# Subject SA2: Assignment X1

## 2017 Examinations

*Time allowed: 3 hours, plus 15 minutes reading time*

### Instructions to the candidate

1. *Please:*

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   - ***begin your answer to each question on a new page***
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**Number of following pages:** _______

**Please put a tick in this box if you have solutions and a cross if you do not:** ☐

**Please tick here if you are allowed extra time or other special conditions in the profession's exams:** ☐

Time to do assignment
(see Note below): _____ hrs _____ mins

Under exam conditions
(delete as applicable): yes / nearly / no

**Note:** If you take more than 3 hours, you should indicate how much you completed within this time so that the marker can provide useful feedback on your chances of success in the exam.

**Score and grade for this assignment (to be completed by marker):**

| Q1 | Q2 | **Total** | |
|---|---|---|---|
| __ / 63 | __ / 37 | __ / 100 | = _____% |

**Grade:** A B C D E **Marker's initials:** ________

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Please follow the instructions on the previous page when submitting your script for marking.

### *Feedback from marker*

### *Notes on marker's section*

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### *General comment*

*The Subject SA2 exam will consist of between one and four long questions which should be answered in a period of 3 hours (plus 15 minutes reading time). Most of the X Assignments contain two long questions, which has been the most common number of questions in exam papers to date, but you should also be prepared to cope with either one, three or four questions.*

### *Question X1.1*

A proprietary life insurance company is planning to launch a guaranteed equity product for the first time. You are the Product Pricing Actuary and, after some initial research and discussion with the Marketing Manager, the draft product design is:

- Single premium index-linked endowment assurance.
- After a one-month offer period all premiums are invested on the same date for a five-year term.
- The minimum premium is £10,000. There is no maximum premium.
- The default allocation rate is 100%. An extra 1% is given on premiums exceeding £25,000.
- The maturity value will be X% of the allocated amount plus Y% of the growth in the FTSE-100 in excess of Z%, where X, Y and Z are yet to be determined.
- The surrender terms are discretionary.
- The death benefit will be the greater of the allocated amount and 101% of the surrender value.

You have spoken to an investment bank about suitable assets with which to back the product, possibly alongside UK equities, and they are happy to create and supply a mixture of any or all of the following:

- Zero-coupon bonds
- Call options on the FTSE-100 index
- Put options on the FTSE-100 index.

(i) Discuss the possible advantages to both the company and policyholders of selling this product, explaining possible reasons for the launch. [6]

(ii) State the two asset combinations that are most commonly used to back guaranteed equity products. [2]

(Continued …)

(iii) Describe the risks to the company involved with launching this product. [18]

(iv) The Marketing Manager has now proposed the following modifications to the original design of the contract:

(a) Link the maturity value to the growth in a different stock index (one in continental Europe), since the appropriate derivatives can be acquired more cheaply, allowing policyholders a higher percentage participation in its growth.

(b) Split the investment up into ten identical policies, which may each be surrendered separately from the others, and guarantee the terms for surrender.

(c) Offer a choice of various different options for X, Y and Z.

(d) Extend the offer period to two months, in order to capture more money. Pay 4% *pa* interest on the investment during this period.

Discuss each of these proposals. [25]

The company intends to distribute the product primarily using financial advisers.

(v) Describe the requirements introduced by the Retail Distribution Review (RDR), including how they are likely to apply to the proposed product. [12]
[Total 63]

## *Question X1.2*

(i) Describe how the policyholder may be taxed on receipt of benefits arising from a UK life assurance or general annuity contract. [6]

(ii) A UK proprietary life insurance company sells a full range of life assurance and pensions contracts.

The following is an extract from its tax calculations for years X and X+1:

| | X<br>£m | X+1<br>£m |
|---|---|---|
| **BLAGAB** | | |
| taxable income | 1,500 | 1,300 |
| allowable expenses | (800) | (1,000) |
| accounting profit | 400 | 350 |
| **Non-BLAGAB** | | |
| accounting profit | (350) | 450 |

You are given the following information:

- The company was not XSE for year X–1
- there are no non-BLAGAB losses brought forward from year X–1
- the policyholder tax rate is 20%
- the rate of corporation tax is 21% throughout the relevant period
- the company does not receive any dividend income.

(a) Define minimum profit. [2]

(b) Calculate the tax paid by the insurer in respect of the policyholders and shareholders for years X and X+1. Give a brief explanation of each calculation you perform. [8]

(iii) A country has similar taxation and regulation to that of the UK. The tax authorities have just issued a consultation document outlining possible changes to the country's taxation regime. The section relating to life insurance companies reads as follows:

> "The legislation relating to the taxation of life insurance companies has become increasingly complex over the years as companies have become ever more ingenious at finding ways of reducing their tax bills.

> It is therefore proposed to replace the present basis of taxation of the Basic Life Assurance and General Annuity Business with a tax on premium income at a uniform rate of k%.
>
> The rate of tax will be chosen so that the total tax take from all companies for this business will be broadly unchanged."

