

An Introduction to the Mathematics of Financial Derivatives Errata

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2. A Primer on the Arbitrage Theorem

Page 22 — [Typographical error]

Four lines below the first equation

“the right-hand side of (2.48) will be negative and the equality will not be satisfied with positive.”

should be

“the right-hand side of (2.48) will be negative and the equality will not be satisfied with positive ψ_1, ψ_2 .”

Page 22 — [Typographical error]

Three lines below the second equation

“Eq.(2.48) will not be satisfied with positive,”

should be

“Eq.(2.48) will not be satisfied with positive ψ_1, ψ_2 ,”

Page 22 — [Typographical error]

Two lines above the third equation

“Thus, we see that the existence of positive”

should be

“Thus, we see that the existence of positive ψ_1, ψ_2 ”

Page 22 — [Typographical error]

Last sentence before subsection 2.3.1

“role played by the”

should be

“role played by ψ_i in the”

Page 30 — [Typographical error]

In the statement of Theorem 2

“exists a > 0 ”

should be

“exists a $\psi > 0$ ”

Page 30 — [Formula reference]

In the statement of Theorem 2

“If the condition in (2.77) is true, then there are no arbitrage opportunities.”

should be

“If the condition in (2.79) is true, then there are no arbitrage opportunities.”

Page 30 — [Typographical error]

Last sentence before formula (2.82)

“state-price vector”

should be

“state-price vector ψ ”

3. Review of Deterministic Calculus

Page 36 — [Correction]

Formula (3.13)

$$0 = t_0, \dots, t_n$$

should be

$$0 = t_0 < t_1 < t_2 < \dots < t_n = T$$

Page 36 — [Typographical error]

Formula (3.14)

$$f : [0, T] \rightarrow \mathbb{R}$$

should be

$$f : [0, T] \rightarrow \mathbb{R}$$

Page 44 — [Formula references]

reference to formula – three lines below equation (3.42)

“Then the expectation of the term in (3.43)”

should be

“Then the expectation of the term in (3.42)”

Page 44 — [Formula references]

reference to formula – eight lines below equation (3.42)

“the same conditional expectation of the term in (3.42) will. . .”

should be

“the same conditional expectation of the term in (3.41) will. . .”

Page 45 — [Typographical error]

Below formula (3.49)

$$\max_i |t_i - t_{i-1}|$$

should be

$$\max_i |t_i - t_{i-1}| \rightarrow 0$$

Page 46 — [Typographical error]

Below formula (3.57)

“ $f(\cdot)$ is random while $f(\cdot)$ is ”

should be

“ $f(\cdot)$ is random while $h(\cdot)$ is ”

Page 48 — [Formula references]

On the left column

all five references to formula (3.65)

should be

references to formula (3.64)

Page 50 — [Formula references]

Below formula (3.83)

“solves the ODE in (3.78) in that plugging it into (3.80) satisfies the equality (3.78).”

should be

“solves the ODE in (3.81) in that plugging it into (3.83) satisfies the equality (3.81).”

5. Tools in Probability Theory

Page 82 — [Clarification]

Below formula (5.60)

“Here represents”

should be

“Here $[S_{t_0+(i+1)\Delta} - S_{t_0+i\Delta}]$ represents”

Page 82 — [Formula reference]

Three lines below formula (5.61)

“Hence, in taking a limit of (5.57), a new type of convergence”

should be

“Hence, in taking a limit of (5.60), a new type of convergence”

6. Martingale and Martingale Representations

Page 90 — [Formula references]

Below formula (6.12)

“Probability distributions that convert equations such as (6.12) into equalities such as (6.13)”

should be

“Probability distributions that convert equations such as (6.11) into equalities such as (6.12)”

Page 98 — [Formula references]

Above formula (6.69)

“Using (6.64) on the right-hand side of (6.65)”

should be

“Using (6.67) on the right-hand side of (6.68)”

Page 103 — [Formula references]

Four lines below formula (6.105)

“we can use the decomposition in (6.102), along with (6.99)”

should be

“we can use the decomposition in (6.105), along with (6.102)”

Page 104 — [Formula reference]

Left column top

“... used to define the stochastic integral in (6.106)?”

should be

“... used to define the stochastic integral in (6.109)?”

Page 104 — [Formula references]

Right column

“We can now substitute recursively for the left-hand side using Eq.(6.107)... A close look at the expression (6.108)...”

should be

“We can now substitute recursively for the left-hand side using Eq.(6.110) ... A close look at the expression (6.111)...”

Page 105 — [Formula references]

The seven formula references

“It turns out that this equation can be obtained from (6.109). Note that in Eq.(6.110), it is as if we are applying the conditional expectation operator $\mathbb{E}_t^{\mathbb{Q}}[\cdot]$ to both sides of Eq.(6.109) after *normalizing* the C_t by B_t ,... This suggests a way of obtaining the pricing Eq.(6.110)... we can then try to find a normalization that can satisfy the conditions in (6.111) and (6.112) under the

risk-neutral measure... The discrete equivalent of the martingale representation in (6.109) is then given by the following equation...

should be

“It turns out that this equation can be obtained from (6.112). Note that in Eq.(6.113), it is as if we are applying the conditional expectation operator $\mathbb{E}_t^{\mathbb{Q}}[\cdot]$ to both sides of Eq.(6.112) after *normalizing* the C_t by B_t ... This suggests a way of obtaining the pricing Eq.(6.113)... we can then try to find a normalization that can satisfy the conditions in (6.114) and (6.115) under the risk-neutral measure... The discrete equivalent of the martingale representation in (6.112) is then given by the following equation...”

Page 106 — [Formula references]

Right column

“Applying this to the second and third terms on the right-hand side of (6.119)... Thus (6.119) can be rewritten as...”

should be

“Applying this to the second and third terms on the right-hand side of (6.122)... Thus (6.122) can be rewritten as...”

