INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORTS

September 2019

Subject CP1 – Actuarial Practice

Paper One

Introduction

The Examiners' Report is written by the Chief 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.

Mike Hammer
Chair of the Board of Examiners
September 2019

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

1. The aim of the Actuarial Practice subject is that upon successful completion, the candidate should understand strategic concepts in the management of the business activities of financial institutions and programmes, including the processes for management of the various types of risk faced, and be able to analyse the issues and formulate, justify and present plausible and appropriate solutions to business problems.

2. This subject examines applications in practical situations of the core actuarial techniques and concepts. To perform well in this subject requires good general business awareness and the ability to use common sense in the situations posed, as much as learning the content of the core reading. The candidates who perform best learn, understand and apply the principles rather than memorising the core reading.

3. The examiners set questions that look for candidates to apply the principles specific to the situation set out in the questions, having read the question carefully. Many candidates gain few marks by writing around the subject matter of the question in a more general fashion. Detailed specialist knowledge is not required and nor is very detailed development of particular points.

4. Good candidates demonstrate that they have used the planning time well to understand the breadth of the question and to structure their answer – this is a big advantage in making points clearly and without repetition. This also enables candidates to use the later parts of questions to generate ideas for answers to the earlier parts.

5. Time management is important so that candidates give answers to all questions that are roughly proportionate to the number of marks available.

6. 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 use these points to aid their revision.

7. Candidates who give well-reasoned points, not in the marking schedule, are awarded marks for doing so.

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

The pass mark for CP1 is assessed over the 2 papers with the pass mark for this session being a combined 55. Paper 1 scored higher than Paper 2 with the average scores being circa 5% different between the papers. This session was generally answered less well than the April session with candidates struggling on areas which required higher order skills OR significant application to the questions being asked – this was similar for both papers with stronger candidates structuring their answers to consider the specifics being asked in the question.

C. Pass Mark

The Pass Mark for this exam was 55

Q1

Credibility or volume of the data [½]

How long has the data been collected for, e.g has is it only recently been collected or has it been collected for many years [1]

How reliable is the data, is there likely to be errors or missing information [½]

Does the data include all possible data needed for the analysis (i.e. covers the full exposed to risk data) [½]

And does it include all of the deaths [½]

How long ago was the data collected and has it been collected in a consistent way [½]

Relevance of the data to the required work [½]

Does the data sufficiently represent the target group [½]

Are deaths categorised [½]

by gender, postcode, socio economic group etc [1]

by cause of death [½]

Will the past be a good guide to the future [½]

In particular a developing country [½]
may see rapidly increasing life expectancy. [½]

What other sources are available (eg other similar countries or reinsurers) [1]

Changes in mix of homogeneous groups in population [½]

Adjust for expected future trends [½]

Whether to add margins for prudence [½]

Abnormal fluctuations [½]
[Marks available 11, maximum 6]

This question was fairly well answered. Stronger candidates focused on answering the question in sufficient breadth whereas weaker candidates focused on one area and went into too much detail. Candidates that didn't consider the specifics to the question generally scored lower.

Q2

(i)
Employees
Account holders (Customers)
Landlords
Competitors
Shareholders
Regulator

[Marks available 3, maximum 2]

(ii)

Customers

Loss of existing customers, as they like personal touch. This might be a bigger impact from higher net worth customers who require a bespoke service which cannot be done online [1½]

Difficulty attracting new customers, as no branches to advertise or for them to walk into [½]

Loss of customers with poor IT infrastructure [½]

New customers might only buy low margin products (eg free current accounts but not insurance and mortgages as they would like to meet someone for that) [1½]

Will products be able to be approved quickly enough [½]

Competitors

Competition is better at offering the technology [½]

Are there better established internet banks who might have stronger branding in this area than an old "legacy" firm [1]

If the idea took off then other competitors might be able to react quickly and therefore get into lower margin, price competition impact. [1]

Then may have similar retention of key staff issues [½]

Shareholders

Loss of ability to raise further capital from shareholders who do not support the new plan [½]

Lack of capital to implement new IT infrastructure [½]

Employees

Internet only business will require new staff, particularly IT staff – may not be able to hire sufficient staff [½]

Will need to train staff with new systems and operations – this incurs additional cost and time [½]

May face reputational risk if staff are not well trained leading to poor customer service [1]

Adverse publicity around redundancies, possible industrial action [½]

Other

Operation risk – can they implement the technology necessary for online servicing, particularly around security. [1]

Cyber risk, either actual or reputational [½]

Political Risk [½]

Regulators may not approve of the plan [½]

Regulators may implement more restrictions around online business and impose additional capital requirements due to new risks [1]

Regulators

May not approve the products or put restrictions on the types of products [1]

Landlords

May not be able to stop renting buildings immediately due to renting contract limitations [1]

May incur large penalty for early termination of contract [½]

[Marks available 17, maximum 8]

(i) This question was answered very well with most candidates scoring full marks.

