Investment Guarantees; Modelling and Risk Management for Equity-Linked Life Insurance

Errata

Here are some errata for my book "Investment Guarantees; Modelling and Risk Management for Equity-Linked Life Insurance"(Wiley, 2003). If you find any more, please email me at mrhardy@uwaterloo.ca.

Page 32 In equation (2.19) and the following RSLN-2 model development section, we assume that $S_0 = 1.0$.

Page 35 In Equation (2.31) there should be an x in the denominator, giving a correct equation:

$$f_{S_n}(x) = \sum_{r=0}^{n} \frac{1}{\sigma^*(r)\, x}\, \phi\left(\frac{\log x - \mu^*(r)}{\sigma^*(r)}\right) p_n(r) \tag{1}$$

Page 38 In the characteristic function in Equation (2.33),the left hand side should be $\phi(t)$, not $\phi(X)$.

Page 38 The stochastic volatility model described is not a sensible model, since the volatility just keeps increasing if $a > 0$ (and may become negative if $a < 0$. A better model might be that described in Campbell, Lo and McKinlay (1996), where the log return y_t is modelled as:

$$y_t = \mu + \sigma_t\, \epsilon_t \quad \text{and} \quad \sigma_t = e^{\alpha_t/2} \tag{2}$$

$$\text{where} \quad \alpha_t = \phi\alpha_{t-1} + \varepsilon_t^{\sigma} \tag{3}$$

where ϵ_t and ε_t^{σ} are serially independent and independent of each other, and are both Normally distributed with zero mean.

Page 74 The table 4.4 is calculated using more accurate $p_{1,2}$ and $p_{2,1}$ parameters. Using the rounded values of $p_{1,2} = 0.037$ and $p_{2,1} = 0.21$, as given in the text, gives a distribution for R_{12}:

r	$\Pr[R_{12}=r]$	r	$\Pr[R_{12}=r]$
0	0.011205	7	0.040641
1	0.007352	8	0.050770
2	0.010314	9	0.062445
3	0.014111	10	0.075643
4	0.018894	11	0.090206
5	0.024815	12	0.561580
6	0.032020		

Page 76 In line 5 the term 1.645 has been omitted; it should read:

"So, if $\tilde{p} - 1.645\sqrt{\frac{\tilde{p}(1-\tilde{p})}{m}}$ is greater than the required probability..."

Page 98 π_1 is wrongly defined, it should be

$$\pi_1 = \frac{p_{2,1}}{p_{1,2} + p_{2,1}}$$

Page 100 In equation (6.9) the exponent for $(1-m)$ should be $t-1$, so the correct formula for $M-t$ is

$$M_t = m_c \, F_{0^-} \frac{S_t(1-m)^{t-1}}{S_0}$$

Page 100 In equation (6.11) the sign should be + not -.

Page 101 In equation(6.14) the power for the first (1-m) term should be t, not $t-1$.

Page 102 Under Table 6.1, the net present value of the future liability in this case should be -0.055, not -0.145.

Page 103 In the right hand side of equations (6.15) to (6.17) the second 1.0 should not be there; the second term in the argument of the max function should be $\frac{F_{n_r^-}}{F_{n_{r-1}^+}}$.

$$\begin{aligned}
G_1 &= \max(G_0, F_{n_1^-}) = G_0 \max\left(1.0, \frac{F_{n_1^-}}{F_{n_0^+}}\right) \\
G_2 &= \max(G_1, F_{n_2^-}) = G_0 \prod_{r=1}^{2} \max\left(1.0, \frac{F_{n_r^-}}{F_{n_{r-1}^+}}\right) \\
&\vdots \\
G_k &= \max(G_{k-1}, F_{n_k^-}) = G_0 \prod_{r=1}^{k} \max\left(1.0, \frac{F_{n_r^-}}{F_{n_{r-1}^+}}\right)
\end{aligned}$$

Page 136 The numbers in Table 8.1 are incorrect. The correct table is:

Guarantee	Term to maturity T		
% of fund	5	10	20
60	0.549	0.604	0.217
80	2.333	1.696	0.473
100	5.866	3.423	0.826
120	11.099	5.725	1.262
${}_Tp^{\tau}_{50}$	0.65520	0.42247	0.15972

Example hedge costs, % of fund at the valuation date, for a GMMB, with allowance for policyholder exits following Appendix A.

Page 137 The exponent T in equations (8.7) and (8.8) should be t.

Page 137 The numbers in Table 8.2 are incorrect. The correct table is:

Guarantee	Term to maturity T		
% of fund	5	10	20
60	0.0062	0.0306	0.0947
80	0.0392	0.1189	0.2743
100	0.1392	0.3145	0.6033
120	0.3324	0.6411	1.1006

- On page 140 the first term in the equation for

$$S_0 \frac{\partial H(0,t_3)}{\partial S_0}$$

is missing the $(1-m)^{t_1}$ term. The correct equation should be

$$\begin{aligned} S_0 \frac{\partial\, H(0,t_3)}{\partial\, S_0} &= \left(-S_0\,(1-m)^{t_1}\Phi(-d_1(t_1)) + S_0(1-m)^{t_1}\right) \times \\ &\quad \left\{1 + P(t_2-t_1)\,(1+P(t_3-t_2)) + (1-m)^{t_2-t_1}\,P(t_3-t_2)\right\} \\ &\quad -S_0(1-m)^{t_1} \end{aligned}$$

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