Corrections to
Quantitative Modeling of Derivative Securities
by Marco Avellaneda
and Peter Laurence
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Compiled by Nathan Welch
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Further corrections (to the book, or to this document) are appreciated and can be emailed to welchn@cims.nyu.edu. An updated list of corrections is available on Peter Laurence’s web page www.math.nyu.edu/~laurence.

Chapter 1

3 Page ix: third of the way down the page; omit comma "risk using financial engineering is still seen"

3 pg. 4; omit s in holds: ...(1.5b) hold, then...

3 pg. 4; footnote 2; "compilation" should be "combination"

2 pg. 5; top line: ...which separates $R^M_{t+1}$...

3 pg. 5; comma should be a period at the end of eqn. (*)

1 pg. 7: arbitrage example should read: ..This can be seen as follows: if the price of the portfolio is more than $p_i$...

3 pg. 7; middle of the page: "investor's" should be "investors"

1 pg. 7; last line, $\hat{\pi}_j$ should be $\pi_j$.

1 pg. 8; first eqn., $\hat{\pi}_j$ should be $\pi_j$.

1 pg. 8; omit example 1.2
3 pg. 8: Suggestion: expand on the sentence: Notice then that the risk-neutral probabilities...

1 pg. 11: arbitrage example should read: ..If the value of the portfolio is more than the value of the security, the first strategy is an arbitrage. If the portfolio is worth less than the security, the second strategy is an arbitrage...

3 pg. 11: bottom third, insert the word “a”: ..The portfolio is equivalent to having a long position...

1 pg. 11: bottom of the page in the section on Put-Call Parity: ..Recall, from 1.1, that a call option is a contract... should read ...A call option is a contract...

2 pg. 13-14: the occurrences of the security “(s)” or “s” should be denoted S: I count 3 occurrences on page 13, and one on page 14.

2 pg. 14: in π_U and π_D should be π_U and π_D

2 pg. 15: middle of the page; notational consistency requires that E be rendered E, as in top half of page

3 pg. 15: middle of the page: ..Since any derivative security... is clearer as ...Since in a complete market any derivative security...

2 pg. 15: in proof of Prop. 1.2, delete transpose superscript and subsequent parenthetical remark to read: ..If the market is complete the rank of D is M. Therefore...

1 pg. 16: bottom; ..3 × 2... should read ...2 × 3...

1 pg. 17: eqn (1.18a), π_2 and π_3 should be switched, ie:

\[ \pi_2 = \frac{(1 + R) - D}{(1 + R)(M - D)}, \pi_3 = \frac{M - (1 + R)}{(1 + R)(M - D)} \]

2 pg. 17: eqn (1.18b) needs a capital “R”:

\[ \pi_1 = \frac{(1 + R) - M}{(1 + R)(U - M)} \]

3 pg. 18: middle; ..of risk-aversion of different agents... should read ..of the risk-aversion of different agents...

1 delete exercise 3, page 19.

Chapter 2
2 pg. 21; eqn. 2.2 and after: change $p$ to $P_U$ and $q$ to $P_D$ ... with $P_U + P_D = 1$.

1 pg. 21: Delete the phrase before eqn. 2.3 which reads: “Since the asset price divided by the returns on riskless investment must be a martingale under the pricing measure, we should have” and insert: “From the one-period model defined in Chapter 1, we have”

2 pg. 21: insert ellipsis and comma in parenthetical listing: $\ldots, S_n, \ldots, S_N$)

2 pg. 22; figure 2.1: upper right triangular node should read $S_t^2$, not $S_t^3$

2 pg 23; 3rd line in under (2.6): change ...at time $n$ it can... to ...at time $N$ it can...

1 beginning on page 24 and throughout chapter 2: change all occurrences of “multinomial” to “binomial”: first is in title of figure 2.2, then in description of fig. 2.2; next one I find is on title to fig. 2.4 top of pg. 35 and again in description of fig. 2.4 then once each in description and legend to fig. 2.5

3 pg 24: bottom third: change ...we obtain the value in explicit form... to ...we obtain the value at time zero in explicit form...

2 pg 25; insert comma: $(\Delta_j^i, B^i_n)$ should be $(\Delta^i_j, B^i_n)$

2 pg 26; figure 2.3; change $n$ to 3: in

$$V^j_3 = F(S^j_3)$$

1 pg. 30; first line in the eqn array 2.20 should read

$$\text{Var}Y = \text{Var}\left\{ \frac{1}{T} \sum_{n=1}^{N} \ln(H_n) \right\}$$

1 pg. 30 last line before Proposition 2.3: should read: ... $= e^{rt}$, from the no arbitrage condition for a one period model. Thus...