Page 107 — [Formula references]

The six formula references

“looking for a method to determine an arbitrage-free value for this term that satisfies the pricing Eq.(6.110)... Hence, the first bracketed term has some similarities to the D_t term in the martingale representation (6.109)... to Eq.(6.124) and hope to end up with something like..The bracketed terms in (6.124) will not... we can divide the $\{C_t, B_t, S_t\}$ in (6.124) by another arbitrage-free price... We now show how these steps can be applied to Eq.(6.124).”

should be

“looking for a method to determine an arbitrage-free value for this term that satisfies the pricing Eq.(6.113)... Hence, the first bracketed term has some similarities to the D_t term in the martingale representation (6.112)... to Eq.(6.127) and hope to end up with something like..The bracketed terms in (6.127) will not... we can divide the $\{C_t, B_t, S_t\}$ in (6.127) by another arbitrage-free price... We now show how these steps can be applied to Eq.(6.127).”

Page 108 — [Formula references]

The three formula references

“... the unwanted bracketed terms in (6.124)... applying the operator $\mathbb{E}_t^{\mathbb{Q}}[\cdot]$ to Eq.(6.132) gives... how do we eliminate this last bracketed term in Eq.(6.136)...”

should be

“... the unwanted bracketed terms in (6.127)... applying the operator $\mathbb{E}_t^{\mathbb{Q}}[\cdot]$ to Eq.(6.135) gives... how do we eliminate this last bracketed term in Eq.(6.138)...”

Page 108 — [Correction]

Formula (6.140)

$$\mathbb{E}_t^{\mathbb{Q}} \left\{ \sum_{i=0}^n [(\Delta\alpha_{t_i})\tilde{B}_{t_{i+1}} + (\Delta\alpha_{t_i})\tilde{S}_{t_i}] \right\}$$

should be

$$\sum_{i=0}^n [(\Delta\alpha_{t_i})\tilde{B}_{t_{i+1}} + (\Delta\alpha_{t_i})\tilde{S}_{t_i}] = 0$$

Page 109 — [Formula references]

The two formula references

“This gives the pricing Eq.(6.124)... This equation has the same form as (6.106)”

should be

“This gives the pricing Eq.(6.127)... This equation has the same form as (6.109)”

7. Differentiation in Stochastic Environments

Page 113 — [Correction]

Formula (7.9), the last term on the right hand side

$$\frac{1}{3}(\Delta x)^3$$

should be

$$\frac{1}{3!}f_{xxx}(\Delta x)^3$$

Page 121 — [Typographical error]

Left column, the eighth line

“the ratio of ΔWk to”

should be

“the ratio of ΔW_k to”

8. The Wiener Process, Lévy Processes, and Rare Events in Financial Markets

Page 132 — [Formula references]

The five formula references

“The left-hand side of Eq.(8.17) is simply the weighted average of squared derivations from the mean... the left-hand side of (8.17) is a sum of m finite... Equation (8.18) says that all terms such as are linear functions of h ... According to Eqs.(8.22) and (8.23)...”

should be

“The left-hand side of Eq.(8.23) is simply the weighted average of squared derivations from the mean... the left-hand side of (8.23) is a sum of m finite... Equation (8.24) says that all terms such as are linear functions of h ... According to Eqs.(8.28) and (8.29)...”

Page 133 — [Formula references]

Above formula (8.30)

“The variance of ΔW_k in (8.18) is made of terms such as...”

should be

“The variance of ΔW_k in (8.24) is made of terms such as...”

Page 133 — [Correction]

Formula (8.39)

$$\frac{1}{2} \geq r_i \geq 0$$

should be

$$\frac{1}{2} \geq r_i > 0$$

Page 133 — [Correction]

Formula (8.43)

$$\lim_{h \rightarrow 0} w_i = \lim_{h \rightarrow 0} \bar{w}_i \sqrt{h}$$

should be

$$\lim_{h \rightarrow 0} w_i = \lim_{h \rightarrow 0} \bar{w}_i \sqrt{h} = 0$$

Page 136 — [Positioning of footnote]

Footnote 20

after Item 2 “...instant h .²⁰”

should be

after Item 1 “...with probability very close to 1.²⁰”

Page 140 — [Formula references]

The eight formula references

“This is the case because on the right-hand side of Eqs (8.74-8.76) there is no dependence...as modeled in (8.74-8.76)...with a parameterization such as in Eq.(8.73)...in place of Eqs.(8.74-8.76) we assume that ... according to (8.80)...”

should be

“This is the case because on the right-hand side of Eqs (8.79-8.81) there is no dependence...as modeled in (8.79-8.81)...with a parameterization such as in Eq.(8.78)...in place of Eqs.(8.79-8.81) we assume that ... according to (8.85)...”

Page 140 — [Correction]

Five lines below formula (8.81)

“there is no dependence on $S_i, i = 1, \dots, i$.”

should be

“there is no dependence on $S_i, i = 0, \dots, n$.”

Page 142 — [Formula references]

After Equation (8.98)

“Replacing this and the values of u, d, p in both (8.91) and (8.92) we can get”

should be

“Replacing this and the values of u, d, p in both (8.96) and (8.97) we can get”

Page 142 — [Formula references]

Three lines after Equation (8.98)

“In other words, with u, d, p , given in Eqs. (8.74-8.76)”

should be

“In other words, with u, d, p , given in Eqs. (8.79-8.81)”

Page 142 — [Formula references]

The line after Equation (8.101)

“It can be shown that if we adopt the parametrization in (8.74) and (8.75) that corresponds to normal events”

should be

“It can be shown that if we adopt the parametrization in (8.79) and (8.80) that corresponds to normal events”

Page 142 — [Formula references]

Three lines after Equation (8.102)

“... the parameterization in (8.78) and (8.79) that corresponds to rare events is adopted...”

should be

“... the parameterization in (8.83) and (8.84) that corresponds to rare events is adopted...”