You are the Chief Actuary of a medium-sized proprietary life insurance company in the country concerned that transacts only unit-linked business. All business is written in the BLAGAB fund. The company has experienced a steady moderate growth in new business for many years and has substantial free assets.

The company's board of directors has asked you to produce a report outlining the implications of the proposal on the insurer's competitive position, pricing, reserving, and any other relevant areas.

Discuss the points you would make in your report. You should assume that the proposed change applies only to future new business. [21]

[Total 37]

***End of paper***

# Subject SA2: Assignment X2

## 2017 Examinations

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# Subject SA2: Assignment X2

## 2017 Examinations

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**Score and grade for this assignment (to be completed by marker):**

| Q1 | Q2 | Q3 | Total | |
|---|---|---|---|---|
| __ / 22 | __ / 24 | __ / 54 | __ / 100 | = _____% |

**Grade:** A B C D E **Marker's initials:** ________

**Please grade your Assignment X1 marker by ticking the appropriate box.**

[ ] **Excellent** – the marker's comments were thorough and very helpful
[ ] **Good** – the marker's comments were generally helpful
[ ] **Acceptable** – please explain below how the marker could have been more helpful
[ ] **Poor** – the marker's comments were generally unhelpful; please give details below

Please give any additional comments here (especially if you rate the marker less than good):

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## *Question X2.1*

It is January 2017. A large proprietary life insurer, selling both with-profits and without-profits protection and savings contracts, has suffered poor results for a number of years, due to:

- a run of poor claims experience
- falling sales and poor persistency
- poor underwriting
- other internal failures.

The insurer has written to the PRA to say that its internal model forecasts that the insurer's solvency level is at risk of dropping below the statutory minimum in the imminent future.

You work for the PRA. Your manager is new to his role, and has asked you for an initial report, to discuss the situation. Outline the points you would make in your report, including:

(a) the particular issues raised as a result of the notification being made at this time

(b) the company's obligations in the event of a breach of its prudential requirements

(c) the measures that may be imposed by the regulator. [22]

## *Question X2.2*

A small UK life insurance company writes single premium unit-linked contracts with the following product features:

- The policy term is 10 years.
- Following deduction of a 5% initial charge, 95% of the single premium is invested in units.
- The customer can choose from a range of unit-linked funds, covering a wide range of asset classes.
- The death benefit is 101% of the value of units at the time of claim.
- A fixed annual management charge of 1.5% per annum is deducted from the unit fund. This charge is intended to cover both expenses and the cost of the death benefits in excess of the unit funds.
- A maturity guarantee applies, such that the benefit payable at maturity is the higher of the value of the units or 101% of the original single premium (provided no partial withdrawals have been taken during the policy term).

  To pay for the guarantee, an additional annual management charge is deducted from the unit fund. The value of this additional charge is fixed for the 10 year term and depends on the unit-linked fund selected by the customer.

Describe how the company might determine the best estimate liability for this product under Pillar 1 of Solvency II. [24]

### *Question X2.3*

A UK life insurance company sells only without-profits and unit-linked business. It has never sold with-profits business nor has it ever sold general or health insurance.

The company has asked for your advice on aspects of the Solvency II regime, in particular the Solvency Capital Requirement (SCR).

(i) Describe how the company's SCR would be calculated using the standard formula. (Details of the standard formula parameterisation are not required.) [15]

(ii) Outline the factors the company should have considered in deciding whether to use the standard formula or an internal model to determine its SCR. [5]

The company decided to use an internal model approach to calculate its SCR. You are placed in charge of the team that calculates the figures for the life insurance risk module. After considerable time to develop the model, you produce a detailed report for the Board which contained the following tables:

**Table A**: Capital required from individual risk 99.5% survival event stresses and from the combined 99.5% survival event stress.

| | *Capital required £m* |
|---|---|
| *Mortality* | 80 |
| *Longevity* | 300 |
| *Lapse* | 40 |
| *Expenses* | 50 |
| | |
| *Sum of individual stresses* | **470** |
| | |
| *Combined scenario result* | **308** |
| | |
| **Total benefit from combining stresses** | **162** |

You may assume that the figures for the other insurance risk sub-modules are sufficiently close to zero to be ignored.

**Table B**: The correlation matrix used to reflect the diversification between risks.

| | *Mortality* | *Longevity* | *Lapse* | *Expenses* |
|---|---|---|---|---|
| *Mortality* | 100% | –20% | 20% | 10% |
| *Longevity* | –20% | 100% | 0% | 0% |
| *Lapse* | 20% | 0% | 100% | 40% |
| *Expenses* | 10% | 0% | 40% | 100% |

(iii) Verify that the SCR for the life insurance risk module is approximately £308*m*. [4]

A Board member has commented that "surely combining all the stresses together will result in more, not less, capital required than the sum of the individual stresses, as we are at greater risk from everything bad happening at once".

(iv) Explain the points that you should cover in your reply to the Board member. [7]

(v) Explain the likely rationale for the following correlation assumptions from Table B:

(a) longevity and mortality

(b) lapse and mortality

(c) expenses and mortality [10]

You are then asked to look at how the insurance risks are correlated to the market risks. One of your conclusions is that equity market risk and lapse risk are positively correlated, *ie* stock market falls and increased lapses tend to happen together. You estimate the correlation to be 30%.