2 p. 31; middle, eqn ref.: ...Using (2.23).... should be ...Using (2.21)...

3 p. 32 middle: change ...We now discuss the expected growth rate under the risk-neutral measure, $\mu$. ... to ...We now discuss the expected growth rate $\mu$ under the risk-neutral measure. ...

1 top third of p. 34: should read: ...$+ \text{ higher-order terms}$

1 pg. 35, bottom; inside integral should read: ...Max $(S_te^\mu$
1 pg. 36, first integral after fig 2.5 should insert \( z + \) to read:

\[ \ldots Se^{\sigma \sqrt{T + (r - \sigma^2/2)T}} \ldots \]

1 pg. 36, bottom third; eqn for \(-d_2\) should be unchanged but for \(d_2\)

1 pg. 36, bottom third; should read \(\ldots(\text{which is obtained by solving the equation } Se^{\sigma \cdots} \ldots \text{ for } z = -d_2)\ldots\)

Chapter 3

1 pg. 43 middle of page, eqn 3.7: should read + higher-order terms

1 pg. 45 top; extend sqrt sign over \(\pi\):

\[
N'(d) = \frac{1}{\sqrt{2\pi}} e^{-\frac{d^2}{2}}
\]

1 pg. 45 last line of eqnarray (3.11) should read

\[
= -N(-d_1).
\]

2 pg. 45 bottom: delete \(\ldots\) with \(n_j\) options of type \(j, 1 \leq j \leq M\)

3 pg. 48 bottom: boldface to italics on: \(\ldots\textit{tangent to the graph of the value function}\)

1 pg. 49 footnote should read: ...

\[
\Delta \Pi = -\Theta \delta t + \frac{1}{2} \Gamma (\Delta S)^2.
\]

1 pg. 51 insert comma between \(S\) and \(T\) in numerator of eqn 3.15:

\[
\Theta(S,T) = -\frac{\partial V(S,T)}{\partial T}
\]

1 pg. 51 bottom, same problem with comma and insert equals sign:

\[
\frac{\partial V(S,T)}{\partial T} =
\]

1 pg. 52; same comma problem in first line of eqnarray (3.19)

1 pg. 54; insert two right parentheses in second line of eqn for \(\tilde{V}_{n+1}^{j+1}\):

\[
\frac{1}{2} \left( (S^2V_{SS})^j_n + (SV_S)_n^j \right) \sigma^2 dt
\]
Chapter 4

1 p. 61, top third of page: square the logarithms in both equations to read

$$\sigma^2_{loc} = \left[ \ln \left( \frac{U'}{DU'} \right) \right]^2 P_U P_D$$

and

$$\sigma^2 = \frac{1}{dt} \left[ \ln \left( \frac{U'}{DU'} \right) \right]^2 P_U P_D$$

1 In Remark 4.2, top of page 66, the equation should be the variance of the logarithm:

$$\text{Var} \left[ \ln \left( \frac{S_n}{S_0} \right) \right] = ...$$

1 Top of 68 in the equality continued from bottom of 67, change to

$$= \frac{1}{t} \sum_{j=1}^{n} \sigma_j^2 dt.$$ 

1 next equation on p. 68:

$$\tilde{\sigma}(t) = \sqrt{\frac{1}{t} \int_0^t \sigma^2(s)ds}$$

1 next equation on p. 68: the “Δ”s in the numerator of first square root should be “Δt”s and the second square root should be

$$= \sqrt{\frac{\partial}{\partial t} (t\tilde{\sigma}^2(t)).}$$

1 next equation on p. 68: the second Δ in the numerator should again be Δt.

1 p.72, middle of the page, in the equation for $S_T$, the exponentiated integral needs a right parenthesis to read:

$$... \int_0^T (r(s) - q(s))ds...$$

Chapter 5

1 equ. (5.11) p. 82; wrong subscript: the denominator on the right side should be: $S_{n+1}^j - S_{n+1}^{j-1}$.

