Implementing Derivatives Models: Errata – November 23, 2000

Notation

Page xvi, line 9, column 3 `Ov` should be `C`.

Chapter 1

Page 3, the second section heading should be labelled 1.2.

Chapter 2

Page 12, paragraph 2, line 4 equation should read:

$$S_{i,j} \;=\; Su^j d^{i-j}$$

Thanks to Bernard Murphy, Senior Lecturer, University of Limerick.

Page 18, paragraph 1, lines 3 to equation (2.13) should read:

Cox, Ross and Rubinstein (1979) (CRR) chose equal jump sizes which leads to

[replace equation (2.12) with equation (2.13)]

Jarrow and Rudd (1983) (JR) set the probabilities equal which leads to

[replace equation (2.13) with equation (2.12)]

Thanks to Martin Godsk Hansen, SimCorp A/S, Denmark.

Page 19, paragraph following equation (2.19) should read:

... Trigeorgis (1991) ...

Thanks to Martin Godsk Hansen, SimCorp A/S, Denmark.

Page 20, figure 2.8, the volatility should be 30%, i.e. $\sigma = 0.3$

Thanks to Ed Fleth, BNP Cooper Neff, USA.

Page 28, figure 2.15, the 5th last line of code should read:

```
C[j] = dpd*C[j-1] + dpu*C[j+1]
```

Page 45, equations (2.38), (2.40) and (2.41) should read:

$$\begin{aligned}
E[\Delta x_1^2] &= (p_{uu} + p_{ud})\Delta x_1^2 + (p_{du} + p_{dd})\Delta x_1^2 = \sigma_1^2\Delta t + \nu_1^2\Delta t^2 \\
E[\Delta x_2^2] &= (p_{uu} + p_{du})\Delta x_2^2 + (p_{ud} + p_{dd})\Delta x_2^2 = \sigma_2^2\Delta t + \nu_2^2\Delta t^2 \\
E[\Delta x_1 \Delta x_2] &= (p_{uu} - p_{ud} - p_{du} + p_{dd})\Delta x_1\Delta x_2 = \rho\sigma_1\sigma_2\Delta t + \nu_1\nu_2\Delta t^2
\end{aligned}$$

Thanks to David Chase, Columbia Energy, USA and Victor Karlsson, ABN Amro.

Chapter 3

Page 52, the reference after "Crank-Nicolson" on line 9 should be:

Courtadon, 1982b

Page 63, line 3 should read:

Example: Pricing an American Put Option by Explicit Finite Difference

Page 70, in figure 3,13, the last for loop should read:

```
for j = Nj-2 downto -Nj+1 do
  C[1, j] = ( pp[j] - pu*C[1,j+1] )/pmp[j]
next j

C[1, -Nj] = C[1, -Nj+1] - lambda_L
```

Page 75, in figure 3.16, the last for loop should read:

```
for j = Nj-2 downto -Nj+1 do
  C[1, j] = ( pp[j] - pu*C[1,j+1] )/pmp[j]
next j

C[1, -Nj] = C[1, -Nj+1] - lambda_L
```

Thanks to Bakulesh Thakker.

Chapter 4

Page 97, line 18 of the psuedo-code:

It has been suggested that this line should read,

```
cv = cv + delta*(Stn-St*erddt)*exp(T-(t+dt))
```

however, we have purposely omitted the inflation factor as it does not improve the control variate greatly and is wasted computation.

Page 106, figure 4.15, line 6 (`lnS = ln(S)`) should be removed.

Page 109, "Example", line 5 should read:

$$\ldots, S_2 \;=\; 110, \ldots$$

Thanks to Dr. Mike Staunton, independent consultant based in the UK.