A new Board member who has recently joined from another UK life insurance company has questioned the rationale behind this equity and lapse correlation. In his previous company, which primarily sold unitised with-profits business, it was assumed that equity and lapses had correlation of –50%.

(vi) Explain why your conclusion for this company is different to the assumption made in the Board member's previous company. Consider both the size and sign of the correlation. [8]

The company's Risk Committee has commented that your report highlights the large risk from surrenders following equity market falls in respect of the company's unit-linked single premium bonds. These contracts have a guarantee to return at least the premium on surrender within the first ten years. The bond is one of the company's best selling products. A large proportion of policyholders invest in equity-based funds and the company has recently experienced high surrender rates following equity market crashes.

(vii) Describe how the company could reduce its exposure to this risk. [5]
[Total 54]

***End of paper***

# Subject SA2: Assignment X3

## 2017 Examinations

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## 2017 Examinations

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|---|---|---|---|---|
| __ / 50 | __ / 35 | __ / 15 | __ / 100 | = _____% |

**Grade:** A B C D E **Marker's initials:** ________

**Please grade your Assignment X2 marker by ticking the appropriate box.**

[ ] **Excellent** – the marker's comments were thorough and very helpful

[ ] **Good** – the marker's comments were generally helpful

[ ] **Acceptable** – please explain below how the marker could have been more helpful

[ ] **Poor** – the marker's comments were generally unhelpful; please give details below

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## *Feedback from marker*

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## *Question X3.1*

A medium-sized UK proprietary life insurance company writes all types of insurance business.

(i) Describe the points the company should consider in assessing the extent to which it is meeting its obligation to treat its with-profits policyholders fairly. [11]

The company's With-Profits Actuary is producing his annual report to confirm that the company has properly taken policyholders' interests into account in exercising its discretion and has treated its customers fairly. In doing so, he is conscious of the need to comply with the professional guidance, including TAS R and the Insurance TAS.

(ii) Outline the relevant requirements of TAS R and the Insurance TAS. [5]

A number of years of equity market falls, followed by a period of equity market volatility, has made the company concerned about the ongoing capital position of its with-profits fund.

(iii) Suggest possible management actions that could be taken in response to this concern and describe any TCF considerations relating to their implementation. [16]

The company decides to alter the allocation of the assets backing the with-profits liabilities within its with-profits fund as follows:

| | Current % | Proposed % |
|---|---|---|
| Equities | 25 | 0 |
| Property | 20 | 10 |
| Bonds (fixed interest) | 45 | 70 |
| Cash | 10 | 20 |
| **Total** | **100** | **100** |

(iv) Discuss the implications of this change for the company, including any actions it may take as a consequence, in the following areas:

(a) Implementing the change in asset mix

(b) Communicating the decision

(c) Illustrations

(d) Surplus distribution

(e) Retention of without-profits and unit-linked business. [18]

[Total 50]

### *Question X3.2*

A proprietary UK life insurance company, quoted on the Stock Exchange, has hitherto issued only individual unit-linked personal pensions business, sold mainly through a direct salesforce.

The company's directors wish to increase the level of new business significantly. Consequently, they propose to introduce the following new products, to be sold both through the existing direct salesforce and through financial advisers:

(a) immediate annuities issued as pensions business

(b) without-profits term assurances.

You have been asked to draft a report to the directors, setting out the issues that arise and the possible solutions. Discuss the points you would make, in respect of:

(i) the risks of the proposal [6]

(ii) the capital requirements and sources of capital [8]

(iii) the investment strategy [4]

(iv) underwriting and reinsurance [17]

[Total 35]

## *Question X3.3*

A UK life insurance company has a recently closed with-profits fund with a wide variety of conventional and unitised with-profits policies.

The Chief Actuary of the life insurance company has carried out some projections of the future financial position of the fund and has suggested a change to its investment strategy, with the following investment guidelines:

- 35% – 45% equity or property
- 50% – 65% fixed-interest
- 5% – 10% cash.

Describe how cashflow projections may have been used in order to reach this recommended investment mix. [15]

***End of paper***

# Subject SA2: Assignment X4

## 2017 Examinations

*Time allowed: 3 hours, plus 15 minutes reading time*

### Instructions to the candidate

1. *Please:*

   – *attempt all of the questions, as far as possible under exam conditions*

   – ***begin your answer to each question on a new page***

   – ***leave at least 2cm margin on all borders***

   – *write in black ink using a medium-sized nib because we will be unable to mark illegible scripts*

   – *note that assignment marking is not included in the price of the Course Materials. Please purchase Series Marking or Marking Vouchers before submitting your script.*

   – *note that we only accept the current version of assignments for marking, ie you can only submit this assignment in the sessions leading to the 2017 exams.*

2. *Please* ***do not****:*

   – *use headed paper*

   – *use highlighting in your script.*

### At the end of the assignment

If your script is being marked by ActEd, please follow the instructions on the reverse of this page.

