of expectation two pages earlier to be applied to give the answer 1.05^n. I should then expect a mighty alarm bell to be rung on the dangers of applying a linear operator to a product. Instead, the author gives a spurious argument which leads to an expected value of $0.9^{n/2}$. The following table is salutary, and shows that short-term behaviour is very surprising:

Number of days held	1	2	3	4	5	6	7
E(Value)	1.05	1.10	1.16	1.22	1.28	1.34	1.41
Pr(Profit)	0.5	0.25	0.5	0.31	0.5	0.34	0.5

The author writes: "we should expect our investment to be less than the initial amount after 2 days!"; he overlooks that, after 3, 5 and 7 days, we would have a 50% chance of making a healthy profit. A more satisfactory approach is to consider the log returns. Figure 1 shows the probability of a loss against the number of days held. The exact probabilities have a saw-tooth behaviour. The normal approximation using log returns is excellent. The conclusions are clear: the expected return tends to infinity, but the expected log return tends to minus infinity; the probability of making a profit tends to zero!

In conclusion, this book has much to offer the would-be actuary who wants to learn probability theory with a financial flavour. The financial motivation of probabilistic ideas is good, there are large numbers of worked examples and exercises, both with a largely financial setting, and much of the discussion has a nice economic insight. A useful addition to *Probability Theory with Applications in X*.

IAIN CURRIE

An Introduction to Actuarial Studies. By M. E. ATKINSON AND D. C. M. DICKSON (Edward Elgar Publishing, 2000)

This text is designed to be used in a general introductory first course in actuarial science. It is the basis for a 'taster' or 'attractor' course, to engage students' interest before they become more engrossed in the detail of actuarial theory.

Every academic actuary is aware that the students who select actuarial science have no real knowledge of what they have committed to until it is almost too late to escape! We start by teaching interest theory; not strictly actuarial, except in our love of notation. Not until they get into life contingencies do students really encounter the peculiarly actuarial blend of finance and uncertainty. This book is the basis of an introductory course which is designed to tackle this problem; it is three or four courses in actuarial science condensed into a single introductory course. Obviously a lot of detail must go; the students for whom this text is designed are new undergraduates, and relatively unsophisticated mathematically.

The first topic covered in the book is compound interest. Here the book goes into surprising detail. Coverage includes effective and nominal rates of interest; annuities immediate, due, $1/m$-thly; bond and commercial loan calculations. While this seems a lot — it is about $1/3$ of a full compound interest course, it is also hard to see what could be omitted, given the later requirements in the life contingencies section. My main disagreement with the authors is that it would have been possible to teach the ideas without going into details of the $1/m$-thly annuity; a change of time unit achieves the same result without the confusing additional notation. Still, perhaps it would not be an honest introduction to actuarial science without a pile of notation to learn.

The second topic is demography — a bit of a surprise to some, as demography has been rather downplayed in actuarial syllabuses, both in the United Kingdom and North America. Here the student is assumed to have some training in continuous probability distributions, required for understanding the force of mortality — again, this maybe takes an introductory course further than one would expect.

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The third topic is a verbal introduction to the major areas of actuarial practice — life insurance, superannuation, and general insurance. This is very helpful in giving an idea of the context of actuarial science.

The final chapter provides an introduction to life contingencies. More than an introduction, in fact, it provides the formulae for premiums for traditional annual premium life insurance. All this the student will meet again, in a more rigorous setting, in a higher level life contingencies course, but introducing the ideas at an early stage may help students understand early the nature of actuarial calculations. It should also make the whole subject easier the second time they meet it.

The book is very easily readable; the pedagogical expertise of the authors comes through in simple, clear and intuitive explanations of actuarial concepts that most students find difficult.

There are some omissions: it would have been nice to see more coverage of background ideas which are important to insurance and pensions practice, but not necessarily to be covered in a lot more detail later. Examples would include utility and insurance, moral hazard and risk management, and some discussion of the asset side of insurance and pensions management. There is not much that connects the chapters to each other.

Overall though, this book provides a well written introduction to actuarial science. For a student just embarking on the actuarial examinations, it provides a swift overview of the actuarial material that they will be poring over for the next few years.

MARY HARDY

Lundberg Approximations for Compound Distributions with Insurance Applications. BY G. E. WILLMOT AND X. S. LIN (Springer, 2000)

Willmot and Lin are well-known researchers in actuarial science, and this book might more aptly be titled *Collected Works, 1994-2000* . It reflects the many contributions they have made to the literature in actuarial science and applied probability over that period. By contrast, their chosen title hides the fact that, at the heart of this work, is the authors' fondness for reliability theory, in particular reliability classifications of distributions. I offer this comment as a warning that, if this is not a subject close to your heart, you will find many parts of the text hard going. This review may be jaundiced by the fact that I include myself in this category!

So, briefly, what is the book about? The main topics are compound distributions, bounds for tail probabilities of these distributions, defective renewal equations and their application to selected problems in ruin theory.

Rather strangely, compound distributions are not discussed in detail until Chapter 4, some fifty pages into the text. Following a brief introductory chapter, Chapter 2 is devoted to reliability theory. Here we are introduced to concepts such as failure rate (force of mortality in actuarial-speak), equilibrium distributions and residual lifetime distribution. The authors then bombard us with the language of reliability theory and classifications of distributions: NWU (new worse than used); IMRL (increasing mean residual lifetime); and UBAE (used better than aged in expectation), to name but a few bits of jargon. I have the advantage of having read many of the authors' research papers, so I had a good idea where this was all leading, but, for a first-time reader, this chapter may appear both dry and baffling.

Chapter 3 contains a short discussion on mixed Poisson distributions. It contains a number of bounds for ratios of tail probabilities, including bounds based on reliability classifications of the mixing distribution. From counting distributions in Chapter 3, we move to compound distributions in Chapter 4. These are the standard tool for modelling aggregate claims distributions. After a discussion of basic ideas and some illustrations of cases where tail probabilities can be found exactly, the authors derive general upper and lower bounds for tail probabilities of compound distributions. These are based on inductive arguments. A feature of the text is that it is written in a style that: "involves the use of elementary analytic

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