ERRATA

A Primer for the Mathematics of Financial Engineering

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Corrections – Chapter 0

- **Page 16**, Section 0.5, Exercise 4, part (iii): the sequence should be denoted $(x_n)_{n\geq 1}$ and not $(x_n)_{n\geq 0}$

Corrections – Chapter 1

- **Page 42**, Section 1.12, Exercise 8: The sentence "When scaled appropriately, the derivative of f(y) with respect to y give the duration and convexity of the bond" should be "When scaled appropriately, $f'(y)$ and $f''(y)$ give the duration and convexity of the bond, respectively"

Corrections – Chapter 2

- **Page 55**, Section 2.4 : On line 9 from the bottom, I_n^s should be I_8^s
- **Page 57**, Section 2.5: the term $f''(\xi_{i,T})$ in formula (2.28) should be $f''(\xi_{i,M})$; the term $f''(\xi_{i,M})$ in formula (2.29) should be $f''(\xi_{i,T})$; the terms $f''(\xi_{i,T})$ in the last formula on page 57 should be $f''(\xi_{i,M})$
- **Page 57**, Section 2.5: Line 3 from the bottom should be

$$|I - I_n^M| \;=\; \left| \sum_{i=1}^{n} \left(\int_{a_{i-1}}^{a_i} f(x)\;dx \;-\; \int_{a_{i-1}}^{a_i} c_i(x)\;dx \right) \right|$$

- **Page 58**, Section 2.5: the inequality $|f''(\xi_{i,T})| \leq \max_{a\leq x\leq b} |f''(x)|$ should be $|f''(\xi_{i,M})| \leq \max_{a\leq x\leq b} |f''(x)|$
- **Page 62**, Section 2.5.2: the tolerance is $tol = 5 \cdot 10^{-7}$, not $tol = 0.5 \cdot 10^{-7}$
- **Page 77**, Section 2.8: The input for the code is $y = 0.065$, not $y = 0.06$
- **Page 78**, Section 2.10, Exercise 2, part(i): formula $\int_0^1 x^{\alpha-1}\, e^{-x}\, dx \;=\; \lim_{t\to 0} \int_t^1 x^{\alpha-1}\, e^{-x}\, dx$ should be

$$\int_0^1 x^{\alpha-1}\; e^{-x}\; dx \;=\; \lim_{t\searrow 0} \int_t^1 x^{\alpha-1}\; e^{-x}\; dx$$

- **Page 79**, Section 2.10, Exercise 6: Let $h(x)$ be a continuous function such that $\int_{-\infty}^{\infty} |xh(x)|dx$ exists. Define $g(t)$ by

$$g(t) \;=\; \int_t^{\infty} (x-t)h(x)\; dx,$$

and show that

$$g''(t) \;=\; h(t).$$

- **Page 79**, Section 2.10, Exercise 8: Instead of "... the continuously compounded instantaneous interest curve..." should be "... the continuously compounded instantaneous interest rate curve..."

Corrections – Chapter 3

- **Page 85**, Section 3.2: in the statement of Lemma 3.4, the inequality $\int_{\mathbb{R}} |h(x)f(x)dx < \infty$ should be $\int_{\mathbb{R}} |h(x)|f(x)dx < \infty$
- **Page 110**, Section 3.8: the value of the put is $P = 2.343020$, not $P = 2.343022$
- **Page 111**, Section 3.10, Exercise 4 (iv): formula $P(X \ \geq \ t) \ = \ \int_t^\infty f(x) \ dx \ = \ e^{\alpha t}$ should be

$$P(X \ \geq \ t) \ = \ \int_t^\infty f(x) \ dx \ = \ e^{-\alpha t}$$

Corrections – Chapter 4

- **Page 123**, Section 4.3: In Theorem 4.1, the equality should be

$$(f_1 * f_2)(x) \ = \ \int_{-\infty}^{\infty} f_1(z) f_2(x-z) \ dz \ = \ \int_{-\infty}^{\infty} f_1(x-z) f_2(z) \ dz$$

- **Page 126**, Section 4.3: The last sentence of Theorem 4.3 should be "Then $Y_1 Y_2$ is a lognormal variable with parameters $\mu_1 + \mu_2$ and $\sqrt{\sigma_1^2 + \sigma_2^2}$". Also, the last sentence in the proof of Theorem 4.3 should be "which shows that $Y_1 Y_2$ is a lognormal random variable...", instead of "which shows that $\ln(Y_1 \ Y_2)$ is a lognormal random variable..."