In addition to this paper, you should have available actuarial tables and an electronic calculator.

### *Submission for marking*

You should aim to submit this script for marking by the recommended submission date. The recommended and deadline dates for submission of this assignment are listed on the summary page at the back of this pack and on our website at www.ActEd.co.uk.

Scripts received after the deadline date will not be marked, unless you are using a Marking Voucher. *It is your responsibility to ensure that scripts reach ActEd in good time*. ActEd will not be responsible for scripts lost or damaged in the post, or for scripts received after the deadline date. If you are using Marking Vouchers, then please make sure that your script reaches us by the Marking Voucher deadline date to give us enough time to mark and return the script before the exam.

When submitting your script, please:

- complete the cover sheet, including the checklist
- scan your script and cover sheet (and Marking Voucher if applicable) to a pdf document, then email it to: ActEdMarking@bpp.com
- **do not submit a photograph of your script**
- **do not include the question paper in the scan**.

In addition, please note the following:

- Please title the email to ensure that the subject and assignment are clear *eg* "SA2 Assignment X4 No. 12345", inserting your ActEd Student Number for 12345.
- The assignment should be scanned the **right way up** (so that it can be read normally without rotation) and as a single document. We cannot accept individual files for each page.
- Please set the resolution so that the script is legible and the resulting PDF is less than 3 MB in size. **The file size cannot exceed 4 MB**.
- Do not protect the PDF in any way (otherwise the marker cannot return the script to ActEd, which causes delays).
- Please include the "feedback from marker" sheet when scanning.
- Before emailing to ActEd, please check that your scanned assignment includes all pages and conforms to the above.

# Subject SA2: Assignment X4
## 2017 Examinations

| Please complete the following information: | |
|---|---|
| **Name:**<br><br>**ActEd Student Number** (see Note below):<br><br>**Note:** Your ActEd Student Number is printed on all personal correspondence from ActEd. Quoting it will help us to process your scripts quickly. If you do not know your ActEd Student Number, please email us at ActEd@bpp.com.<br><br>**Your ActEd Student Number is not the same as your IFoA Actuarial Reference Number or ARN.** | **Number of following pages:** _______<br><br>**Please put a tick in this box if you have solutions and a cross if you do not:** ☐<br><br>**Please tick here if you are allowed extra time or other special conditions in the profession's exams:** ☐<br><br>Time to do assignment (see Note below): _____ hrs _____ mins<br><br>Under exam conditions (delete as applicable): yes / nearly / no<br><br>**Note:** If you take more than 3 hours, you should indicate how much you completed within this time so that the marker can provide useful feedback on your chances of success in the exam. |

**Score and grade for this assignment (to be completed by marker):**

| Q1 | Q2 | **Total** | |
|---|---|---|---|
| __ / 53 | __ / 47 | __ / 100 | = ____% |

**Grade:** A B C D E **Marker's initials:** ________

**Please grade your Assignment X3 marker by ticking the appropriate box.**

[ ] **Excellent** – the marker's comments were thorough and very helpful

[ ] **Good** – the marker's comments were generally helpful

[ ] **Acceptable** – please explain below how the marker could have been more helpful

[ ] **Poor** – the marker's comments were generally unhelpful; please give details below

Please give any additional comments here (especially if you rate the marker less than good):

**Note**: Giving feedback on your marker helps us to improve the quality of marking.

Please follow the instructions on the previous page when submitting your script for marking.

| Please tick the following checklist so that your script can be marked quickly. Have you: | |
|---|---|
| [ ] | Checked that you are using the latest version of the assignments, *ie* 2017 for the sessions leading to the 2017 exams? |
| [ ] | Written your full name and email address in the appropriate box? |
| [ ] | Completed your ActEd Student Number in the appropriate box? |
| [ ] | Recorded your attempt conditions? |
| [ ] | Numbered all pages of your script (excluding this cover sheet)? |
| [ ] | Written the total number of pages (excluding the cover sheet) in the space above? |
| [ ] | Included your Marking Voucher or ordered Series X Marking? |
| [ ] | Rated your Assignment X3 marker? |

### *Feedback from marker*

### *Notes on marker's section*

The main objective of marking is to provide specific advice on how to improve your chances of success in the exam. The most useful aspect of the marking is the comments the marker makes throughout the script, however you will also be given a percentage score and the band into which that score falls. Each assignment tests only part of the course and hence does not give a complete indication of your likely overall success in the exam. However it provides a good indicator of your understanding of the material tested and the progress you are making with your studies:

A = Excellent progress B = Good progress C = Average progress
D = Below average progress E = Well below average progress

Please note that you can provide feedback on the marking of this assignment at:

**www.ActEd.co.uk/marking**

## *Question X4.1*

A UK life insurance company writes only unit-linked endowment assurances and immediate annuities. Under the endowment assurances, which are largely used as vehicles for saving for retirement, the benefit available on withdrawal is the value of the unit fund with no surrender penalties. The amount available at maturity is the value of the unit fund. The unit funds are invested in a range of equity funds and the company holds unit-linked assets equal to the face value of the unit funds.