1 p. 83, 3rd line on page should read: ...“exercising approximately four times in a day,”...
2 quarter of the way down p. 87; remove bold ‘1’ in \(-dC + 1dS\)

1 in eqn. (A.1), the sup should be from \(t\) to \(T\): \(\ldots = \sup_{t\leq \tau \leq T}\)

1 the first two lines of appendix 1, p. 90 should be changed to: “In this appendix we show, that in the case of an American put, the “smooth pasting” boundary condition (5.15) holds. Here, the free boundary condition is:”

3 p. 90 middle of the page, beginning of line: ‘the differential (A.4)” should read ‘the differential inequality (A.4)”

1 last 2 lines on page 90: both occurrences of \(P_t\) should be \(\hat{P}_t\).

1 minus signs off last line of last eqn p. 91: should be:

\[-\int_{\Sigma_2} \ldots + \int_{\Sigma_1} \ldots\]

Chapter 6

Chapter 7

1 p. 107, eqn 7.2; divide by \(dt\):

\[\tilde{X}(t) = X_n + (t - ndt) \frac{X_{n+1} - X_n}{dt}, \text{for...}\]

2 3rd line p. 108 “walkers” should read “walker’s”

3 first line of footnote p. 108 should read ...“finite, ie. non-infinitesimal, \(dt\) is more...”

1 description to figure 7.1, p. 109; last line should say “time scales smaller than \(10^{-4}\)”

1 in second to last eqn from bottom of 110; change as \(t \to 0\) to as \(dt \to 0\).

1 p. 112; first eqn, very end of line, insert another right parenthesis, after \(t_{j-1}\) so the line ends with 2 consecutive right parentheses.

1 p.118 Starting with eqn. 7.16, there are several omissions of parentheses in a row: first, missing right parenthesis, and then missing left (before comma and after left square bracket, respectively):

\[\frac{1}{2} \sum_{j=1}^{N} F_{ZZ}(Z(t_{j-1}), t_{j-1}) \left[(\Delta Z_j)^2 - \Delta t\right]\]
1 very next equation: exact same missing parentheses inside the expectation
1 very next eqn.: same missing left parenthesis from inside square bracket
1 top lines of p. 119; same missing left parenthesis from inside square bracket occurs 3 times in first 4 lines.
1 p.122, second eqn. from top; omit one of the two consecutive “=”-signs.
1 p. 123, second line of appendix. “Propositions 7.1 and 7.2.” should read “Propositions 7.2 and 7.3.”
1 p. 124 middle of the page: change from \( j = 1 \) to \( j = 0 \) to read: Consider a sequence of partitions \( \{t^j \} \), where...

Chapter 8

1 p. 132, eqn. 8.8; missing minus sign; last exponent should read:

\[ ...e^{-\frac{1}{2} \sigma^2 T} \]

1 p. 132 last line of eqn 8.9; I compute that the \( \sigma \) should be in the denominator:

\[ = - \frac{e^{-\gamma T} e^{-\frac{a^2}{2\sigma}}}{\sigma \sqrt{2\pi}} \cdot d_1 \]

1 eqn. 8.10 p. 133; missing left parenthesis before last \( S_T \)
1 p. 138 middle of the page, 2 lines above eqn 8.26, replace \( K \) by \$1; should read “as opposed to collecting \$1 the...”
1 second to last line in example 8.2 on p. 140 should read: dollar will not drop below 1.27 DEM over ...
1 p. 141 eqn 8.28d should read: ... if \( S^j_N < H \).
1 p. 141 eqn 8.29b should read: ... if \( S^j_N < H \).
1 p. 143 on the second line of eqn 8.34, reverse the last inequality inside the expectation, to read:

\[ ...Z^{'\mu} \geq -A_H ... \]

2 p. 147 last 6 words on the page should replace “payoff” with “value”: The value of this security is...

2 p. 148 last line on the page would be clearer as:

\[ V(f(S_t)) = e^{-rt} \Pr \{ L < S_t < H \} \]
p. 158 in the equation for $V$, just after **Range Notes**, omit the letter “d” to read

$$V = N \cdot e^{-rT}$$

p. 159, change 3rd line to read: $Q = 365 \times 50 = 18,250,000$.

p. 159, last line of pg., the max in the expectation should replace the underscore by a minus sign: $\max(e^{\sigma X} - K, 0)$.

p. 159, add the following paragraph at the end of the Appendix: “The reader will find that the closed form solutions determined from the single-barrier and double-barrier reflection principles can be extended for pricing other options as well.”