(ii) Most candidates scored very well on this part as well, however candidates needed to go into some detail to score all the marks available, e.g. most candidates scored the easy marks under competitors but didn't go into all the points to maximise their answers.

Q3

(i)
A provider should select investments that are appropriate to the nature, term, currency and uncertainty of the liabilities and the provider's appetite for risk. [2½]

Subject to the above the investments should be selected so as to maximise the overall return on assets, where overall return includes both income and capital. [1]
[Marks available 3½, maximum 3]

(ii)
The liability structure may have changed e.g. due to change in regulations or legislation. [½]

The funding or free asset position may have changed significantly. [½]

This may be due to lower contributions to charity. [½]

Or a change in government position – either through direct contributions to the charity or its encouragement to individuals to contribute e.g. with favourable taxation position. [1½]

Also, there may be a change in focus and/or commitments affecting the charity. [1]

The investment manager's performance may be significantly out of line with those of other funds. [½]
New asset classes might be available [½]
Changed economic environment [½]
Regulatory requirement to review [½]
Eg ethical, social , governance [½]
Changed risk appetite [½]
[Marks available 7, maximum 4]

(iii)
The charity's funds may have different mandates from those of the funds considered to be similar. [½]

The investment strategies may be different. [½]

The risk they are able to take may be different. [½]

There may be different constraints on the funds. [½]

This may particularly apply to the definition of ethical. [1]

There may also be constraints on the use of derivatives (limited use or not allowed). [1]

And also, on investments overseas (a narrower or a broader range or even none). [1]

These could give rise to currency as well as performance differences. [½]

These funds may have different charges from those of other funds. [½]

The sizes of the funds may be different which may lead to different investment opportunities. [½]

The cash flows may be different which may have influenced performance. This could have restricted the funds available for investment or led to disinvestments that may not be timed as well as would otherwise be the case. [1]

Poor stock choice [½]

Different method of measurement (net/gross, TWRR/MWRR etc) [½]
[Marks available 8½, maximum 4]

(i)	*This part was answered very well, although some candidates confused this to another part of the course and scored very few marks.*
(ii)	*This part was less well answered with few candidates focusing on the specifics of the question (i.e. a charity)*
(iii)	*This was answered poorly with most candidates not answering the question being asked – i.e. focusing on ethical versus non-ethical wasn't what the question was asking.*

Q4

In normal circumstances, terminal bonus would be used to ensure the overall payouts align with asset shares. Subject to the general ability of an insurer to apply discretion, and its approach to smoothing of payouts. [2]

The company could be experiencing solvency difficulties. Even if a surplus has arisen currently, the longer term expectation may be that full benefits are unsustainable. Benefits are therefore being cut back now, and not awarding terminal bonus helps this. This will affect all lines of business. [3]

The company may not have any surplus arising to distribute. If it was seriously constrained then, despite smoothing, terminal bonus may have to cease. This would affect all lines of business. Example:

- poor investment returns
- poor mortality/expense experience
- macro difficulty eg specific regulatory change, reinsurer failure
- new business strain
- cross subsidies

[4]

Normally, only a sustained period of low/nil surplus would justify zero terminal bonus. Because with profit funds will normally hold sufficient capital to avoid/smooth away at least occasional such periods. [2]

The company may have surplus to distribute but there are competing uses for it eg

- capital needed elsewhere
- margins for future adverse experience
- business objectives of the company

But sustained under-distribution is likely to be contrary to policyholders' expectations. Where profit is not being distributed as and when it arises, there will be years when the amount distributed exceeds the amount generated and vice versa. However, over time it would be expected that there should be a balance between the two. [4]

In normal circumstances, the company will need to ensure that bonuses are awarded in line with disclosures made to policyholders about how the product/fund operates. The company may be awarding bonuses regularly through policy life, and these are sufficient to return the asset share at point of termination. This is likely to affect individual lines of business only. Particularly those with low equity/property investment strategy, so that investment profits are more stable and predictable enough not to need a terminal bonus approach. Similarly, the company may be using a bonus distribution method which does not have terminal bonus as a feature. [4]