The company is considering its Solvency II Pillar 1 balance sheet. In particular, it has re-stated its prior year balance sheet on the Solvency II basis, and then produced an analysis of the surplus which has emerged over the past financial year.

(i) Outline reasons why a company would analyse the change in surplus. [5]

An extract from the analysis of surplus is shown in the table below. In producing these results the company defined Solvency II surplus as being the excess of assets over best estimate liabilities (BEL).

Over the year considered in the table, yields on UK government and corporate bonds fell at all durations and equity markets fell slightly. The company has changed its discount rates in line with EIOPA's monthly discount rates and this impact is included within the "Investment return" item. Other elements of the best estimate basis are unchanged.

| *£m* | *Immediate Annuities* | *Unit-Linked Policies* |
|---|---|---|
| .... | | |
| **Economic variances:** | | |
| Investment return | –£5*m* | –£0.1*m* |
| **Non-economic variances:** | | |
| Deaths | +£1*m* | –£0.2*m* |
| Surrenders | £0*m* | –£3*m* |
| Expenses | –£1*m* | –£0.4*m* |
| .... | | |

(ii) Explain what may have caused the results shown in the table. [21]

(iii) Suggest actions the company might take in relation to items showing losses. [16]

(iv) Other than the items shown in the table, describe other components that might be included in an analysis of Solvency II surplus. [11]

[Total 53]

## *Question X4.2*

A UK proprietary life insurance company writes conventional without-profits protection policies and flexible premium unit-linked savings policies.

The company is considering how to calculate its market-consistent embedded value under Solvency II. The current proposal is to determine this as the sum of:

- Free surplus, which is defined as the excess of the market value of assets over the total Solvency II liabilities and capital requirements. Total liabilities and capital requirements comprise the best estimate liabilities (BEL), the risk margin (RM) and the Solvency Capital Requirement (SCR).

- The sum of the RM and the SCR, less the cost of holding these risk margin and capital requirements.

- The value of future profits on in-force business (VIF).

One view that has been expressed within the company is that the third of these elements, the VIF, is not required under the Solvency II regime and that the embedded value should consist of just the first two elements.

(i) Discuss whether or not the VIF element should be included in the company's calculation of the embedded value under Solvency II. [8]

A director has heard that some other companies have announced that they will no longer publish embedded value results in future. He is questioning whether this company should continue to publish an embedded value at all in future.

(ii) Discuss the factors the company should consider in deciding whether to continue to publish embedded value results in future. [7]

The company decides to continue to publish its embedded value and to include a VIF element that recognises only those profits that are not recognised in the free surplus. It intends to restate its opening embedded value using the Solvency II basis.

The company is now considering the approach it will take to analysing the change in its embedded value in future. The company currently analyses its embedded value in line with the approach suggested by the European Embedded Value (EEV) guidance.

The company includes the following items in this analysis:

| |
|---|
| *Opening Embedded Value* |
| Expected return on free surplus |
| Return on in-force business |
| – Expected return |
| – Experience variances |
| – Operating assumption changes |
| New business contribution |
| Development costs |
| *Operating return before tax and exceptional items* |
| Investment return variances |
| Effect of currency movements |
| Effect of economic assumption changes |
| Exceptional items |
| *Return on EV before tax* |
| Attributed tax |
| *Return on EV after tax* |
| Capital raised |
| *Less* Capital distributed |
| Closing Embedded Value |

(iii) Suggest how the company should determine each of the items in the analysis of change in embedded value in future. [13]

The company is about to run a major marketing campaign promoting its unit-linked savings policies and is confident that there will be a significant boost to sales as a result.

(iv) Assess how this marketing campaign might impact the current and future reported embedded value, including how the impacts would be classified in the analysis of change. [8]

The company is also considering withdrawing from one of the markets for without-profits business in which it operates. If it did so, it would probably seek a purchaser for its in-force business from this market to simplify future administration arrangements.

(v) Describe how you would expect the sale price to relate to the component of the published embedded value in respect of this block of business. [11]
[Total 47]

***End of paper***

# Subject SA2: Assignment X5

## 2017 Examinations

*Time allowed: 3 hours, plus 15 minutes reading time*

### Instructions to the candidate

1. *Please:*
   - *attempt all of the questions, as far as possible under exam conditions*
   - ***begin your answer to each question on a new page***
   - ***leave at least 2cm margin on all borders***
   - *write in black ink using a medium-sized nib because we will be unable to mark illegible scripts*
   - *note that assignment marking is not included in the price of the Course Materials. Please purchase Series Marking or Marking Vouchers before submitting your script.*
   - *note that we only accept the current version of assignments for marking, ie you can only submit this assignment in the sessions leading to the 2017 exams.*

2. *Please* ***do not****:*
   - *use headed paper*
   - *use highlighting in your script.*

### At the end of the assignment

If your script is being marked by ActEd, please follow the instructions on the reverse of this page.

In addition to this paper, you should have available actuarial tables and an electronic calculator.