Corrections – Chapter 5

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Corrections – Chapter 6

- **Page 179**, Section 5.1: Formula (6.10) should be

$$f(x) = f(a) + (x-a)f'(a) + \frac{(x-a)^2}{2} f''(a) + \cdots + \frac{(x-a)^n}{n!} f^n(a) + O\left((x-a)^{n+1}\right)$$

Corrections – Chapter 7

- **IMPORTANT: Page 222**, Section 7.7: Formula (7.36) for b should be

$$b \ = \ \left(\frac{r-q}{\sigma^2} + \frac{1}{2} \right)^2 \ + \ \frac{2q}{\sigma^2}$$

- **Page 231**, Section 7.11, Exercise 1: show that $\lim_{S \searrow 0} \Gamma(S) = 0$, not $\lim_{S \to 0} \Gamma(S) = 0$
- **Page 231**, Section 7.11, Exercise 4: the formula for b should be

$$b \ = \ \left(\frac{r-q}{\sigma^2} + \frac{1}{2} \right)^2 \ + \ \frac{2q}{\sigma^2}$$

- **Page 233**, Section 7.11, Exercise 6: the first sentence on page 233 should read
Thus, the value $V(S, I, t)$ of an Asian option depends not only on the spot price S of the underlying asset and on the time t, but also on the following random variable:

$$I(t) \ = \ \int_0^t S(\tau) \ d\tau$$

- **Page 233**, Section 7.11, Exercise 7: "Fill in the Black–Scholes values of the OTM put options..." should be "Fill in the Black–Scholes values of the ITM put options..." After the table, the sentence "For which of these options is the intrinsic value $\max(K - S, 0)$ larger than the price of the option" should be "For which of these options is the intrinsic value $\max(K - S, 0)$ larger than the Black–Scholes value of the option"
- **Page 233**, Section 7.11, Exercise 8: "Show that the premium of the price of a European call option..." should be "Show that the premium of the Black–Scholes value of a European call option..."
- **Page 233**, Section 7.11, Exercise 9: "Use formula (7.41) to price a six months down–and–out call..." should be "Use formula (7.41) to find the value of a six months down–and–out call..."
- **Page 234**, Section 7.11, Exercise 10: the Hint should read "Use formula (7.41) to show that the value of the down–and–out call is
$$V(S) \ = \ C(S) \ - \ \left(BN(d_1) \ - \ \frac{SK}{B} e^{-rT} \ N(d_2) \right),$$
where $C(S)$ is the value at time 0 of the plain vanilla call with strike K..."

Corrections – Chapter 8

- **Page 236**, Section 8.1: formula (8.7) should be
$$\nabla_\lambda \ F(x, \lambda) \ = \ \left(\frac{\partial F}{\partial \lambda_1}(x, \lambda) \ \ldots \ \frac{\partial F}{\partial \lambda_m}(x, \lambda) \right) \ = \ (g(x))^t$$
- **Page 237**, Section 8.1: formula (8.8) should be
$$\nabla_{(x,\lambda)} \ F(x, \lambda) \ = \ \left(\ \nabla f(x) + (\nabla g(x))^t \lambda \ (g(x))^t \ \right)$$
- **Page 248**, Section 8.2.1: the number of iterations in the bisection method example is 35, not 33
- **Page 252**, Section 8.2.2: The sentence "For example, if $x_0 = 0.001$, then $x_1 = 350.0269$" should read "For example, if $x_0 = 0.01$, then $x_1 = 350.0269$"
- **Page 260**, Section 8.3: The sentence "For the initial guess $x_0 = (2\ 2\ 2)^t$, the solution $x^* = (-1\ 3\ 1)^t$ is found after 58 iterations" should read "For the initial guess $x_0 = (2\ 2\ 2)^t$, the solution $x^* = (-1\ 3\ 1)^t$ is found after 65 iterations"
- **Page 263**, Section 8.4: In the first formula, $\nabla(x, \lambda)F(x, \lambda)$ should be $\nabla(w, \lambda)F(w, \lambda)$
- **Page 264**, Section 8.4: On row four from the top of the page, the equality $\nabla g(x_0)\ v = 0$ should be $\nabla g(w_0)\ v = 0$
- **Page 264**, Section 8.4: The footnote at the bottom of the page should read "Note that $D^2 F_0(w)$ is equal to twice the covariance matrix of the rates of return $(R_i)_{i=1:4}$, which is a positive definite matrix"
- **Page 271**, Section 8.7: formula (8.78) should be
$$109 \ = \ 2 \sum_{i=1}^{9} e^{-0.5i \ r(0,0.5i)} \ + \ 102 \ e^{-5r(0,5)}$$
- **Page 277**, Section 8.9, Exercise 8: The first sentence should be "Use bootstrapping to obtain a continuously compounded zero rate curve given the prices..." The last formula on Page 277 should be
$$r\left(0, \frac{7}{6}\right) \ = \ \frac{3r(0,1) + 4r\left(0, \frac{5}{3}\right)}{4}.$$