

Actuarial Update

Issue 5
May 2005

Introduction

This issue will follow up on the themes of the previous Update – looking at developments in the markets, both globally and locally, as well as some interesting theory behind mortality functions.

Please feel free to contact us if there is any specific subject you would like covered in a future *Update*. Please also send us any queries relating to damages calculations. Send a **fax** to (021) 422 4378 or **email** update@iac.co.za

Economic and market indicators

The following table shows selected economic and market indicators for the major economies as well as for South Africa. It is interesting to note the turn in markets towards the end of 2004, indicating global slowdown due to rising interest rates, inflation and high and sustained oil and commodity prices. Also of interest is South Africa's excellent performance, due to good fundamentals, including low inflation and stable interest rates.

Indicators	USA	Europe	UK	Japan	SA
GDP growth	3.8%	0.6%	2.8%	0.5%	4.0%
Consumer prices	3.0%	2.1%	1.6%	-0.3%	2.6%
Equities - 2005 Q1	-2.2%	-1.2%	1.6%	-1.9%	6.0%
Past 12 months	6.7%	19.1%	18.8%	-2.3%	28.2%
Bonds - 2005 Q1	-0.5%	-3.6%	-1.5%	-3.1%	-0.3%
Past 12 months	1.2%	11.6%	8.9%	0.4%	15.2%
Interest rates	5.0%	2.2%	5.0%	0.1%	7.8%

Laws of Mortality

In the days before computers, a number of so-called "laws of mortality" – mathematical expressions for a function on a life table such as death rates – were developed to help simplify the calculation of mortality functions.

The most famous law is that of Gompertz (1825), which provided a simple expression for the instantaneous death rate (force of mortality) at a particular age.

Such laws are of limited use in today's computerized era, and also because it is unlikely that any single mathematical function can reproduce actual experience sufficiently closely – especially since mortality functions can vary significantly over different age ranges.

However, application of such a law can be used to quickly and easily calculate the reduction in life expectancy for an impaired life given the higher mortality to be suffered by such a life. This higher mortality is often expressed by medical experts in terms of the Standardised Mortality Ratio (SMR).

Estimating reduction in life expectancy from SMR

The SMR of an impaired class of lives relative to the standard class may be thought of as a ratio of two instantaneous death rates (or forces or mortality), this ratio being taken as the same for all ages under consideration.

For example, an SMR of 2 (or 200%) for (say) epilepsy versus "normal" lives means the instantaneous death rate of the former is twice normal at all relevant ages.

Assuming that Gompertz' law holds, we can derive the following formula that gives an approximation of the reduction in life expectancy for an impaired life subject to an SMR of α :

$$r = \frac{\log_e(\alpha)}{\log_e(c)}$$

where r = No of years reduction in life expectancy (from "normal")
 α = SMR
 c = A constant from the Gompertz formula

Gompertz' law is often found to be quite accurate (at least to a first approximation) for ages over about 25 or 30. The value of c depends on the life table under consideration, but is usually in the range 1.07 to 1.12. Some quick calculations using the SALT84-86 life tables indicate a value for c of 1.09.

For example, a male impaired life aged 45 with an SMR of, say, 2, has a reduction in life expectancy of 8 years ($\ln(2)/\ln(1.09)$). Given that a "normal" male life aged 45 has a life expectancy of 27 years (SALT84-86 "white"), the impaired life expectancy is approximately 19 years.

Note the above is only a rough approximation for the reduction in life expectancy and depends on the following assumptions:

- that Gompertz' law holds; and
- that the value chosen for c is appropriate for the life table under consideration

The above formula is also not very appropriate for ages under 25.

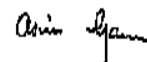
Changes in fees for actuarial reports

Please note that certain of the fees for our actuarial reports will change from 1 June 2005. Although we have had to increase fees for our full reports, we are glad to report that we have been able to reduce the fee for our one-page Actuarial Assessment of Loss. Please feel free to contact us for more detail.

Kind Regards,



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