10. ITÔ's Lemma

Page 166 — [Correction]

Formula (10.17),

$$\begin{aligned}\Delta F(k) &= F_s[a_k h + \sigma_k \Delta W_k] \\ &+ F_t[h] + \frac{1}{2} F_{ss}[a_k h + \sigma_k \Delta W_k]^2 \\ &+ \frac{1}{2} F_{tt}[h] + F_{st}[h(a_k h + \sigma_k \Delta W_k)] + R\end{aligned}$$

should be

$$\begin{aligned}
\Delta F(k) &= F_s[a_k h + \sigma_k \Delta W_k] \\
&+ F_t[h] + \frac{1}{2} F_{ss}[a_k h + \sigma_k \Delta W_k]^2 \\
&+ \frac{1}{2} F_{tt}[h^2] + F_{st}[h][a_k h + \sigma_k \Delta W_k] + R
\end{aligned}$$

Page 166 — [Correction]

Two paragraphs below formula (10.17)

“...and the effects of change in the underlying asset’s price, $F_{st}[h(a_k h + \sigma_k \Delta W_k)]$.”

should be

“... and the effects of change in the underlying asset’s price, $F_s[a_k h + \sigma_k \Delta W_k]$.”

Page 167 — [Correction]

Formula(10.18)

$$f(S) - f(S_0) = \Delta f = f_s(S_0)\Delta S + \frac{1}{2}f_{ss}(S_0)\Delta S^2 + \frac{1}{3}f_{sss}(S_0)\Delta S^3$$

should be

$$f(S) - f(S_0) = \Delta f = f_s(S_0)\Delta S + \frac{1}{2!}f_{ss}(S_0)\Delta S^2 + \frac{1}{3!}f_{sss}(S_0)\Delta S^3 + R$$

Page 169 — [Correction]

Formula (10.30) and (10.34), the term

$$\frac{1}{2}F_{ss}\left[\frac{a_k h^2}{h} + \frac{(\sigma_k \Delta W_k)^2}{h} + \frac{2a_k \sigma_k h \Delta W_k}{h}\right]^2$$

should be

$$\frac{1}{2}F_{ss}\left[\frac{a_k^2 h^2}{h} + \frac{(\sigma_k \Delta W_k)^2}{h} + \frac{2a_k \sigma_k h \Delta W_k}{h}\right]$$

Page 171 — [Correction]

Formula (10.44)

$$\sigma(I_t, t) = 1$$

should be

$$\sigma(I_t, t) = 2W_t$$

Page 171 — [Correction]

Formula (10.53)

$$+\frac{1}{2} \int_0^2 dt$$

should be

$$+\frac{1}{2} \int_0^t ds$$

Page 171 — [Correction]

Formula (10.55)

$$-\frac{1}{2} \int_0^2 dt$$

should be

$$-\frac{1}{2}t$$

Page 173 — [Correction]

Formula (10.69)

$$\begin{aligned} dF_t &= F_t dt + F_{s_1} dS_1 + F_{s_2} dS_2 \\ &+ \frac{1}{2} [F_{s_1 s_1} dS_1^2 + F_{s_2 s_2} dS_2^2 + F_{s_1 s_2} dS_1 dS_2] \end{aligned}$$

should be

$$\begin{aligned} dF_t &= F_t dt + F_{s_1} dS_1 + F_{s_2} dS_2 \\ &+ \frac{1}{2} [F_{s_1 s_1} dS_1^2 + F_{s_2 s_2} dS_2^2 + 2F_{s_1 s_2} dS_1 dS_2] \end{aligned}$$

Page 174 — [Correction]

Formula (10.74)

$$dS_1(t)^2 dS_2(t)^2 = [\sigma_{11}(t)\sigma_{21}(t) + \sigma_{12}(t)\sigma_{22}(t)] dt$$

should be

$$dS_1(t)dS_2(t) = [\sigma_{11}(t)\sigma_{21}(t) + \sigma_{12}(t)\sigma_{22}(t)] dt$$

Page 174 — [Correction]

Formula (10.78)

$$\begin{aligned} dF_t &= F_t dt + F_r dr + F_R dR \\ &+ \frac{1}{2} [F_{rr}(\sigma_{11}^2 + \sigma_{12}^2) + F_{RR}(\sigma_{21}^2 + \sigma_{22}^2) \\ &+ F_{rR}(\sigma_{11}\sigma_{21} + \sigma_{12}\sigma_{22})] dt \end{aligned}$$

should be

$$\begin{aligned} dF_t &= F_t dt + F_r dr + F_R dR \\ &+ \frac{1}{2} [F_{rr}(\sigma_{11}^2 + \sigma_{12}^2) + F_{RR}(\sigma_{21}^2 + \sigma_{22}^2) \\ &+ 2F_{rR}(\sigma_{11}\sigma_{21} + \sigma_{12}\sigma_{22})] dt \end{aligned}$$

Page 177 — [Clarification]

Problem 3(c)

“...contain the term, what ...”

should be

“...contain the $\frac{1}{2}\sigma^2 t$ term, what ...”

11. The Dynamics of Derivative Prices

Page 183 — [Correction]

Formula (11.14)

$$dS_t = a(S_t, t)dt + \sigma(S_t, t)d\tilde{W}_t$$

should be

$$d\tilde{S}_t = a(\tilde{S}_t, t)dt + \sigma(\tilde{S}_t, t)d\tilde{W}_t$$

Page 185 — [Correction]

Formula (11.24)

$$dS_t = \mu S_t dt + \sigma S_t dW_t$$

should be

$$dS_t = \mu S_t dt + \sigma S_t dW_t, t \in [0, \infty)$$

Page 185 — [Correction]

Formula (11.29)

$$\int_0^t \sigma dW_u = \mu t + \sigma W_t$$

should be

$$\int_0^t \frac{1}{S_u} dS_u = \mu t + \sigma W_t$$

Page 185 — [Typographical error]

Second line after (11.30)

“... a and of time t ...”

should be

“... a and σ , of time t ...”

