightly, reducing the value of the PVFP. 1/2

The charges would also change assuming that these are a proportion of the unit-fund value. The rate of return used for the projection of the unit-fund would now be a risk-free rate. 1/2

So, the projected value would reduce, leading to lower charges being taken.

This would reduce the value of the PVFP. 1/2

Moving to a risk-free basis may change the way the expense inflation assumption is determined for both products. 1/2

Under the current basis the PVFP will allow for expenses to inflate at the expected long term inflation rate. 1/2

Moving to a market consistent basis expenses inflate based on current market conditions 1/2

For example this could be based on the difference between nominal and real yields on government bonds (if available). 1/2

The impact on the change in PVFP will therefore depend on how the "market" inflation rates vary according to the long term expected inflation rate. 1/2

So these elements would likely combine to contribute to a reduction in earnings in the year of introduction of the basis change followed by small positive contributions to earnings as the expected additional investment returns are earned.

1

### **Impact on Shareholder net assets**

The net assets are the excess of assets over those required to meet the liabilities. 1/2

Under the current embedded value approach these should already be determined on a market value basis. 1/2

So there would be no change moving to a market-consistent approach on the shareholder net assets. 1/2

Under the market consistent basis the cost of any guarantees and options would be deducted from the PVFP. 1/2

Under the passive basis the cost of guarantees and options may not be fully recognised. 1/2

[Max 8]

[Total Max 13]

*Part (i) was a mainly bookwork question and was reasonably answered.*

*However, part (ii) was not well answered with many candidates struggling to apply the bookwork to an embedded value question. For instance, only the better candidates discussed the impact the change of basis would have on the risk discount rate and the assumed future investment returns.*

## Q6

CI pays out when the policyholder is diagnosed with a listed CI. 1

AIDS/HIV is often one of the listed CIs. 1/2

Thus if policyholders are able to find out earlier that they have AIDS, the insurer will have to increase their reserves due to earlier payment being anticipated. 1/2

They are also more likely to survive the survival period for CI only policies. 1/2

The impact on CI reserves will depend:

- on how widely the test is carried out 1/2
- the proportion of CI claims that are for AIDs 1/2
- the likelihood of a positive result 1/2
- the average size of these policies (several ideas!) 1/2

If HIV/AIDS is not covered by the CI policy there would be no change to the reserves. 1/2

CI often has options which allow the policyholder to take out additional cover, on standard rates, without undergoing underwriting 1/2

So policyholders who are aware that they have AIDS are more likely to exercise the option before getting a formal diagnosis. 1/2

Similarly they are less likely to lapse their policy without checking if they have a potential claim. 1/2

Thus the insurer will need to increase the option reserves for an increased number of policyholders who may be expected to exercising options on unprofitable terms. 1/2

If policyholders find they have non covered AIDS they are more likely to lapse (as they expect to die before they can claim for a covered CI) 1/2

And hence the insurer will receive less premiums than it expected and will have to increase its expense reserves. 1/2

May lead to increase in new business and hence increase in new business reserves. 1/2

May also increase awareness of existing policies held and hence lead to more claims and higher reserves. 1/2

PMI provides cover for short term acute medical conditions, in patient tests etc. 1/2

Cover for AIDS is often not excluded. 1/2

Earlier diagnosis is likely to lead to more claims 1/2

And to more costly claims e.g. if AIDS medication is covered 1/2

And if the cost of the test is also covered. 1/2

However, some PMI claims for acute conditions may have resulted from AIDs claims anyway, which would reduce the impact of this change. 1/2

Also early detection may lead to reduced claims compared to what would have been claimed if undetected for longer. 1/2

Hence claim reserves may need to be increased or reduced e.g. 1/2

URR 1/4

OCR 1/4

IBNR 1/4

IBNER 1/4

There will be an increase in anti-selection as policyholders take out policies having first confirmed they have AIDS. 1/2

More claims will lead to an increase in expense reserves. 1/2

[Total Max 5]

*This question was well answered with most candidates providing a good range of points. However, only a few candidates discussed the impact depending on whether AIDS related claims were covered by each of the products or not, for instance in relation to anti-selection and lapsing and behaviour in relation to any options available under the policies.*

## Q7

- (i) The actuary would carry out an analysis of surplus. 1/2  
Each item that contributes to the profit and loss account of the business would be looked at, in turn. 1/2

The positive cashflows for the insurer's PMI portfolio are:

Premiums received 1/4

Reinsurance claims	1/4
Investment returns	1/4

The negative cashflows for a PMI portfolio are:

Policyholder claims	1/4
Broker commission	1/4
Reinsurance premiums	1/4
Internal expenses (policy administration, claims handling, overheads)	1/4
Third party defaults	1/4
Other items include change in reserves	1/4
And liquidity.	1/4