Page 112, equations (4.41) and (4.42) should read:

$$dS_1 \;=\; (r-\delta_1)S_1dt + \sigma_1 S_1 dz_1$$

$$dS_2 \;=\; (r-\delta_2)S_2dt + \sigma_2 S_2 dz_2$$

Page 113, line 12 add:

```
V1 = sig1*sig1

V2 = sig2*sig2
```

Page 113, line 18 add:

```
Vt1 = V1

Vt2 = V2
```

Page 118, equation (4.49), expression for a should read:

$$a \;=\; \frac{m}{N}\ln(G_t) + \frac{N-m}{N}((\ln(S) + \nu(t_{m+1}-t) + \tfrac{1}{2}\nu(T-t_{m+1}))$$

Thanks to Andrea Lucchesi, Banca del Salento, Italy

Page 120, figure 4.24, line 21 should read:

```
G = productSt^(1/N)
```

Page 127, equation (4.54) should read:

$$\begin{aligned} &\text{repeat} \\ &\qquad x_1 \;=\; 2\times\ \text{standard\_uniform\_random\_number}\ -1 \\ &\qquad x_2 \;=\; 2\times\ \text{standard\_uniform\_random\_number}\ -1 \\ &\qquad \ldots \end{aligned}$$

Page 131, the line above equation (4.58) should read:

$\ln(M)/\ln(p)), a_{0,l} =$ integer part of $(M\% p^l)),^{12}\ l = 0,\ldots,m$

Chapter 5

Page 151, 4th line from the bottom of pseudo-code should read:

```
C[i,j] = X_rebate - (X_rebate-C[i,j])/(St[j+1]-St[j])*(H-St[j])
```

Page 155, equation (5.26) should read:

$$C_{N,j,k} \;=\; \max(0, F_{N,j,k}-K)$$

Page 162, equation (5.35) should read:

$$C_{N,j,k} \;=\; \max(0, F_{N,j,k}-K)$$

Page 167, equation (5.42) should read:

$$C_{N,j,k} \;=\; \text{pay-off}\,(F_{N,j,k})$$

Page 167, equation (5.43) should read:

$$C_{i,j,k} \;=\; \max\left\{e^{-r\Delta t_i}\left(p_{\mathrm{u},i,j}C_{i+1,j+1,\mathrm{u}} + p_{\mathrm{m},i,j}C_{i+1,j,\mathrm{m}} + p_{\mathrm{d},i,j}C_{i+1,j-1,\mathrm{d}}\right), \text{pay-off}\,(F_{i,j,k})\right\}$$

Chapter 6

Page 190, equation (6.15) should read:

$$\text{caplet}(t, t_k, t_{k+1}) \;=\; P(t, t_{k+1})[f(t, t_k, t_{k+1})N(d_1) - R_{\text{cap}}N(d_2)]\Delta\tau L$$

Page 191, figure (6.5) should read:

Caplet(0,0.75,1.0) 0.0012

See also the updated Chapter 6 Numerical Examples Spreadsheet.

Page 192, 2nd line should read:

$$\begin{aligned}\text{caplet }(0, 0.75, 1) &= 0.9512(0.05 \times N(1.2599) - 0.045 \times N(1.1733))0.25(1) \\ &= 0.0012\end{aligned}$$

Page 192, equation (6.16) and following line should read:

$$\text{swaption}(t) \;=\; \Delta\tau \sum_{i=1}^{n} P(t, T_i)[R_{\text{fswap}}N(d_1) - KN(d_2)]$$

where R_{fswap} is the forward swap rate, n is the number of reset periods of the swap and $\Delta\tau$ is the reset period.

Page 193, last line of figure (6.6) should read:

Swaption 0.0052

Page 193, last two lines should read:

$$\begin{aligned}\text{swaption} &= 0.5(0.8825 + 0.8607)[0.0506 \times N(0.1587) - 0.050 \times N(-0.0971)] \\ &= 0.0052\end{aligned}$$

Page 195, equation (6.27) should read:

$$p(t, T, s) \;=\; \ldots$$

Thanks to Dr. Mike Staunton, independent consultant based in the UK.