### *Submission for marking*

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When submitting your script, please:

- complete the cover sheet, including the checklist
- scan your script and cover sheet (and Marking Voucher if applicable) to a pdf document, then email it to: ActEdMarking@bpp.com
- **do not submit a photograph of your script**
- **do not include the question paper in the scan**.

In addition, please note the following:

- Please title the email to ensure that the subject and assignment are clear *eg* "SA2 Assignment X5 No. 12345", inserting your ActEd Student Number for 12345.
- The assignment should be scanned the **right way up** (so that it can be read normally without rotation) and as a single document. We cannot accept individual files for each page.
- Please set the resolution so that the script is legible and the resulting PDF is less than 3 MB in size. **The file size cannot exceed 4 MB**.
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# Subject SA2: Assignment X5
## 2017 Examinations

**Please complete the following information:**

| | |
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| **Name:**<br><br>**ActEd Student Number** (see Note below):<br>[   ][   ][   ][   ][   ]<br><br>**Note:** Your ActEd Student Number is printed on all personal correspondence from ActEd. Quoting it will help us to process your scripts quickly. If you do not know your ActEd Student Number, please email us at ActEd@bpp.com.<br><br>**Your ActEd Student Number is not the same as your IFoA Actuarial Reference Number or ARN.** | **Number of following pages:** _______<br><br>**Please put a tick in this box if you have solutions and a cross if you do not:** [ ]<br><br>**Please tick here if you are allowed extra time or other special conditions in the profession's exams:** [ ]<br><br>Time to do assignment (see Note below): _____ hrs _____ mins<br><br>Under exam conditions (delete as applicable): yes / nearly / no<br><br>**Note:** If you take more than 3 hours, you should indicate how much you completed within this time so that the marker can provide useful feedback on your chances of success in the exam. |

**Score and grade for this assignment (to be completed by marker):**

| Q1 | Q2 | **Total** | |
|---|---|---|---|
| __/45 | __/55 | __/100 | = _____% |

**Grade:** A B C D E     **Marker's initials:** ________

**Please grade your Assignment X4 marker by ticking the appropriate box.**

[ ] **Excellent** – the marker's comments were thorough and very helpful
[ ] **Good** – the marker's comments were generally helpful
[ ] **Acceptable** – please explain below how the marker could have been more helpful
[ ] **Poor** – the marker's comments were generally unhelpful; please give details below

Please give any additional comments here (especially if you rate the marker less than good):

**Note**: Giving feedback on your marker helps us to improve the quality of marking.

Please follow the instructions on the previous page when submitting your script for marking.

| Please tick the following checklist so that your script can be marked quickly. Have you: | |
|---|---|
| [ ] | Checked that you are using the latest version of the assignments, *ie* 2017 for the sessions leading to the 2017 exams? |
| [ ] | Written your full name and email address in the appropriate box? |
| [ ] | Completed your ActEd Student Number in the appropriate box? |
| [ ] | Recorded your attempt conditions? |
| [ ] | Numbered all pages of your script (excluding this cover sheet)? |
| [ ] | Written the total number of pages (excluding the cover sheet) in the space above? |
| [ ] | Included your Marking Voucher or ordered Series X Marking? |
| [ ] | Rated your Assignment X4 marker? |

### *Feedback from marker*

### *Notes on marker's section*

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A = Excellent progress  B = Good progress  C = Average progress
D = Below average progress  E = Well below average progress

Please note that you can provide feedback on the marking of this assignment at:

**www.ActEd.co.uk/marking**

## *Question X5.1*

A large UK insurance company has a large portfolio of immediate annuity business.

(i) Discuss how the company might manage its longevity risk. [9]

The company currently invests primarily in traded fixed-interest assets, *eg* corporate bonds. Given the low yields currently available on these assets, the company is considering a strategy of investing a proportion of its portfolio in so called "alternative assets". In particular, it is investigating the possibility of investing in long-term infrastructure projects.

Such infrastructure projects would involve the insurer, as the investor, financing the construction and operation of properties (*eg* hospitals, schools, student accommodation, airports) and then providing them to the government and other institutions, (*eg* universities) under long-term contracts in return for a stream of revenue.

(ii) Describe the reasons why such investments may be attractive to the insurance company. [7]

(iii) Explain the practical difficulties the company would face in investing in such assets. [8]

(iv) Describe the risks to the insurance company of investing in these alternative assets. [14]

(v) Describe how the company might control the credit risk in relation to these investments. [7]

[Total 45]

## *Question X5.2*

A large proprietary life insurance company has two separate funds: a with-profits fund and a without-profits fund. The with-profits fund was launched 25 years ago to sell a wide variety of unitised with-profits business. All other business is written in the without-profits fund. Shareholders receive all the profits from the without-profits fund and 10% of the cost of all surplus distributions, on the supervisory valuation basis, from within the with-profits fund.

Both funds have a healthy solvency position. However, with-profits sales had fallen to very low levels, so the company's directors decided to close the with-profits fund to new business five years ago.