**Chapter 9**

p. 166, to be consistent with earlier notation (p. 165) the ‘W’s in figure 9.2 should be changed to ‘M’s: 4 occurrences in the far right of the figure should read $M_1, M_2, M_3, M_4$, also the equation $W = \ldots$ should be $M = \ldots$ and in the fourth line of the explanation we want $M_1, M_2, \ldots$

p. 166, bottom of: boldface should read: **Proof of Proposition 9.2**

p. 166, last line of equation array at the top of: inside the first expectation should be

$$e^{\lambda_1(W(t+a) - W(t))}$$

p. 168, middle of: I suggest $Q = M(T)P$ is better as $dQ = M(T)dP$

**Chapter 10**

p. 174 and through the first eqn. top of page 176, all (but one of the) summation indexes should be $i$ instead of $j$:

$$\sum_{i=1}^{N}$$

I count 14 such typos.

p. 176-7: replace all occurrences of $\sigma_{k,i}$ by $\sigma_{i,k}$. I count 4 occurrences.

p. 178, should be:

$$s_k = (\sigma_{1,k}, \ldots, \sigma_{N,k}), k = 1, \ldots, \nu$$

**Chapter 11**
1 for consistency (at least thru sections 11.2, 11.3) change the following 3 occurrences of \( q \) to \( d \): a) in eqn for \( Y(T) \) just after eqn 11.17 p.188; b) in eqn for \( d_i \) just after eqn 11.18 p. 188; c) in eqn 11.19 p. 189

1 p. 191, first line after eqn 11.27 should read: “where \( Z_k(\cdot), k = 1, \ldots, \nu \)...

2 p. 193, first line in proposition 11.3; boldface \( X \): “Assume that \( X(t) \) is the diffusion process defined by”

Chapter 12

2 p. 200, 2nd line in paragraph beginning “Bonds issued by..” should read “corporation cannot meet its obligations.”

2 4th line from the top of p. 202 should read “...the decimal fraction of a year that”...

1 in the eqn for \( AI(t, t_n) \) in the middle of p. 203, the right hand equality should be

\[
= \frac{C \cdot Pr.}{\omega} f,
\]

1 for consistency throughout secs. 12.1 and 12.2, since \( f \) is alternately defined as the fraction of the period elapsed since the last coupon and the fraction of the period remaining until the next coupon, I suggest the following changes: a) last paragraph on p. 204, first line “...and that \( f \) represents the ratio of the number of days since the last coupon date to the number of days in the coupon period,”... b) in eqn 12.5b p. 204, change the exponents from \( f + n - m - 1 \) to \( n - m - f \) and from \( f + N - m - 1 \) to \( N - m - f \), respectively; c) yield in example 12.1 computed using 12.5b and which \( f \) d) in eqn 12.6, each occurrence of the expression “\( + f - 1 \)” should be replaced by “\(- f \)”. I count 10 occurrences. e) next line following eqn. 12.6 should read “Notice that \( (n - m - f)/\omega \) represents...”... f) in eqnarray 12.7 p. 207 each occurrence of the expression “\( + f - 1 \)” should be replaced by “\(- f \)”. I count 20 occurrences. The exponents in this eqnarray should then be \( n - m - f + 1 \) and \( N - m - f + 1 \) respectively.

1 eqn 12.13 p.210 should be (note change in superscript and additional parenthesis):

\[
-P_0^t + (1 + \Delta TF(t, t + \Delta T)) \cdot P_0^{t+\Delta T}.
\]

1 second to the last line in first (partial) paragraph on p. 211; the integral should have lower limit 0: \( e^{-\int_{0}^{t+\Delta T} r_s ds} \).

1 line before eqn 12.17 p. 211 should read ...\( D = e^{-\int_{0}^{t+\Delta T} r_s ds} \)...
1 last line in eqn 12.20 p. 214, remove the term \( R(t_{N-1}, t_N) \) to read ...

\[ + \text{Not.} E^P \left\{ e^{-\int_0^\infty r_s \, ds} \right\}. \]

2 second line in second to last paragraph on p. 216 should read “bond implies” ...

1 p. 217, the large print in Figure 12.9 should be “where \( x_i = \max (R_i - F, 0) \)”

2 p. 221 the line with footnote 19 (middle of the page) should begin “factors and the” ...

1 p. 221 2nd to last line in sec. 12.6, should “calls and puts” read “puts and calls”?

1 p. 222 2nd line of last paragraph should read “seen in Section 12.3” ...

1 p. 222 last eqn on the page, should be

\[ \lim_{\Delta T \to 0} \]

1 p. 224-5 beginning with eqn 12.26 and through eqn 12.27, each occurrence of \( C_n \) should be \( C_i \); 1 count 4 occurrences.