Page 186 — [Typographical error]

Formula (11.39)

$$e^{\sigma W_T}$$

should be

$$e^{\sigma W_T}$$

Page 186 — [Clarification]

Right column, four lines above Equation (11.40)

“... expectation in two ...”

should be

“... expectation $E_t[e^{\sigma W_T}]$ in two ...”

Page 186 — [Correction]

Formula (11.40)

$$\mathbb{E}_t[e^{\sigma W_t}] = \int_{-\infty}^{\infty} e^{\sigma W_T} f(W_T|W_t) dW_T$$

should be

$$\mathbb{E}_t[e^{\sigma W_T}] = \int_{-\infty}^{\infty} e^{\sigma W_T} f(W_T|W_t) dW_T$$

Page 187 — [Clarification]

Formula (11.44)

$$Z_t = Z_0 + \sigma \int_0^t e^{\sigma W_s} dW_s + \int_0^t \frac{1}{2} \sigma^2 e^{\sigma W_s} ds$$

should be

$$Z_t = Z_0 + \sigma \int_0^t e^{\sigma W_s} dW_s + \int_0^t \frac{1}{2} \sigma^2 e^{\sigma W_s} ds$$

Page 187 — [Correction]

Formula (11.46)

$$\mathbb{E} \left[\int_0^t e^{\sigma W_s} dW_s \right]$$

should be

$$\mathbb{E} \left[\int_0^t e^{\sigma W_s} dW_s \right] = 0$$

Page 187 — [Correction]

Formula (11.47)

$$\mathbb{E}[Z_t] = 1 + \int_0^t \frac{1}{2} \sigma^2 \mathbb{E}[Z_t] ds$$

should be

$$\mathbb{E}[Z_t] = 1 + \int_0^t \frac{1}{2} \sigma^2 \mathbb{E}[Z_s] ds$$

Page 187 — [Correction]

Below (11.50)

“Going back to $\mathbb{E}_t[S_t]$ ”

should be

“Going back to $\mathbb{E}_t[S_T]$ ”

Page 187 — [Correction]

Formula (11.51)

$$\mathbb{E}_t[S_t] = \left[S_0 e^{(r - \frac{1}{2}\sigma^2)T} \right] \mathbb{E}[Z_t]$$

should be

$$\mathbb{E}_t[S_T] = \left[S_0 e^{(r - \frac{1}{2}\sigma^2)T} \right] \mathbb{E}_t[Z_T]$$

Page 187 — [Correction]

Formula (11.52)

$$\mathbb{E}_t[S_t] = \left[S_0 e^{(r - \frac{1}{2}\sigma^2)T} \right] e^{\sigma W_t} e^{\frac{1}{2}\sigma^2(T-t)}$$

should be

$$\mathbb{E}_t[S_T] = \left[S_0 e^{(r - \frac{1}{2}\sigma^2)T} \right] e^{\sigma W_t} e^{\frac{1}{2}\sigma^2(T-t)}$$

Page 187-189 — [Equation renumbering]

Number the equation above Formula (11.53) as new (11.53) and consequently add one to every following equation/formula number until (11.65), and remove the number for the original equation (11.65). Equation numbers starting from Section 11.4.2 should remain the same.

Page 187 — [Correction]

Formula (11.54) (Originally Formula (11.53) before equation renumbering)

$$S_t e^{r(T-t)}$$

should be

$$\mathbb{E}_t[S_T] = S_t e^{r(T-t)}$$

Page 189 — [Correction]

Formula (11.69)

$$\frac{dS_t}{S_t} = \mu S_t + \sigma S_t$$

should be

$$\frac{dS_t}{S_t} = \mu dt + \sigma dW_t$$

Page 190 — [Clarification]

Left column, three lines below (11.73)

“... proportional instead of being ...”

should be

“... proportional to $\sqrt{S_t}$ instead of being ...”

Page 191 — [Typographical error]

Right column, the equation after (11.79)

$$d\sigma_t = \lambda(\sigma_0 - \sigma_t)dt + \alpha\sigma_t dW_t$$

should be

$$d\sigma_t = \lambda(\sigma_0 - \sigma_t)dt + \alpha\sigma_t dW_{2t}$$

Page 191 — [Formula reference]

Right column, before the last line

“Note what Eq.(11.80) says ...”

should be

“Note what the above equation says ...”

Page 194 — [Typographical error]

Left column, last equation

$$\begin{aligned} f(x; \sigma, \nu, \theta) &= \int_0^\infty \phi(\theta g, \sigma^2 g) \times \text{gamma} \\ &= \left(\frac{t}{\nu}, \nu\right) dg \int_0^\infty \frac{1}{\sigma\sqrt{2\pi g}} \exp\left(-\frac{(x - \theta g)^2}{2\sigma^2 g}\right) \frac{g^{t/\nu-1} e^{-g/\nu}}{\nu^{t/\nu} \Gamma(t/\nu)} dg \end{aligned}$$

should be

$$\begin{aligned}
f(x; \sigma, \nu, \theta) &= \int_0^\infty \phi(\theta g, \sigma^2 g) \times \text{gamma}\left(\frac{t}{\nu}, \nu\right) dg \\
&= \int_0^\infty \frac{1}{\sigma\sqrt{2\pi g}} \exp\left(-\frac{(x - \theta g)^2}{2\sigma^2 g}\right) \frac{g^{t/\nu-1} e^{-g/\nu}}{\nu^{t/\nu} \Gamma(t/\nu)} dg
\end{aligned}$$

Page 194 — [Clarification]

Left column, second to last paragraph,

“...relative to the normal for the return distribution ...”

should be

“...relative to the return for the normal distribution ...”

Page 195 — [Correction]

Problem 3, in the equation, the term

$$+0.05\sigma S_t dW_t$$

should be

$$+0.05S_t dW_t$$

12. Pricing Derivative Products: Partial Differential Equations

Page 201 — [Clarification]

Equation (12.24) is correct by Itô’s product rule

Page 201 — [Correction]

Equation above (12.25), the term

$$\sigma dW_t$$

should be

$$\sigma S_t dW_t$$

Page 202 — [Clarification]

Left column, third line

“... additional term.”

should be

“... additional term $S_t^2 F_{ss}(\sigma dW_t + (\mu - r)dt)$.”