A comparison of actual experience against assumed in the pricing basis would be carried out. 1/2

If the experience of any of these components materialises to be worse than that assumed in the pricing basis then the portfolio will make lower profit margins or even losses. 1/2

As PMI is short-term business, the analysis of profit will generally involve consideration of claim and expense ratios (ratios with regards to the premium or exposure) for cohorts or categories of business, 1/2

Comparing actual ratios against those expected in the pricing basis. 1/2

Experience should be analysed initially at portfolio level and then greater subdivision should be performed. 1/2

### **Analysis of Claims**

For PMI business, as the claim amounts are not fixed, nor rising according to a specific index, the analysis should compare the amounts of claims incurred with those expected. 1/2

Claims might rise in line with medical inflation so the rate of increase could be analysed compared to a suitable index, if available. 1/2

The paid claims will be in the insurer's data but estimates must be made for the IBNR and RBNS claims to estimate the total incurred claims for the portfolio during the assessment period. 1/2

The estimates of IBNR and RBNS claims and other reserves should be compared against those expected. 1/2

Claim frequencies compared to those expected would also be analysed. 1/2

After the analysis at the portfolio level has been completed, a deeper analysis can be performed in which the data is subdivided into more risk categories (both claims and exposed to risk). 1/2

For example:

- type of contract 1/4
- age 1/4

- gender 1/4
- duration from entry 1/4
- smoker/non-smoker status 1/4
- underwritten status 1/4
- source of business 1/4
- occupation 1/4
- benefit conditions, for example length of deferred period 1/4
- geographical location 1/4
- amount of excess 1/4
- No Claims Discount level 1/4
- possibly also hospital band 1/4
- by hospital chain 1/4
- by individual surgeons and other consultants 1/4

*(Marks given for a maximum of 12 examples)*

The subdivision of information into risk cohorts should be balanced against the need for adequate data to produce meaningful results. 1/2

#### **Analysis of New Business**

The new business sales should be compared against targets: 1/2

To check the mix of business in each of the significant homogeneous cohorts against the mix assumed in the pricing basis 1/2

To check commissions paid against those assumed (where averages were estimated in the pricing bases). 1/2

The extant and impact of cross subsidies would be analysed. 1/2

#### **Analysis of Renewals**

If the assessment period includes historic periods then the analysis should include the business which has lapsed (i.e. not renewed) during that period and is therefore no longer in-force. 1/2

Renewal rates will be compared with those assumed by region, policy type and distribution channel (and particular agent if numbers permit). 1/2

The impact of the renewals could be that the mix of business in-force today does not match that assumed in the original pricing basis. 1/2

The impact of lapses will be crucial to profitability where the pricing bases have amortised initial costs over a number of years of renewal. 1/2

#### **Analysis of Internal Expenses**

The expenses incurred in writing the business will be compared against the assumptions in the pricing basis, including: 1/2

administration costs 1/2

underwriting cost 1/2

claims management costs 1/2

Expense inflation would also be analysed against that expected 1/2  
 These analyses would be split into the same set of subdivisions as the claims analysis. 1/2

**Other**

Would investigate any other unexpected outgo e.g. 1/2  
 Mis-selling costs 1/2  
 Regulatory fines. 1/2  
 Would also carry out an analysis of competitors' result. 1/2

**[Max 8]**

**7(ii) Broker Commission**

Typically the broker commission would be fixed in advance of selling the business or at the latest known at the time of policy inception. 1/2  
 There could have been market pressure to pay more commission in order to sell PMI business, due to the power of brokers operating in this market. 1/2  
 The business may be sold via many brokers or sales channels and the pricing basis had included an assumption about the average commission that would be paid. 1/2  
 There may have been more new business sold via the brokers or channels with higher commission. 1/2

**Reinsurance**

If reinsurance is used then the reinsurance premium may have increased more than the amount assumed in the pricing basis. 1/2  
 The reinsurance claims may be lower than assumed in the pricing basis. 1/2

**Internal Expenses**

Internal expenses of the insurer may have increased compared to the expenses assumed in the pricing basis. 1/2  
 Higher new business than expected may have led to new business strain. 1/2  
 Lower new business than expected may have led to costs not being recouped or higher expenses per policy. 1/2  
 Absolute expenses may have increased, for example: 1/2  
 Salary inflation may be higher than anticipated. 1/2  
 Claim management expenses may have increased. 1/2  
 More staff may have been hired. 1/2  
 Technology (IT, telephony, software licenses, etc) may be more expensive than expected. 1/2  
 Property costs may be higher than expected. 1/2  
*Marks given for up to four suitable examples*

