Errata and Updates for ASM Exam MFE/3F (Seventh Edition Second Printing) Sorted by Page

Note: None of the choices for practice exam 5:3 are correct.

[8/25/2010] Here is a revised version of Table 1, page x, incorporating the 76 sample questions.

Topic	Textbook chapters	Manual lessons	Number of questions				
			CAS		SOA		
			Spring 2007	Fall 2007	Sample questions	Spring 2007	Spring 2009
Put-call parity and related material	9	1–2	4	5	3	1	2
Binomial trees	10–11	3–6	4	4	8	4	3
Lognormal model	18	6–8	0	0	3	0	0
Black-Scholes	12	9–11	2	4	8	4	3
Delta hedging	13	12	2	1	4	2	1
Exotic options	14	13–14	1	3	12	2	2
Monte Carlo valuation	19	15	0	0	5	0	0
Itô processes	20–23	16–18	1	0	24	2	6
Interest rate models	24	24–26	2	0	9	3	3
Not on syllabus			0	0	0	1	0
Total questions			16	17	76	19	20

[3/5/2011] The information in the section "The normal distribution table" only applies to paper-and-pencil sites. For students taking the exam under CBT, replace that section with the following:

Formulas in this course use the normal distribution. Most students will be taking this exam at a Prometric site. Prometric provides a standard normal distribution calculator. See `http://www.prometric.com/SOA/MFE3F_calculator.htm` to see how this works. The calculator provides values of the cumulative normal distribution function and its inverse to 5 decimal places.

In addition, you will be given a formula sheet. See `http://www.prometric.com/SOA/MFE3F_calculator.htm` for this sheet. It provides the standard normal density function, the lognormal density function, and moments of the lognormal distribution.

This edition of the manual was written before the Prometric calculator was introduced, and therefore uses the former rounding rules of the SOA, as listed in the section of the manual these paragraphs are replacing.

[8/30/2011] On page 6, third line, change 's to seller's.

[7/8/2010] On page 9, at the end of the first sentence (after "put"), add "both of them at-the-money ($K = S_0$)."

[7/19/2010] On page 13, on the last line of the page, change the first 1.02540 to 0.97539.

[9/16/2010] On page 23, in the solution to exercise 1.17, on the first displayed line, change 95.41 to 96.35.

[6/28/2010] On page 24, the solution to exercise 1.21 is incorrect. The correct solution is

Using equation (1.10), the maturity value of the Treasury for every share purchased is

$$K + \text{CumValue(dividends)} = 95 + 2e^{0.04(0.25)} + 2 = 99.0201$$

Therefore, the number of shares of stock is 10,000/99.0201 = **100.99**.

[7/9/2010] On page 26, on the last line of the solution to Quiz 1-7, change 1.25 to 0.75 and 5.1132 to 4.5132.

[8/9/2010] On page 37, on the first line of the third bullet for the answer to Example 2D, change $S_1 = 45 - k$ to $S_1 = 40 + k$.

[11/23/2010] On page 40, on the last line of the first paragraph, $S_t > K$ should be $S_t > K_1$.

[8/5/2010] On page 54, on the seventh line of the answer to Example 3A, change "(***) from (*)" to "(***) from (**)".

[11/4/2010] On page 70, in the solution to exercise 3.27, on the 12th line, p_1 and p_2 should be p_1^* and p_2^*.

[7/18/2010] On page 92, in Figure 4.10, in the upper node in the second period (with stock price 130), replace 0 with 7.21181.

[3/11/2011] On page 138, replace the first three sentences of the paragraph beginning "Let's generalize" with the following:

Let's generalize from a 1-year period to a t-year period. Let us assume that S_1/S_0 is a lognormal random variable with parameters $m = \mu = \alpha - 0.5\sigma^2$ and $v = \sigma$, so that $\ln \mathbf{E}[S_1/S_0] = \alpha$. Then $\ln(S_t/S_0)$ is a normal random variable with parameters $m = \mu t = \alpha t - 0.5\sigma^2 t$ and $v = \sigma\sqrt{t}$.

[8/4/2010] On page 138, on the last line, the right parenthesis on the left side of the equation should be after $\frac{150}{80}$, and in the second expression, the right side should be ln(15/8) (ln is missing): $\Pr\left(\frac{S_4}{S_0} > \frac{150}{80}\right) = \Pr\Big(\ln(S_4/S_0) > \ln(15/8)\Big)$.