Page 202 — [Correction]

Left column, second equation

$$\mathbb{E}^{\mathbb{P}}[\dots]$$

should be

$$\mathbb{E}^{\mathbb{Q}}[\dots]$$

Page 202 — [Typographical error]

Formula (12.31) the term

$F_s(X, t)$ and $F_{ss}(X, t)$

should be

$F_X(X, t)$ and $F_{XX}(X, t)$

Page 205 — [Typographical error]

Left column, line after (12.37)

$$F(Sl, t)$$

should be

$$F(S_t, t)$$

Page 205 — [Correction]

Formula (12.38)

$$F(S_5, 5) = 6 - 3S_5$$

should be

$$F(S_5, 5) = 6 - 2S_5$$

13. PDEs and PIDEs—An Application

Page 216 — [Correction]

Formula (13.3), the term

$$+rF_tS_t$$

should be

$$+rF_sS_t$$

Page 216 — [Correction]

Formula (13.6)

$$F(S_t, t) = S_tN(d_1) + Ke^{-r(T-t)}N(d_2)$$

should be

$$F(S_t, t) = S_tN(d_1) - Ke^{-r(T-t)}N(d_2)$$

Page 216 — [Correction]

In Formula (13.10)

$$\sigma = 0.080$$

should be

$$\sigma = 0.80$$

Page 217 — [Correction]

Formula (13.11)

$$B(130, 0.2)$$

should be

$$B = F(130, 0.2)$$

Page 217 — [Figure reference]

Right column, fourth line

“Figure 8”

should be

“Figure 13.6”

Page 220 — [Formula reference]

Right column, the line after (13.33)

“Putting this together with (13.14) ...”

should be

“Putting this together with (13.31) ...”

Page 221 — [Positioning of footnote]

Left column, Footnote 4

marked in the third paragraph of section 13.6.1, “...during the life of the option.⁴”

should be

marked at the end of the second paragraph in section 13.6.1, “...observed during the life of the option.⁴”

Page 223 — [Clarification]

In Formula (13.44), use the fact that we denote $\sigma_t = \sigma S_t$ to re-write the term

$$\frac{1}{2}\sigma_t^2 F_{ss}$$

as

$$\frac{1}{2}F_{ss}\sigma^2 S_t^2$$

Page 225 — [Formula reference]

Right column, fourth line before section 13.7.3

“...by solving recursively the (system of) equations in (13.30).”

should be

“...by solving recursively the (system of) equations in (13.47).”

Page 226 — [Formula reference]

Left column, second line before section 13.7.4

“Using these boundary values in Eq.(13.30), we can...”

should be

“Using these boundary values in Eq.(13.47), we can...”

Page 228 — [Typographical error]

Exercise 2, in the question the term

$$e^{-rt}X_t$$

should be

$$e^{-rt}X_s$$

Page 228 — [Correction]

Exercise 2(a)

$$\mathbb{E}[X_t|X_s, s < t] = e^{-rt}X_s$$

should be

$$\mathbb{E}^p[e^{-rt}X_t|X_s, s < t] = e^{-rs}X_s$$

Page 228 — [Correction]

Exercise 2(b), the term

$$\mathbb{E}[X_t|X_s, s < t]$$

should be

$$\mathbb{E}[e^{-rt}X_t|X_s, s < t]$$

Page 228 — [Typographical error]

Exercise 2(b) & 2(d), in the comment,

$$e^{-rt}X_t$$

should be

$$e^{-rt}X_s$$

14. Pricing Derivative Products: Equivalent Martingale Measures

Page 236 — [Clarification]

Left column, three lines after Equation (14.21)

“... a new random variable. This...”

should be

“... a new random variable $\tilde{R}_t = R_t + \mu$. This...”

Page 236 — [Clarification]

Right column, second paragraph fourth line

$$\mathbb{E}[\cdot]$$

should be

$$\mathbb{E}_t[\cdot]$$

Page 236 — [Correction]

Formula (14.28) right-hand side

$$1 + r_t$$

should be

$$\mu + r_t$$

Page 237 — [Clarification]

Left column, second line,

“... and is the ...”

should be

“... and $\frac{1}{(1+r_t)}$ is the ...”

Page 237 — [Typographical error]

Left column, Footnote 5, in the equation’s denominator,

$$\mathbb{E}[R]_t$$

should be

$$\mathbb{E}[R_t]$$

Page 241 — [Correction]

In Formula (14.57), for all three places

$$[\mu_1, \mu_1]$$

should be

$$[\mu_1, \mu_2]$$

Page 241 — [Typographical error]

The line after (14.58)

$$(z_{1t}, z_{2t})$$

should be

$$\mathbb{Q}(z_{1t}, z_{2t})$$

Page 242 — [Typographical error]

Formulas (14.68), (14.69), (14.70), and (14.71), the term

$$d\xi(z_t)$$

should be

$$\xi(z_t)$$

Page 242 — [Clarification]

Left column, second line below (14.69)

“...measure with ...”

should be

“...measure \mathbb{Q} with ...”

Page 242 — [Clarification]

Left column, second paragraph below (14.69), in the second line

“...derivative of with ...”

should be

“...derivative of \mathbb{Q} with ...”

Page 242 — [Typographical error]

Right column, line before (14.74),

“... two measures; and \mathbb{P} ...”

should be

“... two measures \mathbb{Q} and \mathbb{P} ...”

Page 243 — [Correction]

Formulas (14.76), (14.77) and (14.84),

$$t \in [0, \infty)$$

should be

$$t \in [0, T]$$

Page 244 — [Clarification]

Right column, second paragraph after 3., second line,

“... drift under \mathbb{P} , hence can be ...”

should be

“... drift under \mathbb{P} . Hence, W_t^* can be ...”

Page 244 — [Clarification]

Right column, third paragraph after 3., first line

“Also, because contains ...”

should be

“Also, because W_t^* contains ...”