Some policy lines may be in a position where the benefits guaranteed to date already exceed asset share, so no terminal bonus is due. Annual bonuses may have been too high in retrospect (ie profits turn out lower than assumed). Or the original pricing (setting the basic guaranteed benefit) may have been too optimistic. [3]

Other companies may also not be paying terminal bonuses. Or the company may not be concerned about its competitive position, for example wanting to exit the market. Also the lack of terminal bonus will restrict profits to any shareholders/executives, so presumably nil bonus is in line with their expectations. [2½]

[Marks available 24½, Maximum 11]

This question was not well answered with few candidates scoring more than half marks. Candidates that understood the principles did not explain in depth to score a lot of the marks on offer, i.e. they were stating points but not then explaining them.

Q5

(i)
The Solvency Capital Requirement (SCR) – this is the target level of capital below which companies may need to discuss remedies with their regulators [½]

Economic capital is the amount of capital that a provider determines is appropriate to hold given its assets, its liabilities, and its business objectives. [½]

The regulator will probably require a company to hold more capital than they would consider necessary. [½]

It will probably ensure that the capital assumptions are stronger than the insurance company would otherwise assume [1]

and therefore the liabilities and capital will be higher under solvency basis than the economic basis. Therefore the surplus (assets less liabilities less capital requirements) will be higher under the economic basis [½]

The regulator will make assumptions relating to the average risk about companies when considering suitable requirements for solvency capital. [1]

The mortality (or other) assumptions may not be appropriate to the experience and expertise of the company. [1]

Also, the regulator will be unlikely to allow for the benefits of diversification between the annuity business and the term assurance business (i.e. mortality offsetting) [2]

Assets used may not be the same if there are differences in regulation on certain asset classes, i.e. inadmissible assets [1½]

[Marks available 8½, maximum 4]

(ii)

The insurance company could consider reinsurance to reduce the capital requirement. [½]

This could be either by a quota share arrangement or other appropriate method [½]

Or more likely via Financial Reinsurance. [½]

The main aim of FinRe is to exploit some form of regulatory arbitrage to manage the capital position more efficiently. Financial reinsurance arrangements can be used to improve the regulatory balance sheet of a company (including capital) by crystallising the value of future expected profits. [1½]

Securitisation involves converting an illiquid asset into tradable instruments. The primary motivations are often to achieve regulatory or accounting off balance sheet treatment. Typical transactions will be structured with an element of transfer of the risk associated with the value of the asset. This will result in any potential loss in value of the asset being capped. [2]

The insurance company could use derivatives. An example of when a derivative contract might be used is when a provider is concerned about the impact of a fall in the value of its asset portfolio. It could enter into a contract to protect its asset portfolio falling below a certain level. Potentially, the cost of this 'downside protection' could be partially met by the sale of some 'upside' potential via a second derivative contract. [1½]

Equity refinance, or rearrange debt [½]

It could also use longevity swaps to help manage its longevity capital requirements [1]

Diversification could also be used if appropriate [½]

Amend investment strategy to reduce capital requirement [½]

Restructure the business to reduce capital requirement [½]
[Marks available 9½, maximum 4]

(iii)
The company will have seen a reduction in its best estimate liabilities because of one of two main reasons. Either the experience has been significant or it has changed the assumptions underpinning the liabilities. [1]

The company could have seen a significant increase in the number of deaths in the annuity portfolio – [½]
this could have reduced the liabilities materially over the 0.5 year period but is unlikely to have had a 20% impact on its own [½]

However the change in experience could have influenced the assumptions for the insurance company going forward that has had a material impact on the best estimate liabilities. This could have come about on the base mortality table or a belief that mortality improvements could be slower than expected in the future. This information could be based on 0.5 year or a longer term view [2]

Alternatively other assumptions could have changed – e.g. expense, inflation assumptions. But it unlikely that this would have had a 10% impact. [1]

The company could have changed its asset portfolio, allowing them to invest in higher yielding assets which in turn could have improved the assumptions underpinning its investment yields which in turn would reduce the liabilities of the company. [1]

However the rules around capital may not move in line [½]

In respect of mortality changes, if there is a belief that the mortality experience could reverse or even improve more than expected then the capital requirement could go up. That is the insurance company would need to hold capital for the increased risks associated with mortality. [1½]