Page 196, the first equation in the "Example: Vasicek" should read:

$$r_0 \;=\; \bar{r} \;=\; 0.05$$

Page 198, line before equation (6.32) and parts of equation (6.32) should read:

European pure discount bond option prices ...

$$\theta \;=\; \sqrt{(\alpha^2 + 2\sigma^2)}\,, \qquad \phi = \frac{2\theta}{\sigma^2(e^{\theta(T-t)} - 1)}\,,$$

$$r^* = \ln\left(\frac{A(T,s)}{K}\right) \Big/ B(T,s)$$

Thanks to Dr. Mike Staunton, independent consultant based in the UK.

Page 199, figure 6.9, a number of the calculations are incorrect. The bottom half of the table should be:

option price

θ	0.2062	A(1,5)	0.9521
ϕ	180.09	B(0,5)	3.4199
ψ	35.62	B(1,5)	2.9498
		r*	0.1191
		call(0,1,5)	0.1463

See also the updated Chapter 6 Numerical Examples Spreadsheet.

Page 200, lines 7-9 should read:

$$\begin{aligned}
\theta &= \sqrt{0.15^2 + 2(0.1)^2} = 0.2062 \\
\phi &= \frac{2(0.2062)}{0.1^2(e^{0.2062(1)} - 1)} = 180.09 \\
\psi &= \frac{0.15 + 0.2062}{0.1^2} = 35.62
\end{aligned}$$

Thanks to Dr. Mike Staunton, independent consultant based in the UK.

Page 200, line 11 should read:

$$r^* = \ln\left(\frac{A(1,5)}{K}\right) \Big/ B(1,5) = \ln\left(\frac{0.9521}{0.67}\right) \Big/ 2.9498 = 0.1191$$

Thanks to Dr. Mike Staunton, independent consultant based in the UK.

Page 200, line 14 should read:

$$2r^*[\phi + \psi + B(1,5)] = 2(0.1191)(180.09 + 35.62 + 2.9498) = 52.0917$$

Thanks to Dr. Mike Staunton, independent consultant based in the UK.

Page 200, lines 16-18 should read:

$$\begin{aligned}
\frac{2\phi^2 r e^{\theta(1)}}{\phi + \psi + B(1,5)} &= \frac{2(180.09)^2(0.05)e^{0.2062(1)}}{180.09 + 35.62 + 2.9498} = 18.2288 \\
2r^*[\phi + \psi] &= 2(0.1191)(180.09 + 35.62) = 51.3890 \\
\frac{2\phi^2 r e^{\theta(1)}}{\phi + \psi} &= \frac{2(180.09)^2(0.05)e^{0.2062(1)}}{180.09 + 35.62} = 18.4781
\end{aligned}$$

Thanks to Dr. Mike Staunton, independent consultant based in the UK.

Page 200, line 20 and 21 should read:

$$\begin{aligned} c(0,1,5) &= 0.7835 \times \chi^2(52.0917; 3, 18.2288) - 0.67 \times 0.9513 \times \chi^2(51.3890; 3, 18.4781) \\ &= 0.7835 \times 0.9999395 - 0.67 \times 0.9513 \times 0.9999059 \\ &= 0.1463 \end{aligned}$$

Thanks to Dr. Mike Staunton, independent consultant based in the UK.

Page 202, the values in the last line of figure 6.11 should be:

1.0 0.9388 5.888% 5.29% 0.4323 −0.0022 0.0285

Chapter 7

Page 213, figure (7.2) - *See the updated Chapter 7 Numerical Examples Spreadsheet.*

Page 214, 2nd line should read:

$$\text{caplet}(0, 0.16, 0.41) = 0.9733[0.0671 \times N(-0.6513) - 0.07 \times N(-0.7126)] \times 0.25 \times 1$$

See also the updated Chapter 7 Numerical Examples Spreadsheet.