Page 245 — [Clarification]

Formula (14.102) and (14.103), on the right-hand side

$$S$$

should be

$$S_t$$

Page 245 — [Typographical error]

Formula (14.105), the term

$$-\frac{1}{\sigma^2}$$

should be

$$-\frac{1}{\sigma^2}$$

Page 246 — [Typographical error]

Formula (14.106), the term

$$-\frac{1}{\sigma^2}$$

should be

$$-\frac{1}{\sigma^2}$$

Page 246 — [Correction]

Formula (14.110), on the right hand side, the term

$$r_t \Delta$$

should be

$$r_t \Delta + 1$$

Page 247 — [Correction]

Left column, seventh line after (14.112)

$$\mathbb{Q}$$

should be

$$S_T^j$$

Page 248 — [Correction]

Formula (14.132)

$$\mathbb{E}^{\mathbb{P}}[Z_t]$$

should be

$$\mathbb{E}^{\mathbb{P}}[Z_t] = 1$$

Page 249 — [Typographical error]

Right column, two lines before (14.142)

“Note that by definition $0 \leq Z_t$ ”

should be

“Note that by definition $0 \leq Z_t$ ”

Page 249 — [Typographical error]

Formulas (14.143) and (14.144), the term

$$dW_t$$

should be

out of the exponent term

15. Equivalent Martingale Measures

Page 253 — [Correction]

Formula (15.1) the term

$$e^{r(T-t)}$$

should be

$$e^{-r(T-t)}$$

Page 254 — [Correction]

Formula (15.2) the term

$$\sigma t$$

should be

$$\sigma^2 t$$

Page 257 — [Correction]

Formula (15.37) and (15.38), the term

$$e^{-rt}$$

should be

$$e^{-r(t-u)}$$

Page 258 — [Clarification]

Left column, second line from the bottom,

“...with in (15.47).”

should be

“...with W_t^* in (15.47).”

Page 258 — [Clarification]

Right column, second to third lines of the first paragraph

“...substituting in place of W_t ...”

should be

“...substituting W_t^* in place of W_t ...”

Page 258 — [Clarification]

Right column, next to last line of the first paragraph

“...error terms will ...”

should be

“...error terms dW_t^* will ...”

Page 258 — [Correction]

Formula (15.50), the term

$$S_t dt$$

should be

$$dt$$

Page 260 — [Correction]

In Formulas (15.60), (15.65), (15.68), (15.69), and (15.71), the term

$$e^{-\frac{1}{2\pi\sigma^2 T}(Y_T - (r - \frac{1}{2}\sigma^2)T)^2}$$

should be

$$e^{-\frac{1}{2\sigma^2 T}(Y_T - (r - \frac{1}{2}\sigma^2)T)^2}$$

Page 261 — [Correction]

In Formula (15.76), in both places

$$dY_T$$

should be

$$dZ$$

Page 261 — [Correction]

Formula (15.81), the term

$$e^{-\frac{1}{2}(Z - \sigma\sqrt{T})^2}$$

should be

$$e^{-\frac{1}{2}(Z + \sigma\sqrt{T})^2}$$

Page 261 — [Correction]

Formula (15.83),

$$= S_0 \int_{-\infty}^{d_2 + \sigma\sqrt{T}} \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}H^2} dH$$

should be

$$= S_0 \int_{-\infty}^{d_2 + \sigma\sqrt{T}} \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}H^2} dH = S_0 N(d_1)$$

Page 263 — [Correction]

Formula (15.90), the term

$$[\mu_t - r]S_t dt$$

should be

$$[\mu_t - rS_t]dt$$

Page 263 — [Correction]

Formula (15.91), the term

$$[\mu_t - r] > 0$$

should be

$$[\mu_t - rS_t] > 0$$

Page 263 — [Typographical error]

Left column, in Footnote 5, the term

$$\mu t dt$$

should be

$$\mu_t dt$$

Page 264 — [Correction]

Formula (15.106), (15.109), and (15.110), the term

$$\frac{1}{2} F_{ss} \sigma_t^2 dt$$

should be

$$\frac{1}{2} F_{ss} \sigma_t^2$$

Page 264 — [Correction]

Formula (15.108)

$$d[e^{-rt}F(S_t, t)] = e^{-rt} \left[-rF + F_t + F_s\mu + \frac{1}{2}F_{ss}\sigma_t^2 dt - \frac{\mu_t - rS_t}{\sigma_t} \right] dt + e^{-rt}F_s\sigma_t dW_t^*$$

should be

$$d[e^{-rt}F(S_t, t)] = e^{-rt} \left[-rF + F_t + F_s\mu_t + \frac{1}{2}F_{ss}\sigma_t^2 dt - \sigma_t F_s \left(\frac{\mu_t - rS_t}{\sigma_t} \right) \right] dt + e^{-rt}F_s\sigma_t dW_t^*$$

Page 265 — [Correction]

Formula (15.112), the term

$$\frac{1}{2}F_{ss}\sigma_t^2 dt$$

should be

$$\frac{1}{2}F_{ss}\sigma_t^2$$

Page 265 — [Correction]

Formula (15.113)

$$dX_t = \frac{\mu_t - rS_t}{\sigma_t}$$

should be

$$dX_t = \frac{\mu_t - rS_t}{\sigma_t} dt$$

Page 265 — [Correction]

Formula (15.114)

$$e^{-rt}F(S_t, t) = F(S_0, 0) + \int_0^t e^{-ru} \left[-rF + F_t + \frac{1}{2}F_{ss}\sigma_u^2 + F_s r S_u \right] du + \int_0^t e^{-ru} \sigma_u F_s dW_u^*$$

should be

$$e^{-rt}F(S_t, t) = F(S_0, 0) + \int_0^t e^{-ru} \left[-rF + F_t + \frac{1}{2}F_{ss}\sigma_u^2 + F_s r S_u \right] du + \int_0^t e^{-ru} \sigma_u F_s dW_u^*$$