Unless the new business volumes sold had also been higher in proportion to the higher absolute expenses, then the per-policy expense loadings will be insufficient to cover the actual expenses. 1/2

Absolute expenses may be stable but the volume of new business sold may be lower than planned and this would lead to the expenses been spread over fewer policies. 1/2

This would mean that the expense loading in the premium basis is inadequate to meet the real per-policy expenses. 1/2

### **Claims**

The average claims paid per policy may be higher than the risk premium. 1/2

This could be because of higher frequency of claims than expected due to, for example: 1/2

- An ageing population 1/2
- General worsening health levels 1/2
- More policyholders falling sick or having accidents 1/2
- Poor underwriting leading to anti-selection 1/2
- Worsening State care with longer waiting times 1/2
- Greater awareness of the policy benefits leading to greater utilization 1/2
- A catastrophic event 1/2
- Accumulation of claims 1/2
- Changing the product design leading to more claims e.g. removing NCDs 1/2
- Fraud 1/2

Average claim amount is higher than expected due to, for example: 1/2

Salaries of health and care professionals higher than expected 1/2

Medical technology has developed rapidly leading to new treatments which are more expensive than previous treatments 1/2

New drugs/medicines/pharmaceuticals developed which are more expensive than previous versions 1/2

Primary care professionals are following new guidelines (or change their behaviour) and are recommending courses of treatment which are more expensive than previously 1/2

Private hospitals and other treatment providers have increased their charges for treatment or are passing on more of the cost to insurers 1/2

- e.g. due to greater demand 1/2
- Or decreased supply 1/2
- Change in area covered leading to higher costs 1/2
- More disputed claims leading to higher costs 1/2
- Reinsurer or other 3rd party default 1/2



**Other**

There may have been higher reserving requirements	1/2
Or higher tax rates than expected	1/2
Or compensation payments/regulatory fines.	1/2

**[Max 8]**

- 7(iii)(a)** If it is believed that this broker sells business to higher risk lives then increase premiums for business sold by this broker. 1/2
- It could be that the broker causes the high risk, e.g. through its sales process encouraging higher utilization of certain benefits. 1/2
- If this is the case then the insurer should aim to discourage sales from this broker 1/2
- Or change the sales methods of this broker to guide its sales towards lower risk lives. 1/2
- The insurer could provide training to the broker's salesforce to help them sell to lives which more closely match the risk profile of the pricing basis. 1/2
- It could stop doing business with this broker, i.e. cancel its business arrangement. 1/2
- It could reduce the commission that it pays to this broker. 1/2
- It could remove other broker incentives, such as stopping training that was previously provided to the broker's salesforce. 1/2
- It could introduce (or increase) commission clawback. 1/2
- It could be that other risk factors are more prevalent in the business sold by this broker. 1/2
- e.g. it sells in a particular geographic region which carries high risk of some diseases 1/2
- Or it sells to people with dangerous occupations which are not identified by the underwriting process. 1/2
- To address this problem, the insurer could strengthen its underwriting procedures. 1/2
- (b)** 1/2
- It could introduce new rating factors which would lead to higher premiums for the high risk policyholders. 1/2
- It could increase the premiums for existing rating factors. 1/2
- Reduce claim frequency / costs by: 1/2
- introducing or increasing excesses or coinsurance 1/2
  - offer no claims discounts 1/2
  - requiring a GP referral before a claim is made 1/2
  - require pre-authorisation for any treatment 1/2
  - restricting hospital selection through bands 1/2
  - improve deals with hospitals to reduce costs 1/2
  - it could change the policy wording to be more strict in certain benefits. 1/2

- review its claims handling processes to ensure that all claims submitted are valid and covered by the policy 1/2

Reduce expenses by: 1/2

- outsourcing admin or claims functions as these could be done more cheaply elsewhere 1/2
- improve efficiencies 1/2
- reduce staffing levels where possible 1/2

Improve underwriting to: 1/2

- charge fair premiums reflecting the level of risk 1/2
- identify higher risk applicants and determine whether to accept and on what terms 1/2

Other:

It could change its marketing to encourage sales from other brokers or non-broker sales channels. 1/2

If the high claims experience from this segment is due to a particular benefit then the insurer could redesign its product to remove or limit particular benefits. 1/2

Introduce a retention team to improve lapses 1/2

**[Max 6]**

**[Total 22]**

*In general, this question was well answered with candidates providing a wide range of points in all three parts. However, only a small number of candidates discussed that the results may be related to the region in which the broker operated or the type of product sold rather than the actions of the broker distribution channel itself.*

## **END OF EXAMINERS' REPORT**