[1/20/2011] On page 140, on the first line of the answer to Example 7C, change "in Section 7.1" to "on the previous page".

[11/1/2010] On page 140, one line above Example 7D, replace $(\alpha = 0.5\sigma^2)t$ with $(\alpha - 0.5\sigma^2)t$.

[8/4/2010] On page 141, change the left side of the last line of the answer to Example 7D to

$$\Pr(S_4/S_0 > 150/80)$$

In other words, change 8 to 80 and move the right parenthesis.

[4/24/2011] On page 147, in equation (7.6), put a hat on d_2: $N(-\hat{d}_2)$.

[11/2/2011] On page 150, in the solution to exercise 7.2, on the first line, change "lognormal" to "normal" in two places.

[2/18/2011] On page 152, the solution to exercise 7.11 uses equation (7.6) (not (7.5)) and the solution to exercise 7.12 uses equation (7.9) (not (7.8)).

[9/27/2011] On page 162, on the first line of Table 8.2, change x_i to S_i.

[3/15/2011] On page 162, exercise 8.2 is identical to exercise 6.11.

[9/27/2011] On page 165, change the first sentence of exercise 8.4 to

A stock's price follows a lognormal model.

[7/6/2010] On page 183, the solution to exercise 9.14 is incorrect. The correct solution is

We shall use formula (9.8). The one-year futures price of the stock is

$$F = S_0 e^{(r-\delta)t} = 40e^{0.06-0.02} = 41.6324$$

In the formulas for d_1 and d_2, use $t = 0.25$, the period of the option.

$$d_1 = \frac{\ln(41.6324/45) + 0.5(0.3^2)(0.25)}{0.3\sqrt{0.25}} = -0.4436 \qquad N(-d_1) = N(0.44) = 0.6700$$

$$d_2 = -0.4436 - 0.3\sqrt{0.25} = -0.5936 \qquad N(-d_2) = N(0.59) = 0.7224$$

In the formula for the put premium, use $t = 0.25$, the period of the option.

$$P = 45e^{-0.06(0.25)}(0.7224) - 41.6324e^{-0.06(0.25)}(0.6700) = \boxed{\mathbf{4.55}}$$

[3/8/2011] On page 216, in the solution to exercise 10.11, on the fifth line in the denominator change $N(0.1)$ to $N(-0.1)$.

[5/15/2011] On page 231, in the displayed formula, change the summation index from i to t.

[8/13/2010] On page 235, in the solution to exercise 11.2, on the fifth line, remove the minus sign from -0.10.

[3/26/2011] On page 243, 2 lines above Example 12B, change 4.1474 to 4.1874.

[7/12/2010] On page 268, in the solution to exercise 12.27:

- On the first and fourth displayed lines, replace 0.08 in the exponents with 0.02.
- Replace the last three lines with:
  We want to solve $e^{-0.005}(0.4207) - ce^{-0.02}(0.3446) = 0$. Therefore

$$c = \frac{e^{-0.005}(0.4207)}{e^{-0.02}(0.3446)} = 1.2393$$

  and you need to buy $\boxed{\mathbf{1.2393}}$ 1-year put options.

[3/26/2011] On page 276, three lines below equation (*), replace "is also lognormal" with "is normal".

[11/4/2010] On page 306, 4 lines above Example 14B, replace the entire line with

For cash-or-nothing put options, the derivative is negative the derivative for a cash-or-nothing call option. For asset-or-nothing put options, the derivative is

$$\frac{\partial V}{\partial S} = e^{-\delta T}N(-d_1) - e^{-\delta T}\frac{e^{-d_1^2/2}}{\sigma\sqrt{2\pi T}}$$

[4/29/2011] On page 312, on the first displayed line, $Se^{-\delta t}$ should be $Se^{-\delta T}$.

[9/21/2010] On page 313, 2 lines above Section 14.3, change 0.031628 to 0.033737.

[5/4/2011] On page 316, first line, delete "at-the-money" and add "with strike price 50" after "put options".

[3/4/2011] On page 317, 4 lines above Quiz 14-5, change $S_0e^{-\delta t}$ to $S_0e^{-\delta T}$.

[10/21/2010] On page 326, in the solution to exercise 14.2, the first $<$ on the payment lines for 10 and 20 should be $\leq$.