Page 214, figure (7.3) - *See the updated Chapter 7 Numerical Examples Spreadsheet.*

Page 220, figure (7.5) - *See the updated Chapter 7 Numerical Examples Spreadsheet.*

Page 221, equation (7.20) should read:

$$d \ln r = \left[\theta(t) + \frac{\sigma'(t)}{\sigma(t)} \ln r\right] dt + \sigma(t) dz$$

Page 227, figure 7.10 bottom right hand corner should read:

d1	5.3613
d2	5.3164
c(0,1,5)	**0.1660**

Page 229, last line of "Example: European Option Calculation" should read:

$$c(0,1,5) = 0.7788 \times N(5.3613) - (0.6442)(0.9512) \times N(5.3164) = 0.1660$$

Page 232, endnote 1, reference should be Strickland (1992a).

Thanks to Martin Godsk Hansen, SimCorp A/S, Denmark.

Page 232, in Appendix 7.1, the expression for η should begin:

$$\eta = \frac{\sigma_1^2}{4a}\left(1 - e^{-2a(T-t)}\right) B(T,s)^2 - \ldots$$

Chapter 8

Page 234, figure 8.1, lower r_U should be r_D and upper r_{UD} should be r_{UU}.

Thanks to Martin Godsk Hansen, SimCorp A/S, Denmark.

Page 237, line 4 following equation (8.12), reference to (8.12) should be (8.11).

Page 240, equation (8.15) should read:

$$\sigma_R(i)\sqrt{\Delta t} = \frac{1}{2}\ln\frac{\ln P_U(i)}{\ln P_D(i)}$$

Thanks to Dr. Mike Staunton, independent consultant based in the UK.

Pages 242-243, in figure 8.5 the following changes are required:

The code block beginning with { `initialise nodes` } and ending with `Qd[1,-1] = 1` should be moved up above the comment line { `compute Pu[.]  and Pd[.]` }.

Line 5 from the bottom of figure 8.5 on page 242, should read:

```
Pd[i] = Pu[i]^exp(-2*sigR[i]*sdt) }
```

Thanks to Victor Karlsson, ABN Amro.

Page 252, line 2 following figure 8.11 should read:

"... as year 5 with $\Delta t = 1$ year. A payer swaption is a put option ..."

Page 253, the heading for the last tree in figure 8.12 should be:

Payer Swaption

Thanks to Johan Garcia, Artesia Bank, Belgium.

Chapter 9

Page 258, the equation in "Step 4" should read:

$$\mu_{i,j} = [\theta(i\Delta t) - \alpha r_{i,j}]\Delta t$$

Thanks to Matthias Heurich, Arthur Andersen, Germany.

Page 261, figure 9.4, missing branch from node (1,0) to node (2,1).

Page 265, figure 9.5, line 17 of the psuedo-code should read:

```
Q2 = Q2+Q[i,j]*exp(-2*r[i,j]*dt)*dt*dt
```

Page 267, equation (9.17) should read:

$$dr = -\alpha r dt + \sigma dz$$

Page 268, equation (b) should read:

$$p_u = \frac{1}{6} + \frac{j^2M^2 + jM}{2}$$

$$p_m = -\frac{1}{3} - j^2M^2 - 2jM$$

$$p_d = \frac{7}{6} + \frac{j^2M^2 + 3jM}{2}$$

Page 269, line 9 should read:

$$(i+1)\Delta t$$

Page 269, equation (9.18) the argument of $\ln P$ should be:

$$(i+1) \text{ and not } (i+l)$$

Page 270, in figure 9.9, line 6 should read:

```
jmax = smallest_integer > -0.1835/M
```

Page 270, lines 24 to 25 of the pseudo-code should read:

```
pu[i,j] = 7/6+(j*j*M*M+3*j*M)/2
pm[i,j] = -1/3-j*j*M*M-2*j*M
```

Also the statement `next i` should be inserted after `next j` on the third line from the bottom of the page.

Page 271, in figure 9.9, lines 3, 7 and 11 should read:

```
for j = -top_node[i] to top_node[i] do
```

Thanks to Kazuhisa Arimura, Kokousai Sercurities Co., Japan.

Page 272, figure 9.10 - *See the updated Chapter 9 Numerical Examples Spreadsheet.*