Page 265 — [Typographical error]

Second last line, the term

$$\mu t$$

should be

$$\mu_t$$

Page 266 — [Correction]

Formula (15.115)

$$\mathbb{E}^{\mathbb{Q}}[e^{\int_0^t (F_s e^{-ru} \sigma_u)^2 du}]$$

should be

$$\mathbb{E}^{\mathbb{Q}}[e^{\int_0^t (F_s e^{-ru} \sigma_u)^2 du}] < \infty$$

Page 266 — [Correction]

Formula (15.116)

$$\int_0^t F_s e^{-ru} \sigma_u du$$

should be

$$\int_0^t F_s e^{-ru} \sigma_u dW_u^*$$

Page 266 — [Correction]

Formula (15.118)

$$-rF + F_t + \frac{1}{2}F_{ss}\sigma_u^2 + F_s r S_u = 0 \quad 0 \leq S_t, 0 \leq t \leq T$$

should be

$$-rF + F_t + \frac{1}{2}F_{ss}\sigma_t^2 + F_s r S_t = 0 \quad 0 \leq S_t, 0 \leq t \leq T$$

16. New Results and Tools for Interest-Sensitive Securities

Page 274 — [Typographical error]

Right column, in the equation before (16.2), the term

$$(a(r_t, t) - \lambda_t \sigma(r_t, t) dt)$$

should be

$$(a(r_t, t) - \lambda_t \sigma(r_t, t)) dt$$

17. Arbitrage Theorem in a New Setting

Page 279 — [Correction]

Left column, third paragraph

“which by defining

$$Q_\mu = (1 + r\Delta)\psi^\mu$$

gave

$$Q_d = (1 + r\Delta)\psi^d$$

”

should be

“which by defining

$$Q_\mu = (1 + r\Delta)\psi^\mu$$

and

$$Q_d = (1 + r\Delta)\psi^d$$

gave

$$1 = Q_\mu + Q_d$$

”

Page 280 — [Correction]

Left column, Footnote 3

“It is assumed that there is no default risk in this time setting.”

should be

“It is assumed that there is no default risk in this setting.”

Page 282 — [Clarification]

The following footnote should be added after the third line on the left column after “there are four possibilities here.”

Under some conditions the forward contracts may involve an immediate settlement at time t_2 . Then, the payment (receipt) will equal the present value of the difference, and will be given by

$$\frac{F_t - L_{t_2}}{1 + L_{t_2}}$$

This is the case, for example, for most Forward Rate Agreements, traded in the market. But, because this type of settlement will involve a ratio of two random

variables, they will introduce some further complications, called the FRA-adjustment. By assuming that the contract is settled at time t_3 we avoid such nonlinearities at this initial stage. In addition, most interest-rate derivatives settle in-arrears anyway.

Page 286 — [Typographical error]

Two occurrences below Equation (17.25), one below Equation (17.28), and one in the Equation (17.29)

$$F_{t_i}$$

should be

$$F_{t_1}$$

Page 289 — [Typographical error]

Right column, third line after (17.52),

“... and the K is the Libor rate realized at time t_2 ”

should be

“... and the L_{t_2} is the Libor rate realized at time t_2 ”

Page 290 — [Correction]

Left column, last paragraph fifth and eleventh lines,

$$B_{t_2}^s$$

should be

$$B_{t_1}^s$$

Page 295 — [Correction]

Left column, second paragraph in Section 17.3.3

$$C_{t_2}^{ij}$$

should be

$$C_{t_3}^{ij}$$

Page 295 — [Typographical error]

Right column, in the first and second paragraph in Subsection 17.3.3.1,

$$\Delta$$

should be

$$\delta$$

Page 295 — [Formula reference & Typographical error]

Right column, below (17.106)

“How can this price be zero given the formula in (17.56)? Because F_l is ...”
should be

“How can this price be zero given the formula in (17.105)? Because F_t is ...”

Page 296 — [Clarification]

Left column, third line,

“... risk-neutral measure Black-Scholes framework ...”
should be

“... risk-neutral measure \mathbb{Q} . Black-Scholes framework ...”

Page 296 — [Formula reference]

Left column, first paragraph last line

“... and we cannot use Eq.(17.59) under \mathbb{Q} ”
should be

“... and we cannot use Eq.(17.108) under \mathbb{Q} ”

Page 297 — [Typographical error]

Right column, two lines below (17.114)

“... once they are normalized by the B_l ”
should be

“... once they are normalized by the B_t ”

Page 297 — [Correction]

Equation (17.115), the term

$$\begin{bmatrix} \frac{1}{B_t^s} \\ \frac{1}{B_t} \end{bmatrix}$$

should be

$$\begin{bmatrix} \frac{1}{B_t^s} \\ \frac{1}{B_t} \end{bmatrix}$$

Page 297 — [Correction]

Equation (17.116), the term

$$\left[\begin{array}{c} \frac{1}{B_t^s} \\ \frac{1}{B_t} \end{array} \right]$$

should be

$$\left[\begin{array}{c} B_t \\ \frac{1}{B_t^s} \end{array} \right]$$

18. Modeling Term Structure and Related Concepts

Page 303 — [Correction]

Right column, Definition 22,

$$B(t, T)$$

should be

$$R(t, T)$$

Page 305 — [Typographical error]

Formula (18.9), the term

$$e^{-r(t, T)}$$

should be

$$e^{-r(T-t)}$$

Page 306 — [Clarification]

Left column, second to third line,

“... can invest dollars in a ...”

should be

“... can invest $e^{-r(T-t)}$ dollars in a ...”

Page 306 — [Typographical error]

Right column, third line, the term

$$e_t^{-r(t, T)}$$

should be

$$e^{-r(T-t)}$$

Page 307 — [Typographical error]

Left column, five occurrences of the term

$$e^{-r(t.T)}$$

should be

$$e^{-r(T-t)}$$

Page 307 — [Clarification]

Left column, second to third line,

“... and invest of the proceeds ...”

should be

“... and invest $e^{-r(T-t)}$ of the proceeds ...”

