

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

Subject CA3 – Communications

Day 1

INSTRUCTIONS TO THE CANDIDATE

1. *You have two hours to prepare the presentation. You must then save the file, print it and hand in a copy.*
2. *Copies of the Formulae and Tables, Core Reading for subjects CT1 to CT8 inclusive and CA1 should be available electronically on your PCs. In addition to this you may refer to your workbook from today. No other material can be brought into the examination room.*
3. *You must not start preparing the presentation until instructed to do so by the supervisor.*
4. *At the end of the examination you should hand in this question paper and any notes made during the examination. You are permitted to take ONE copy of your slide presentation away with you which must be handed in at the end of your presentation tomorrow. You are not permitted to make any further copies of your presentation.*

PLEASE NOTE THAT THE CONTENT OF THIS PAPER IS CONFIDENTIAL AND STUDENTS ARE NOT TO DISCUSS OR REVEAL THE CONTENTS UNDER ANY CIRCUMSTANCES.

A manager in the Finance department of your organisation has sent you an e-mail as follows:

Jim,

I see that new regulations state that when determining annuity rates, insurance companies must use the difference in annuitant mortality rates between Males and Females based on standard industry published ratios.

The published ratios of Male to Female mortality rates relevant to annuities are:

Age 71 to 75 inclusive	147%
Age 76 to 80 inclusive	146%
Age 81 to 85 inclusive	143%

Looking at our annuity rates for a £50,000 fund size at age 70:

Male	£360 monthly
Female	£340 monthly

A ratio of 106%.

Do we have a risk that a male annuitant may claim that they should be receiving much more, i.e. something in the region of 40–50% more rather than just 6%?

Please can you prepare a 5 to 10 minute presentation to my management team to explain this?

Thanks,

Bob

A member of your team has provided the following further information:

Jim,

As usual Bob has only understood a part of the story. He has looked at the published q_x ratios — which are factually correct. But — if he'd looked at the detail of the underlying tables, he'd have noticed that the ratios for other factors such as p_x and e_x are very different. The ratio of the q_x isn't at all relevant when trying to consider the ratio between annuity rates.

Here are some points to help you in your presentation:

- The new regulations are known as the “Gender Discrimination Regulations”. They have been introduced to make it illegal to discriminate between Males and Females. For annuities this means that any difference in annuity rates needs to be proportionate, which is judged relative to the published industry-certified ratios that Jim has quoted.
- Individuals can make a legal claim for compensation if they think the rates they have been given are discriminatory.
- The published ratios show the ratio of male to female mortality rate (q_x) for the period 2002 to 2006, based on data from a certain number of participating companies. The data is taken from CMI tables AMC00 and AFC00.
- The published ratios cease at age 85 — but clearly annuities can last considerably longer. The CMI smoothed mortality tables show convergence between Male and Female q_x as age increases.
- I've attached an extract from the underlying CMI tables (AMC00 and AFC00) using the ultimate q_x only. As you can see the ratios for q_x , p_x and e_x are very different.
- The formula for annuity rates is:

$$\text{annual income} = (F * (1 - C) - IE - RE * a_x) / a_x$$

where:

F = Fund at outset

C = commission rate

IE = Initial expense

RE = Renewal expense — i.e. the cost of annual service

a_x = relevant annuity factor for this age

- Just looking at a_x — the a_x for a Female vs a_x for Male is not close to 147%.
- We use our own company mortality experience — not the published ratios. Our own experience is similar to the published industry data.
- We allow for expected improvement in mortality — which we expect to be different for males and females.

- Looking at the usual assumption that females outlive males by 3 to 4 years, I've looked at our rates for females aged 73 and 74. They are £358 for females aged 73, and £370 for females aged 74.

<i>Age x</i>	<i>q_{x ult}</i>	<i>Male</i>		<i>q_{x ult}</i>	<i>Female</i>	
		<i>p_x</i>	<i>e_x</i>		<i>p_x</i>	<i>e_x</i>
70	0.01933	0.98067	14.28438	0.01319	0.98681	16.76755
75	0.03377	0.96623	10.88436	0.02283	0.97717	13.04273
80	0.05761	0.94239	8.00153	0.03947	0.96053	9.75308
85	0.09553	0.90447	5.66793	0.06786	0.93214	6.96685
90	0.15317	0.84683	3.86804	0.11550	0.88451	4.72220
95	0.23602	0.76398	2.54569	0.19298	0.80702	3.01779
100	0.34676	0.65324	1.63700	0.31219	0.68781	1.83627
105	0.45311	0.54689	1.12133	0.43329	0.56672	1.19786
110	0.53526	0.46474	0.83177	0.52540	0.47460	0.86025
115	0.59671	0.40329	0.65444	0.59337	0.40663	0.66184
120	1.00000	0.00000	0.00000	1.00000	0.00000	0.00000

Male / Female ratio

	<i>q_{x ult}</i>	<i>p_x</i>	<i>e_x</i>
70	1.46595	0.99377	0.85191
75	1.47887	0.98881	0.83452
80	1.45974	0.98111	0.82041
85	1.40770	0.97032	0.81356
90	1.32619	0.95741	0.81912
95	1.22302	0.94667	0.84356
100	1.11073	0.94974	0.89149
105	1.04576	0.96502	0.93611
110	1.01876	0.97923	0.96689
115	1.00563	0.99178	0.98882
120	1.00000		

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