The change in assets could be more risky than previously invested in, meaning that the capital requirements would increase to reflect the additional risk. [1]

The regulator could have reviewed the assumptions and believed they are more risky and ensured that the more capital is required for the insurance company. [½]

The insurance company could have reviewed its capital models [½]

Could have been calculated incorrectly before [½]

New risks identified now included in the capital calculations [½]

[Marks available 11, maximum 4]

(i)	*This question was answered well by most candidates*
(ii)	*This question was generally well answered, however the command verb of "Describe" was missed by some candidates and as such the answers didn't go into sufficient detail to get credit.*
(iii)	*This was generally poorly answered with candidates only focusing on one part of the question – i.e. few addressed the size and direction of the changes.*

Q6

The Government uses legislation and regulation as its mechanism to ensure that the insurance market is transparent, orderly and provides proper protection to investors. [1]
The sound operation on insurance markets is essential for financial stability of the economy. [1]
The Government delegates to the regulator the of oversight of legislation. The development, implementation and oversight of regulation to achieve both the above policy objectives. [1½]
The regulation has two objectives, that business is undertaken in a prudent manner and that business is conducted competently with integrity. [1½]
A regulator does not have the capacity to oversee all the day-to-day operations of all individual insurance companies in real time. The legislation and regulation assigns this responsibility to the Board of the insurance company. [1]

<u>The regulator must approve all board and senior management appointments</u>
To achieve the policy objectives the Board and senior management the individuals must be competent and act with integrity, both now and in the future. [1]
Competence can be judged at a point in time through obtaining specified qualification or membership of a professional organisation. However, these may have been obtained a long time ago so not demonstrate current competency. [1]
It is therefore reasonable that a regulator checks and individual has obtained the necessary qualifications, the qualifications are genuine and makes an assessment of the current technical competency of an individual. [1]
It is also reasonable that the regulator assessed that individuals will act with integrity to ensure they believe an individual will comply with prudential and conduct standard expected and will provide the oversight and challenge of other Board and senior management appoints so that the firm as a whole operates to those standards. [1½]
The regulator also needs to ensure that across all board and senior managers that there is collectively sufficient competence and integrity so that the insurance company can carry out all its responsibilities. [½]
It is therefore reasonable that the regulator approves all board and senior management appointments. [½]

<u>Separation of roles of chairman, chief executive, finance director and chief risk officer</u>
These are four key executive roles of an insurance company. [½]
An individual needs to have sufficient time capacity to carry out their role. [½]
In a medium or large insurance company each of these roles individually requires a significant time commitment. Therefore separation of these roles is a practical necessity if the roles are to be carried out property. [1]

In a small insurance company each of these roles individually requires less time from a time and commitment perspective some or all these roles could be combined. [½]
However, combining these roles together results in an overly powerful and dominant position that is subject to inadequate oversight and challenge. [1]
Unchecked there is greater likelihood that the individual does not act competently with integrity at all times. Therefore, separation of the roles is reasonable given the importance of the individual roles and provide the conditions for adequate oversight and challenge. [1]

<u>The majority of the board consists of non-executive directors</u>
The non-executive directors are not involved in the day-to-day operation of the business. [½]
Non-executive directors act for and balance the interests of the key stakeholders of the insurance company, namely the shareholders (or members for a mutual), regulator, policyholders, the executive, other employees and ex-employees where the company has a financial responsibility for retirement benefits. [1]
If the majority of the board consists of non-executive directors they have a numerical advantage of being able to collectively outvote the executive which may be necessary. [½]
Through their numerical advantage and common responsibilities they are in a better position to be able to rely on the support of other non-executive directors in providing the required oversight and challenge of the executive. [½]
Executive directors are more likely individually and collectively to act appropriately if they know they don't have a majority and they know they will be subject to an a testing level oversight and challenge . [½]

<u>A director representing employees and pensioners</u>
Executive and non-executive directors have responsibilities for a range of stakeholders including employees and pensions. [½]
The employees and pensioners will have a level of representation across the board members. [½]
A director specifically representing employees and pensions will focused specifically on them rather than other stakeholders. This could be reasonable if their interests are not be adequately considered and balanced against other stakeholders. [1]
However, this can reduce the collective responsibilities other directors take for employees and pensioners relative to other stakeholders resulting in overall worse outcomes for employees and pensioners. [1]
There are pros and cons for giving a director individual responsibility for employees and pensioners. Unless there is systematic problem across all insurance companies were the interests of employees and pensioners are not be adequately taken into account there is little merit in the proposal. It could actually lead to worse outcomes for them. [1]