(i) State the main types of contracts that may have been written in the with-profits fund, and discuss the likely run-off pattern of this business. [5]

(ii) Describe how the company would determine the benefit amounts to be paid on these with-profits contracts. [14]

(iii) Describe the risks that the company faces in running this closed book of with-profits business. [14]

The company's directors would like to reduce the risk of running off the closed book. One suggestion is to allow with-profits policyholders to switch into one of the various unit-linked funds offered within the without-profits fund. Switches would not be allowed from any of the unit-linked funds into the with-profits fund. Switches would be calculated on the following basis:

"The surrender value will be used as a single premium to purchase a holding in the required fund."

(iv) Discuss this proposal. [8]

An alternative suggestion is to convert *all* of the remaining with-profits contracts to one of the contracts offered within the without-profits fund.

(v) Discuss the merits of this proposal and the issues that the company would need to consider before this suggestion was adopted. [14]

[Total 55]

# Subject SA2: Assignment X6

## 2017 Examinations

*Time allowed: 3 hours, plus 15 minutes reading time*

### Instructions to the candidate

1. *Please:*

   – *attempt all of the questions, as far as possible under exam conditions*

   – ***begin your answer to each question on a new page***

   – ***leave at least 2cm margin on all borders***

   – *write in black ink using a medium-sized nib because we will be unable to mark illegible scripts*

   – *note that assignment marking is not included in the price of the Course Materials. Please purchase Series Marking or Marking Vouchers before submitting your script.*

   – *note that we only accept the current version of assignments for marking, ie you can only submit this assignment in the sessions leading to the 2017 exams.*

2. *Please* ***do not****:*

   – *use headed paper*

   – *use highlighting in your script.*

### At the end of the assignment

If your script is being marked by ActEd, please follow the instructions on the reverse of this page.

| In addition to this paper, you should have available actuarial tables and an electronic calculator. |
|---|

### *Submission for marking*

You should aim to submit this script for marking by the recommended submission date. The recommended and deadline dates for submission of this assignment are listed on the summary page at the back of this pack and on our website at www.ActEd.co.uk.

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When submitting your script, please:

- complete the cover sheet, including the checklist
- scan your script and cover sheet (and Marking Voucher if applicable) to a pdf document, then email it to: ActEdMarking@bpp.com
- **do not submit a photograph of your script**
- **do not include the question paper in the scan**.

In addition, please note the following:

- Please title the email to ensure that the subject and assignment are clear *eg* "SA2 Assignment X6 No. 12345", inserting your ActEd Student Number for 12345.
- The assignment should be scanned the **right way up** (so that it can be read normally without rotation) and as a single document. We cannot accept individual files for each page.
- Please set the resolution so that the script is legible and the resulting PDF is less than 3 MB in size. **The file size cannot exceed 4 MB**.
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- Before emailing to ActEd, please check that your scanned assignment includes all pages and conforms to the above.

# Subject SA2: Assignment X6

## 2017 Examinations

| **Please complete the following information:** | |
|---|---|
| **Name:** | **Number of following pages:** _______ <br> **Please put a tick in this box if you have solutions and a cross if you do not:** ☐ <br> **Please tick here if you are allowed extra time or other special conditions in the profession's exams:** ☐ |
| **ActEd Student Number** (see Note below): <br> ☐☐☐☐☐ | Time to do assignment <br> (see Note below): _____ hrs _____ mins |
| **Note:** Your ActEd Student Number is printed on all personal correspondence from ActEd. Quoting it will help us to process your scripts quickly. If you do not know your ActEd Student Number, please email us at ActEd@bpp.com. <br> **Your ActEd Student Number is not the same as your IFoA Actuarial Reference Number or ARN.** | Under exam conditions <br> (delete as applicable): yes / nearly / no <br> **Note:** If you take more than 3 hours, you should indicate how much you completed within this time so that the marker can provide useful feedback on your chances of success in the exam. |

**Score and grade for this assignment (to be completed by marker):**

| Q1 | Q2 | Q3 | **Total** | |
|---|---|---|---|---|
| __ / 19 | __ / 43 | __ / 38 | __ / 100 | = ____% |

**Grade:** A B C D E **Marker's initials:** ________

**Please grade your Assignment X5 marker by ticking the appropriate box.**

[ ] **Excellent** – the marker's comments were thorough and very helpful

[ ] **Good** – the marker's comments were generally helpful

[ ] **Acceptable** – please explain below how the marker could have been more helpful

[ ] **Poor** – the marker's comments were generally unhelpful; please give details below

Please give any additional comments here (especially if you rate the marker less than good):

**Note**: Giving feedback on your marker helps us to improve the quality of marking.

Please follow the instructions on the previous page when submitting your script for marking.

| **Please tick the following checklist so that your script can be marked quickly. Have you:** | |
|---|---|
| [ ] | Checked that you are using the latest version of the assignments, *ie* 2017 for the sessions leading to the 2017 exams? |
| [ ] | Written your full name and email address in the appropriate box? |
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| [ ] | Included your Marking Voucher or ordered Series X Marking? |
| [ ] | Rated your Assignment X5 marker? |

***Feedback from marker***

***Notes on marker's section***

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D = Below average progress E = Well below average progress

Please note that you can provide feedback on the marking of this assignment at:

**www.ActEd.co.uk/marking**

### *Question X6.1*

A proprietary life company is reviewing the guarantees and options present in two of the products it currently sells. The products are:

(a) a unit-linked endowment assurance with fixed premiums and a guaranteed minimum death benefit of 50 times one year's premiums.