1 p. 227 change the two occurrences of \( \theta_{N+1} \) in the first two eqns. on the page to \( \theta_N \). (Note: do not change the occurrences of \( \theta_i \).)

Chapter 13

2 p. 230 3rd line in second paragraph should read „\( T < T_{max} \)“; then in the fourth to fifth line „and \( f(t; T) \) at time \( t \).”

1 p. 232 in eqns 13.9 and 13.10, replace “\( \hat{\sigma}(s; u) \)” with “\( \hat{\sigma}_i(s; u) \)”

1 p. 233, footnote 3, replace “\( \hat{\sigma}(t; t) \)” with “\( \hat{\sigma}_i(t; t) \)” both times

1 p. 234 middle line of the page should read „“linear shock” (Figure 13.1).”

2 p. 235 third to last line of first partial paragraph on pg. should be: „“of two bonds with”...

1 in equarray 13.16 p. 236; in the second line change \( W(s) \) to \( W(t) \) to read „\( + \sigma W(t) + \)“ and change the last line to

\[ \frac{P^T}{P_0} e^{-\left( \sigma W(t) + \frac{\sigma^2}{2} \right)(T-t)} \]
top third of p. 238, “and using the fact that
\[ \sigma \int_0^t \ldots \]
” (ie begin eqn with a ‘\( \sigma \)’)
1 2/3 of the way down p. 238, delete \( \sigma \) to read
\[ r_t \approx f(0; t) + X(t) + \frac{\sigma^2}{2k^2}. \]
1 p. 240 should read “Let us denote by \( Y_1(\tau), Y_2(\tau), \ldots, Y_8(\tau), \)”...
1 p. 244 in eqn 13.24, change \( \Delta T \) to \( \Delta t \).
2 p. 245 perhaps clearer if the first line after eqn 13.26 reads “where \( a = A/\sqrt{\Delta t} \)
and \( b = B/\sqrt{\Delta t} \) are”...
2 last line on p. 246 is perhaps better as “This gives a correlation coefficient
\( \rho(0.25, 30) = 82\% \).”

Chapter 14
1 eqn. 14.2 p. 253 should begin:
\[ dX_t = \sum_{k=1}^{\nu} \sigma_{tk}(X, t)dZ_k + \ldots \]
1 large type in fig. 14.1 p. 254 should read:
\[ P_T = \exp[-p(t, T) \cdot X(t) - q(t, T)] \]
2 footnote 4 p. 255, 2nd line: ...“less widely used than the Guassian”...
2 footnote 9 p. 258 ...“are called Gauss-Markov processes.”
2 p. 263; capitalize Principal components.
2 p. 266 better to end the page with a colon: “More precisely, we have:”
2 5 lines from the bottom of p. 267: “The pictures were generated”...
1 in eqn 14.51 p. 271, replace “\( f(0t) \)” by “\( f(0; t) \).”

Chapter 15
1 eqnarray 15.4 on p. 280 should change all occurences of “\( P_t \)” to “\( P^T_t \); I count 7 occurences.
1 3rd line of footnote 2 p. 280. I think it should read “$\bar{V}_i/P_t^T$ allows” ...

2 footnote 3 p. 280 change “$x_\nu^2$” to “$x_\nu$” under the square root sign.

1 1st line of eqn 15.10 p. 282 should be $... + (r_t - d_t) dt$

1 2nd eqn on p. 283; the last factor in the last term of the first line should be squared:

$$... + (1 - p^2)(\sigma')^2 (T - t)^2$$

1 p. 283; in eqn 15.13, the last term under the sq. rt. should be

$$... + \frac{(\sigma')^2 T^2}{3}$$

1 p. 283; “From Eq. (15.11)” should read “From Eq. (15.12)”

1 eqn 15.22 p. 289 should read

$$c_n = \Delta T_n \max(R(T_n, T_{n+1}) - \bar{R}, 0),$$

1 p. 289; next line after eqn. 15.22 should begin: “(cf. p.217, Chapter 12).” ...

1 eqn 15.23 p. 289 and in eqn 15.24 p. 290; replace “$P(T_{n+1})$” by “$P_0^{T_{n+1}}$”

1 eqn 15.25 p. 290; replace both occurrences of “$P(T_n)$” by “$P_0^{T_n}$”

1 eqn 15.26 p. 290 replace “$P_0^{T_{n+1}}$” by “$P_0^{T_{n+1}}$”