<u>Minimum of 40% of directors are male and minimum of 40% of directors are female</u>
The board of directors collectively needs sufficient competence and integrity so that the insurance company can carry out all its responsibilities. The breadth of diversity of the board can be measured subjectively and objectively in a number of ways. [1]
The gender diversity of the board is one simple indicator of potential bias within a board. [½]
The gender make-up of the board can affect how the relative interests of stakeholders are balanced, the behaviour of the board and the way oversight and challenge is carried out. [½]
A minimum of 40% of directors are male and 40% of directors are female will create a perception of diversity that is not otherwise apparent. It can assist in helping developing a cultural change in an insurance company supporting the prudential and conduct objectives and therefore the proposal has <u>long-term</u> merit. [1]

However, the long-term merit should not put at risk satisfying the immediate prudential and conduct objectives. This could occur if competency and integrity standards have to be reduced or the level of oversight and challenge by the directors is reduced. [1]
A high number of changes in board roles to statisfy the 40% standard is likely to result in a significantly loss of experience and a loss of continuity within the board. This increases risk that issues arise threatening the prudential and conduct objectives. [1]
The current gender diversity of directors for insurance companies will determine whether it is reasonable to move immediately to the 40% standard, whether the change needs to be phased in and any period of phase in. [1]
All of the above will bring new ideas/fresh perspectives [1]

[Marks available 30, maximum 15]

Candidates did not answer this question very well with few scoring more than half marks. A lot of candidates approached the question by listing and talking about stakeholders, this was not asked for in the question and this meant that the structure of the answers were difficult to follow and generally didn't cover the scenarios being raised. Stronger candidates focused on each of the 5 proposals and discussed the advantages/disadvantages of each, and these answers generally scored well – these candidates had clearly spent more time planning their answer and scored much better

Q7

(i)
Principal aim is to meet its liabilities as they fall due [1]
While taking appropriate risk [1]

Factors

- Need to be aware of the long-term investment strategy that will most closely match their liabilities by: [½]
    - Nature [½]
    - Currency [½]
    - Term [½]

- Also need to consider uncertainty of liability outgo, both in amount and timing [1]
- Tax
    - Tax treatment of different investments [½]
    - Tax position of the investor [½]
    - Will influence preference for income of capital growth [½]

- Cash flow requirements
    - Low present cash flow requirements may prefer low income yields investments [½]
    - Investors who need current income may prefer high income yielding investments [½]
- Restrictions on how it may invest [½]
- Size of assets, both in relation to its liabilities and in absolute terms [1]

- Satisfy requirements of regulators [½]
- Expected long-term return from various asset classes [½]
- Risk appetite [½]
- Institution's objectives [½]
- Need for diversification [1]
- Accounting impact [½]
- Competitors' strategies [½]
- Future liabilities [½]

[Marks available 13½, maximum 6]

(ii)
Reasons to invest

- An asset that matches long-term liabilities [½]
- Generates income through rent that would match regular outgo [½]
- Rent likely linked to an index, which may match nature of liabilities [1]
- High demand for building from students so little prospect of voids [½]
- Receipts in domestic currency [½]
- Diversification from current portfolio, either into property or types of property [½]
- Better expected long-term returns than other asset classes [½]
- Beneficial treatment by regulators [½]
- Potential government subsidies or preferential tax treatment [½]

[Marks available 5, maximum 3]

(iii)
Contrast differences between the two (give marks for same comment from the other perspective):

- Size of potential investment will be much larger for DB scheme [1]
- Expertise of DB scheme expected to be much greater than individual [1]
- Individual will incur higher relative expenses [½]
- Although liabilities of both are likely to be real in nature, the relevant inflation indices may be different [½]
- Different tax treatment of property [½]
- Individual may need to pool with other investors in order to access the opportunity, unless the inheritance is significantly large [½]
- Percentage of total assets required to invest likely to be greater for the individual than the DB scheme [½]
- Individuals will often not be in a position to accept very much risk [½]
- Individuals may be more concerned about short-term variations in market value [½]
- And liquidity [½]
- Individuals more likely to use insurance to mitigate effect of some types of uncertainty, whereas DB scheme may feel that self-insurance is more appropriate [1]
- Scheme may be subject to regulatory controls [½]