[7/22/2010] On page 359, the solution to exercise 15.17 is incorrect. The correct solution is

$X_1^* = \bar{X} + (Y - \bar{Y}) = \bar{X} + 45 - 50 = \bar{X} - 5$. The Boyle β is $\text{Cov}(X,Y)/\text{Var}(Y) = 450/600 = 0.75$. Therefore, $X_2^* = \bar{X} + 0.75(Y - \bar{Y}) = \bar{X} - 3.75$. The difference is $X_1^* - X_2^* = -5 + 3.75 = \boxed{\mathbf{-1.25}}$.

[8/23/2010] On page 360, in the solution to exercise 15.24, in the header of the table in the last column, change $S_2 - 200$ to $S_2 - 110$.

[3/16/2011] On page 365, in Section 16.1.2, on the line below equation (*), change $X(t)$ to $X(t)/X(0)$.

[9/8/2010] On page 367, the answer to Example 16D is incorrect. The correct answer is

We're given $\mu = 0.15$ and $\sigma = 0.2$. By formula (16.1),

$$\text{Cov}\big(S(1), S(3)\big) = 10^2 e^{[0.15+0.5(0.2^2)](4)}\left(e^{0.2^2} - 1\right) = 100e^{0.68}\left(e^{0.04} - 1\right) = \boxed{\mathbf{8.0555}}$$

[8/24/2010] On page 369, the third line of Example 16E, and the non-display lines of the answer, all have errors. Here is a corrected version of the example and its answer:

EXAMPLE 16E You are given an Itô process of the form

$$dS(t) = 0.25S(t)\,dt + 0.10S(t)\,dZ(t)$$

Calculate the probability that $S(t)$ is at least 5% higher than $S(0)$

1. at time $t = 0.1$
2. at time $t = 1$

ANSWER: The Itô process is a geometric Brownian motion with $\xi = 0.25$ and $\sigma = 0.10$. We calculate $\mu = \xi - 0.5\sigma^2$ to obtain the μ parameter of the corresponding arithmetic Brownian motion:

$$d\ln S(t) = \big(0.25 - 0.5(0.10^2)\big)dt + 0.10\,dZ(t) = 0.245\,dt + 0.10\,dZ(t)$$

Then $\Pr\big(S(t)/S(0) \geq 1.05\big) = \Pr\big(\ln S(t) - \ln S(0) > \ln 1.05\big)$.

1. For $t = 0.1$, $m = (\mu)(0.1) = 0.0245$ and $v = 0.10\sqrt{0.1}$

$$\Pr\left(\frac{S(1)}{S(0)} > \ln 1.05\right) = 1 - N\left(\frac{\ln 1.05 - 0.0245}{0.10\sqrt{0.1}}\right) = 1 - N(0.77) = 1 - 0.7794 = \boxed{\mathbf{0.2206}}$$

2. For $t = 1$, $m = 0.245$ and $v = 0.10$, so

$$1 - N\left(\frac{\ln 1.05 - 0.245}{0.1}\right) = 1 - N(-1.96) = 1 - 0.0250 = \boxed{\mathbf{0.9750}}$$

□

[8/18/2010] On page 369, 4 lines from the bottom, change the left-hand side $X(t)$ to $dX(t)$.

[8/27/2010] On page 373, the first paragraph of exercise 6 is cut off and should end "14.23% probability of being in a negative cash position at the end of the year."

[8/24/2010] On page 373, in exercise 8(ii), change $S_0 - 40$ to $S_0 = 40$.

[9/21/2010] On page 374, in exercise 16.12, there are words missing at the end of the question. The question should be "Calculate the probability of exceeding a continuously compounded annual return of 20% in a two-year time period."

[9/21/2010] On page 374, in exercise 16.13, the second and third bullets should read:

- Volatility = 70.71% per annum.
- Expected return = 15.00% per annum (continuously compounded).

[8/24/2010] On page 377, in the solution to exercise 11, on the third line, change 0.02 (after an equals sign) to 0.04. On the fifth line, change $e^{0.86}$ to $e^{0.92}$.

[10/8/2010] On page 385, one line above Example 17F, add "dt" at the end of the line.

[9/13/2010] On page 386, on the third line, change "lend" to "borrow".

[11/9/2011] On page 400, on the 2nd to last displayed line of the page, there should be a $\mathrm{d}t$ at the end of the line, so that the line looks like this:

$$\mathrm{d}X(t)=\left(-\lambda X(0)e^{-\lambda t}+\alpha\lambda e^{-\lambda t}\right)\mathrm{d}t+e^{-\lambda t}\mathrm{d}\left(\int_0^t \sigma e^{\lambda s}\mathrm{d}Z(s)\right)-\left(\lambda e^{-\lambda t}\int_0^t \sigma e^{\lambda s}\mathrm{d}Z(s)\right)\mathrm{d}t$$

[10/21/2010] On page 411, in exercise 17.30, on the second to last line, change $r\,\mathrm{d}t$ to $a\,\mathrm{d}t$.