Page 307 — [Clarification]

Left column, tenth line,

“... borrow dollars ...”

should be

“... borrow $e^{-r(T-t)}$ dollars ...”

Page 308 — [Correction]

Formula (18.14)

$$B(t, t + 3\Delta) = \mathbb{E}^{\mathbb{Q}} \left[\frac{1}{(1 + r_t\Delta)(1 + r_{t+\Delta}\Delta) \dots (1 + r_{t+n\Delta}\Delta)} \right]$$

should be

$$B(t, t + n\Delta) = \mathbb{E}^{\mathbb{Q}} \left[\frac{1}{(1 + r_t\Delta)(1 + r_{t+\Delta}\Delta) \dots (1 + r_{t+n\Delta}\Delta)} \right]$$

Page 308 — [Typographical error]

Right-hand side of Formula (18.16), the last term

$$e^{-r_{t+\nu}\Delta\Delta}$$

should be

$$e^{-rt+n\Delta}$$

Page 309 — [Clarification]

Right column, two lines after (18.24),

“discount the to time t ”

should be

“discount the $B_{t+\Delta}^*$ to time t ”

Page 310 — [Clarification]

Left column, two lines after (18.26),

“amount at a rate”

should be

“amount B_t^* at a rate”

Page 310 — [Typographical error]

The term in Formula (18.28),

$$t + (n - 1\Delta)$$

should be

$$t + (n - 1)\Delta$$

Page 311 — [Formula reference]

One line above Equation (18.35),

“Then writing the formula (18.32) twice:”

should be

“Then writing the formula (18.33) twice:”

Page 311 — [Formula reference]

Right column, five lines after (18.41),

“... Eq.(18.39) and assuming that some technical ...”

should be

“... Eq.(18.40) and assuming that some technical ...”

Page 312–313 — [Correction]

Formulas (18.48) to (18.51), a negative sign is missing in terms $e^{\alpha(s-t)}$ and $e^{2\alpha(s-t)}$

$$e^{\alpha(s-t)} \text{ and } e^{2\alpha(s-t)}$$

should be

$$e^{-\alpha(s-t)} \text{ and } e^{-2\alpha(s-t)}$$

19. Classical and HJM Approach to Fixed Income

Page 316 — [Correction]

Left column, equation on line 6,

$$B(t, T) = e^{-\int_t^T r_s ds}$$

should be

$$B(t, T) = e^{-\int_t^T F(t,s) ds}$$

Page 318 — [Correction]

Formula (19.9)

$$a(r_t, t) = \mu r_t, \quad \sigma(r_t, t) = \sigma r_t, \quad V_t = W_t$$

should be

$$a(r_t, t) = \mu r_t, \quad b(r_t, t) = \sigma r_t, \quad V_t = W_t$$

Page 320 — [Correction]

Left column, second equation

$$C(r_t, R_t, t) = G(r_T, R_T, T)$$

should be

$$C(r_T, R_T, T) = G(r_T, R_T, T)$$

Page 322 — [Typographical error]

Right column, six lines below (19.13)

“adopt the notation $Bt = B(t, T)\dots$ ”

should be

“adopt the notation $B_t = B(t, T)\dots$ ”

Page 322 — [Correction]

Right column, two lines below (19.14),

“real-world probability \mathbb{Q} .”

should be

“real-world probability \mathbb{P} .”

Page 324 — [Correction]

Formula (19.20)

$$dF(t, T, T + \Delta) = \frac{1}{2\Delta} [\sigma(t, T + \Delta, B(t, T + \Delta))^2 - \sigma(t, T, B(t, T))^2] dt + \frac{1}{2\Delta} [\sigma(t, T + \Delta, B(t, T + \Delta)) - \sigma(t, T, B(t, T))] dW_t$$

should be

$$dF(t, T, T + \Delta) = \frac{1}{2\Delta} [\sigma(t, T + \Delta, B(t, T + \Delta))^2 - \sigma(t, T, B(t, T))^2] dt + \frac{1}{\Delta} [\sigma(t, T + \Delta, B(t, T + \Delta)) - \sigma(t, T, B(t, T))] dW_t$$

Page 324 — [Correction]

Equation (19.22) and the line below it

“

$$dF(t, T) = a(F(t, T), T)dt + b(F(t, T), T)dW_t$$

where the $a(F(t, T), T)$ and $b(F(t, T), T)$ are ...”

should be

“

$$dF(t, T) = a(F(t, T), t)dt + b(F(t, T), t)dW_t$$

where the $a(F(t, T), t)$ and $b(F(t, T), t)$ are ...”

Page 325 — [Correction]

Formula (19.26)

$$r_t = F(0, T) + \int_0^t b(s, T) \left[\int_s^T b(s, u) du \right] ds + \int_0^t b(s, T) dW_s$$

should be

$$r_t = F(0, t) + \int_0^t b(s, t) \left[\int_s^t b(s, u) du \right] ds + \int_0^t b(s, t) dW_s$$

Page 325 — [Correction]

Right column, two lines above equation (19.27)

“...some future spot rate r_t ...”

should be

“...some future spot rate r_τ ...”

Page 326 — [Correction]

Formula (19.30) and (19.31)

$$\int_0^t \mu(r_s, \tau) ds$$

or

$$\int_0^t b(r_s, t) dW_s$$

should be

$$\int_0^t \mu(r_s, s) ds$$

or

$$\int_0^t b(r_s, s) dW_s$$

Page 327 — [Correction]

Formula (19.38), the term

$$r_t = r_{t-\Delta} + \alpha(\kappa - r_t)\Delta + \sigma(W_t - W_{t-\Delta})$$

should be

$$r_t = r_{t-\Delta} + \alpha(\kappa - r_{t-\Delta})\Delta + \sigma(W_t - W_{t-\Delta})$$

Page 330 — [Typographical error]

Left column, Exercise 3(a),

“ $i = 03$ ”

should be

“ $i = 0$ ”