[Marks available 7½, maximum 4]

(iv)
Assess proposal

- Success will depend on supply of suitable houses [1]
- If there are no houses to buy nearby, then proposal will be ineffective [1]
- If houses are empty, then they are put to better use for the local economy by renting out [½]
- They will be cheap to buy but need to factor in cost moving to multi occupancy [1]
- Even if suitable houses are available, will take a long time to complete purchase and conversion, so doesn't solve problem in the short-term [1]
- Will owners be compelled to rent out to students? [½]
- If not, individuals may be tempted to rent out to other groups that may generate higher rents and returns e.g. young professionals. This could be the case if individuals are restricted in how much rent they could charge. [1]
- If only a few individuals able to afford to purchase the houses, it may inadvertently create a monopoly or a cartel, leading to higher rents charged to students [1]
- Other market forces [½]
- Regulation eg councils rules on multiple occupancy [½]

[Marks available 8, maximum 4]

(i) This part was answered very well with most candidates scoring nearly full marks
(ii) This part was generally well answered well
(iii) There was a tendency for this part to focus on (a) and (b) separately rather than contracting as the question asked. This led to micro effects being discussed that didn't score many marks.
(iv) This was answered reasonably well although some candidates didn't think widely enough to score full marks.

It is worth noting that some candidates answered (ii) in (iii) and examiners gave credit if this occurred.

Q8

(i)
The actual experience of a provider should be monitored to check whether the method and assumptions adopted for financing the benefits continue to be appropriate and, if not, what changes should be made to achieve the desired level of profit. [1]

The mortality experience will be monitored to: [½]

- update the methods and assumptions adopted so they reflect expected future experience more closely [½]

- monitor any trends in experience, [½]

particularly adverse trends, so as to take corrective actions; and [½]

- provide information to management and other key stakeholders. [1]

In particular if the mortality experience has been worse than assumed then the company would want to adjust both its pricing and reserving basis to reflect the experience that it has witnessed [1]
Given mortality is key for term assurance [½]

It would also want to ensure the experience is in line with the countries experience, industry and competitor's experience. If this isn't the case as well as revising the basis it will want to review all marketing material and approach to sales [1]

Will want to discuss experience with underwriters and reinsurers [½]
[Marks available 7, maximum 4]

(ii)
There are a number of factors that can influence the mortality rates over the country.

The main mortality factors are age and gender, and therefore one of the reasons for the experience could be the mix of business that was written. That is they could have been older than anticipated, but this should have been allowed for in the mortality assumptions so is unlikely to have impacted the experience analysis. [1½]
Changes to health care system [½]
Previous assumptions incorrect [½]
Random fluctuations [½]

Another reason for the experience could be because of a break out of a disease that is both infectious and has an impact of mortality rates, but this impact is likely to be more immediate than a general trend over 3 years [1]

In addition to variation by age and sex, mortality and morbidity rates are observed to vary:

- between geographical areas e.g. countries, regions of a country, urban and rural areas;
- by social class e.g. manual and non-manual workers [1½]

None of these categories provide a direct causal explanation of the observed differences. Rather, they are proxies for the real factors which cause the observed differences. Such factors are:

- occupation;
- nutrition;
- housing;
- climate/geography;
- education; and
- genetics. [3½]

Occupation can have several direct and indirect effects on mortality and morbidity.

Some occupations are naturally healthier, whereas some work environments give exposure to a less healthy lifestyle. If there has been a switch in business mix this would have a material impact on the experience seen over 3 years. Some occupations by their very nature attract more healthy or unhealthy workers. However, external factors can distort a presumed state of health, for example, former miners who have left the mining industry as a result of ill-health and then chosen to sell newspapers will inflate the morbidity rates of newspaper sellers.

A person's occupation largely determines their income, and this permits them to access a particular lifestyle, content and pattern of diet, quality of housing, access to healthcare. The effect on mortality and morbidity can be positive or negative. [2]

There could have also been a change in the unemployment rate that could of impacted the experience (assuming that the policyholders could continue to pay the premiums) [1]

Nutrition

Nutrition has an important influence on morbidity and in the longer term on mortality.

Poor nutrition can increase the risk of contracting many diseases and hinder recovery from sickness. In the longer term the burden of increased sickness can influence mortality.