[8/26/2010] On page 415, in the solution to exercise 17.4, on the second line, change $\dfrac{\mathrm{d}Z(t)}{\mathrm{d}t}$ to $\dfrac{\mathrm{d}X(t)}{\mathrm{d}t}$.

[3/21/2011] On page 418, in the solution to exercise 17.15, five lines from the end, a 5 is missing from the right-hand side, which should be $5rS^3e^{\gamma t}$.

[4/1/2011] On page 425, in the solution to exercise 17.42, on the last line of the page, change $\mathrm{Var}(S-Q)$ to $\mathrm{Var}(\ln S-\ln Q)$.

[9/22/2010] On page 426, the final answer to exercise 17.42 should be 0.2852 instead of 0.286.

[9/14/2010] On page 427, the solution to exercise 17.46 is incorrect. The correct solution, starting with the fifth line, is

So the anti-derivative of $Z(t)$ is $0.5\left(Z(t)^2-t\right)$, and the integral is

$$\int_0^5 Z(t)\mathrm{d}Z(t)=0.5\left(Z(5)^2-5\right)$$

The expected value of $Z(5)^2$, or the second moment of a standard normal random variable with mean 0 and variance 5, is 5, so the expected value of the integral is $0.5(5-5)=\boxed{\mathbf{0}}$.

[5/15/2011] On page 438, one line before Subsection 18.2.2, change "they could" to "that could".

[3/4/2011] On page 461, in the table, two lines under the heading in the 4% scenario column, change −2.608747 to −2.608074.

[1/25/2011] On page 466, on the fifth line, change page 20.2.1 to page 463.

[5/22/2011] On page 468, the formula for $A(t,T)$ when $a=0$ (the fourth displayed line from the bottom of the page) is incorrect; there should be a negative sign before 0.5 in the exponent. However, McDonald has this erroneous formula, and has not corrected it, so you are probably not expected to know the correct formula.

[10/26/2010] On page 479, on the first line of Section 20.4, change "page" to "section".

[4/24/2010] On page 480, change equation (20.19) to

$$P(r+\epsilon,h,T)-P(r,0,T)=\Delta\epsilon+0.5\Gamma\epsilon^2+\theta h$$

[10/21/2010] On page 486, in the list of additional released exam questions, change Sample:16 to Sample:14.

[5/22/2011] On page 492, in the solution to exercise 20.27, on the second line, the exponent is based on the formula in McDonald, but McDonald's formula is erroneous; there should be a negative sign before $0.5\sigma\phi(5^2)$.

This has no effect on the solution since $\phi = 0$. Since McDonald has not corrected this error, it is unlikely you would be expected to know the correct formula.

[10/30/2010] On page 498, on the first line of the third paragraph, change 11 to 12.

[5/24/2011] On page 562, in question 24, replace the first sentence with

Let $S(t)$ be the time-t value of a stock index, and $Q(t)$ the time-t value of an annuity contract. The annuity's contract value grows at the same rate as the value of the stock index, except that a continuously compounded 1% management fee is assessed. More precisely,

$$Q(t+\mathrm{d}t) = Q(t)\left(\frac{S(t+\mathrm{d}t) - 0.01S(t)\mathrm{d}t}{S(t)}\right)$$

[4/8/2011] On page 583, in question 15, delete the first sentence. This derivative security could not exist under the Black-Scholes framework with constant σ unless $\sigma = 0$.

[4/5/2011] On page 584, in question 17, on the seventh line, add the words "the variance of" before "control variate".

[12/30/2010] On page 603, in the solution to question 18, on the first displayed line, change $(0.12 - 0.02)$ to 0.10. On the 3rd line from the end, replace $0.12 - 0.02$ with 0.10.

[4/10/2011] On page 609, in the solution to question 12, on the first displayed line, change $\dfrac{F_{0,1}\left(S(1)^2\right)}{S(1)^{-1}}$ to $\dfrac{F_{0,1}\left(S(1)^{-1}\right)}{S(0)^{-1}}$.

On the second displayed line, change the denominator to $S(0)^2$.