(b) a without-profits term assurance with the option to increase the sum assured without limit, without having to provide any further medical evidence (*ie* the increase in premium will be based on the standard rates at the time of the increase).

(i) Describe how the determination of unit prices in the unit-linked funds can be a source of risk to the company. [3]

You are the actuary responsible for the review of the guarantees and options.

(ii) Describe the reasons for offering the guarantees and options. [6]

(iii) Explain the risks to the company inherent in offering the guarantees and options. [4]

(iv) Discuss the implications of removing the guarantees and options for all new business. [6]
[Total 19]

### *Question X6.2*

A medium sized life insurer based in an economically developed country currently writes individual term assurance (TA) business solely in its domestic market. The Chief Executive Officer of the company has heard about microinsurance and is thinking of offering a TA microinsurance product in a rapidly developing nation.

(i) Discuss the factors that should be considered by the insurer before entering this market. [20]

(ii) Discuss how the experience under this proposed new product might differ from that under the standard TA product. [14]

(iii) Suggest actions which the insurer might take to try to improve any resultant adverse experience. [9]
[Total 43]

## *Question X6.3*

A UK life insurance company, concerned by falling levels of sales in recent years, is considering extending its product range in an effort to increase sales.

The options that are being considered are:

- Launch of an impaired annuity product. To date the company has offered only standard annuities. The company has yet to decide how it would define impairment and whether it would have an automated system (that offered applicants enhanced annuities given their response to a set of questions) or would underwrite and offer annuity terms on an individual case-by-case basis.

- Launch of a group life contract. Under this contract the premiums would be paid by the employer and the benefit would be a lump sum payable on the death of an employee.

(i) Describe the implications of the choice of definition of impairment and the advantages of each of the two potential approaches to determining the impaired annuity product terms. [9]

(ii) For each element of the impaired annuity pricing basis, other than mortality, describe how the assumption would be set. [7]

(iii) Describe how to determine the mortality assumption in the group life pricing basis. [8]

(iv) Describe other courses of action open to the company to try to achieve its objective of increasing sales. [14]

[Total 38]

***End of paper***

Assignment deadlines

## *For the session leading to the April 2017 exams – SA Subjects*

### *Marking vouchers*

| *Subjects* | *Assignments* | *Mocks* |
|---|---|---|
| **SA1 – SA6** | 29 March 2017 | 5 April 2017 |

### *Series X Assignments*

| *Series* | *Assignment* | *Recommended submission date* | *Final deadline date* |
|---|---|---|---|
| **X** **SA1 – SA6** | **X1** | **16 November 2016** | 18 January 2017 |
| | **X2** | **14 December 2016** | 1 February 2017 |
| | **X3** | **18 January 2017** | 15 February 2017 |
| | **X4** | **1 February 2017** | 1 March 2017 |
| | **X5** | **15 February 2017** | 15 March 2017 |
| | **X6** | **1 March 2017** | 29 March 2017 |

### *Mock Exams*

| *Subjects* | *Recommended submission date* | *Final deadline date* |
|---|---|---|
| **SA1 – SA6** | **22 March 2017** | 5 April 2017 |

We encourage you to work to the recommended submission dates where possible.

We strongly recommend that you submit your mock exam electronically in order for us to return your marked script to you in plenty of time before your exam. If you submit your mock on the final deadline date you are likely to receive your script back less than a week before your exam.

## *For the session leading to the September/October 2017 exams – SA Subjects*

### *Marking vouchers*

| *Subjects* | *Assignments* | *Mocks* |
|---|---|---|
| **SA1 – SA6** | 30 August 2017 | 6 September 2017 |

### *Series X Assignments*

| *Series* | *Assignment* | *Recommended submission date* | *Final deadline date* |
|---|---|---|---|
| **X** SA1 – SA6 | **X1** | **24 May 2017** | 12 July 2017 |
| | **X2** | **7 June 2017** | 19 July 2017 |
| | **X3** | **21 June 2017** | 26 July 2017 |
| | **X4** | **5 July 2017** | 2 August 2017 |
| | **X5** | **19 July 2017** | 16 August 2017 |
| | **X6** | **2 August 2017** | 23 August 2017 |

### *Mock Exams*

| *Subjects* | *Recommended submission date* | *Final deadline date* |
|---|---|---|
| **SA1 – SA6** | **23 August 2017** | 6 September 2017 |

We encourage you to work to the recommended submission dates where possible.

We strongly recommend that you submit your mock exam electronically in order for us to return your marked script to you in plenty of time before your exam. If you submit your mock on the final deadline date you are likely to receive your script back less than a week before your exam.