There could have therefore been a change in nutritional habits that impacted the experience

[2]

Housing

The standard of housing encompasses not only all aspects of the physical quality of housing (state of repair, type of construction, heating, sanitation) but also the way in which the housing is used, such as overcrowding and shared cooking. These factors have an important influence on morbidity, particularly that related to infectious diseases (from tuberculosis and cholera to colds and coughs) and thus on mortality in the longer term.

There could have therefore been a change in housing for the companies policyholders that impacted the experience [2]

Climate/Geographical Location

Climate and geographical location are closely linked. Levels and patterns of rainfall and temperature lead to an environment which is amicable to certain kinds of diseases such as those associated with tropical regions.

Effects can also be observed within these broad categories - differences between rural and urban areas in a geographical region. Some effects may be accentuated or mitigated depending upon the development of an area, with industrial development leading to better roads and communications.

Natural disasters (such as tidal waves and famines) will also affect mortality and morbidity

[2]

Education

Education influences the awareness of the components of a healthy lifestyle which reduces morbidity and lowers mortality rates. It encompasses both formal education and more general awareness resulting from public health and associated campaigns. This effect can be apparent in aspects such as:

- increased income;
- choice of a better diet;
- the taking of exercise;
- personal health care;
- moderation in alcohol consumption and smoking;
- awareness of the dangers of drug abuse; and
- awareness of a safe sexual lifestyle.

Some of these are direct causes of increased morbidity such as smoking and excessive alcohol consumption, which lead to diseases such as lung and other forms of cancer, and strokes. A healthy lifestyle with improved fitness can lead to an enhanced ability to resist diseases.

There could have been a change in education policy that impacted the experience [2]

[Marks available 20, maximum 7]

(iii)
The results could be used to change the assumptions – either pricing, reserving or both. These could be implemented in different ways. [1]

They could be used to enhance the knowledge within the company or improve the modelling of the mortality risk. That is they could highlight areas to be wary of in future. [1]

However the result should not be used blindly. Three year's experience is not a long period and therefore the results could be used to highlight areas to monitor over the coming years or any changes to the assumptions monitored more regularly. [1]

They may need to be adjusted to be useful in the assumption setting – i.e, more detailed results may be required. [1]

They could influence the underwriting of the policies, i.e. change the approach or ask more questions specific to the risks, if selection was an issue a more onerous approach could be taken. Alter risk management approach. Alternatively could target a different business mix. [2]

[Marks available 6, maximum 3]

(iv)
The underwriting of the policy may not be sufficient meaning that prospective policyholders with particular conditions or lifestyles may be targeting the company e.g. smoking status, then lives who smoke will opt to buy a policy from this company rather than a company that uses smoking status as a rating factor. The outcome will be to lessen the effect of the controlled selection being used by the company as part of the underwriting process. The effect of self-selection by smokers is adverse to the company's selection process. It is an example of **adverse selection**. [3]

There could be **Temporary initial selection**. Each group is defined by a specified event (the select event) happening to all the members of the group at a particular age, e.g. buying the term insurance contract. The mortality or morbidity is estimated for each group and for the population that is not exposed to the specified event. The mortality/morbidity patterns in each group are observed to differ only for the first s years after the select event. The length of select period is s years. The differences are temporary, producing the phenomenon called temporary initial selection. The issue could be that there was an economic downturn and people made redundant (as an example) take up the policy more than other times [2]

The population can be divided into classes, for example, gender with classes of male and female or occupation with classes of manual and non-manual employment. The stochastic models (life tables) are different for each class. There are no common features to the models, they are different for all ages. This is termed **class selection –** this is unlikely to be the case in this scenario. [2]

When homogeneous groups are formed we usually assume that the factors used to define each group are the cause of the differences in mortality observed between the groups. However, there may be other differences in composition between the groups, and it is these differences that are the true cause of the observed mortality differences.

Ascribing mortality differences to groups formed by factors which are not the true causes of these differences is termed **spurious selection**. For example, when the population of England and Wales is divided by region of residence, some striking mortality differences are observed. [2]

[Marks available 9, maximum 4]

(i) This was well answered

(ii) This was answered OK but candidates needed to consider a wide range of factors to score all the marks available

(iii) This was answered well with most creating sufficient ideas to score well

(iv) Most candidates picked up on adverse selection but only the stronger candidates considering other forms of selection, indeed a lot of candidates focused solely on adverse selection picking up the 2 or 3 marks but not the others available.

END OF MARKING SCHEDULE