[3/7/2011] On page 617, in the solution to question 10, on the third line, change -0.5156 to -0.5126.

[5/6/2011] On page 619, in the solution to question 16, on the last line, $0.10\,\mathrm{d}Z(t)$ should be $0.10k\,\mathrm{d}Z(t)$.

[4/28/2011] On page 626, in the solution to question 12, on the second line, add "t" before $+0.10Z(t)$.

[11/10/2011] On page 631, the solution to question 3 is incorrect. The correct solution is

[11/4/2011] On page 638, in the solution to question 24, the column S_t/S_{t-1} is incorrect, except that 1.0025 is correct. The five entries in that column should be 1.0025, 1.0948, 0.9180, 0.9429, 1.0579.

[4/1/2011] On page 649, in the solution to question 7.5, on the second line from the end, change $+0.1\,\mathrm{d}Z(t)$ to $-0.1\,\mathrm{d}Z(t)$.

[5/11/2011] On page 661, in the solution to question 13, on the last two lines, $0.06Y(t)^{2/3}\mathrm{d}Z(t)$ should be $0.6Y(5)^{2/3}\mathrm{d}Z(t)$. The error occurs once per line. Do not change the first 0.06 on the last line.

[5/14/2011] On pages 668–669, in the solution to question 11, on the last line of page 668, delete the minus sign. On the 2nd line of page 669, delete 0.04 from the first denominator.

[11/10/2011] On page 678, the solution to question 15 is incorrect. The correct solution is

The prepaid forward price of currency, as indicated in Table 1.2, is

$$x_t e^{-r_f(T-t)}$$

Here, for dollars in terms of euros, $x_t = 1/1.50$ and dollars are the foreign currency so $r_f = 0.04$. Also, $T - t = 2$. We conclude that the prepaid forward price is $100e^{-0.04}/1.50 = \boxed{\mathbf{61.54}}$.

[7/26/2010] On page 685, in the solution to question 24, on the second displayed line, change $-e^{-3r_f}$ to $+e^{-3r_f}$.

[4/5/2011] On page 690, in the solution to question 10, on the second line from the end, change $e^{0.04}$ to $e^{0.02}$. On the last two lines, change 62.0408 to 62.0202 in two places. Change the final answer to 161.24.

[3/9/2011] On page 693, in the solution to question 18, on the fifth and sixth lines, change 0.01905 to −0.01905 and 0.04905 to 0.04095. This sentence is intended to explain the formula for d_1 near the end of the solution. d_1 is a sum of −0.01905 (which is the log of the underlying asset, $S(1)^{0.7}$) and the risk-free rate of 0.06.

[5/15/2011] On page 694, in the solution to exercise 20, 4 lines after the boldface answer key **(B)**, change the last exponent from 0.90 to 0.09.

[5/14/2011] On page 698, in the solution to question 3, on the last displayed line, change $0.12Y^2$ to $0.03Y^2$.

[4/6/2011] On page 705, in the solution to question 22, on the last two lines (once apiece), change $\alpha(0.04,0,2)$ to $\alpha(0.04,0,3)$.

[11/15/2011] On page 705, on the first line of the solution to question 23, change "put" to "call".

[10/25/2010] On page 717, in the solution to question 21, on the 2nd and 3rd lines from the end, change 0.6739 to 0.6736.

[10/25/2010] On page 721, in the solution to question 7, change the last four lines to

$$1.13 = 2\left(\frac{e^r - d}{u - d}\right)e^{-r} = 2\left(\frac{e^r - 0.8}{0.4}\right)e^{-r} = 5 - 4e^{-r}$$
$$e^{-r} = \frac{5 - 1.13}{4} = 0.9675$$

In the revised tree,

$$C = 2\left(\frac{e^r - 0.6}{0.6}\right)e^{-r} = \frac{10}{3} - 2(0.9675) = \boxed{\textbf{1.3983}} \qquad \textbf{(D)}$$

[3/9/2011] On page 723, in the solution to question 12II, on the third line, change $P(45,T) > P(50,T)$ to $P(45,T) \leq P(50,T)$.

[4/10/2011] The url on page 727, second line of Section B.6, should be

`http://www.beanactuary.org/exams/pdf/MFE_SampleQS1-76.pdf`

[10/19/2010] On page 738, in the solution to question 32, on the fourth and fifth displayed lines, the ones for $W(t)$ and $\left(\frac{S(t)}{S(0)}\right)^{\varphi}$, delete the d in front of $Z(t)$.