Errata and updates for ASM Exam C/Exam 4 Manual (Ninth Edition) sorted by page

Warning: Practice exam 3 question 34 is defective. Practice exam 4 question 13 is missing a line; see the errata for page 984. Practice exam 6 question 15 is flawed in that none of the 5 answer choices is correct. In practice exam 9 question 34, multiply the ranges by 10 as noted below in the correction for page 1038. In practice exam 10 question 11, none of the 5 answer choices is correct. Practice exam 10 question 32 should be replaced as indicated below.

[7/2/2009] On page xiv, on the third line of the fourth paragraph of "Tables", change 0.8859 to 0.8860.

[8/4/2009] On page 8, in Section 1.3, $\Pr(B) \neq 0$ and $f(y) \neq 0$ are necessary for the definitions of conditional probability.

[8/4/2009] On page 10, at the end of the third line of Section 1.4, add "independent": "... if X is the sum of independent random variables ...". On the second line from the end of the page, add "independent": "... if X is the sum of independent random variables ...".

[11/29/2009] On page 19, in the solution to exercise 1.10, change "Generalized Pareto" to "Burr".

[11/29/2009] On page 21, in the solution to exercise 1.17, on the last line, $\ln 0.06$ should be $\ln 0.6$.

[7/9/2009] On page 22, in the solution to exercise 1.21, on the 7th line, change $g(x)$ to $g(n)$.

[11/29/2009] On page 23, on the last line of the solution to exercise 1.23, change 0.035764 to 0.035674.

[8/4/2009] On page 26, one line after Example 2A, add the word "independent": "... from n independent identically distributed ...".

[7/29/2009] On page 26, on the third line of Section 2.2, change "determines" to "determine".

[7/9/2009] On page 27, on the second displayed line, change 0.4889 to 0.5367.

[7/16/2009] On page 30, in the third paragraph of Section 2.4, change the beginning of the second sentence to

"Recall from page 4 that $H(x) = \int_0^x h(t)\mathrm{d}t$,"

In the second displayed equation of Section 2.4, change the exponent of the middle term from $H(x)$ to $H(x) \mid \Lambda$. In the third displayed equation, make three corrections to the integrand of the integral: Pr should not be italicized, λ should not be capitalized, and $\mathrm{d}x$ should be $\mathrm{d}\lambda$, so it should be $\Pr(X > x \mid \lambda) f(\lambda)\mathrm{d}\lambda$.

[1/24/2010] On page 36, in the solution to exercise 2.4, on the fourth line, change $\mathrm{Var}(mn)$ to $\mathrm{Var}(mN)$.

[11/30/2009] On page 46, in the solution to exercise 3.6, on the second line of the second paragraph, in the sentence beginning "The expected value ...", delete "by the Bernoulli shortcut". On the second line from the end, delete a plus sign between 0.0064 and 0.183125.

[8/11/2009] On page 76, the solution to exercise 5.18 does not reflect SOA normal distribution rounding rules. A corrected solution is

We need to calculate a. First we calculate $F(100)$.

$$\Phi\left(\frac{\ln 100 - 3}{2}\right) = \Phi(0.80) = 0.7881$$

For the given Pareto, $S(100) = \left(\frac{3}{4}\right)^2 = 0.5625$. Therefore, a must be $(1 - 0.7881)/0.5625 = 0.3767$. Then

$$\Pr(X > 200) = 0.3767\left(\frac{300}{300 + 200}\right)^2 = (0.3767)(0.36) = \boxed{\mathbf{0.1356}}$$

[7/7/2009] On page 84, on the line after equation (6.1), add "and" between $\text{VaR}_y(X)$ and dy.

[11/30/2009] On page 84, 3 lines below equation (6.2), change "b is 0" to "b is 1".

[8/9/2009] On page 85, in the caption of Figure 6.1, change $e(TVaR_{0.95}(X))$ to $e\left(\text{VaR}_{0.05}(X)\right)$. In the figure itself, $Q_{0.95}$ means $\text{VaR}_{0.95}$.

[7/2/2009] On page 85, the word "ln" needs to be added to the first two lines as follows:

We derived above that $\text{VaR}_p(X) = -\theta \ln(1-p)$. Therefore

$$\text{TVaR}_p(X) = -\theta \ln(1-p) + \theta = \theta\left(1 - \ln(1-p)\right)$$

[8/22/2009] On page 89, change the displayed line of exercise 6.1 to

$$\rho(X) = \frac{\ln \mathbf{E}[e^{\alpha X}]}{\alpha}, \quad \alpha > 0$$

[7/5/2009] On page 89, in exercise 6.11, change $\text{VaR}_{0.99}$ to $\text{TVaR}_{0.99}(X)$ and $\text{TVaR}_{0.95}$ to $\text{TVaR}_{0.95}(X)$.

[9/2/2009] On page 90, change the solution to exercise 6.1 to

- **Translation invariance.**
$$\rho(X+c) = \frac{\ln \mathbf{E}[e^{\alpha(X+c)}]}{\alpha} = \frac{\ln e^{\alpha c} + \ln \mathbf{E}[e^{\alpha X}]}{\alpha} = c + \rho(X) \quad \checkmark$$
- **Positive homogeneity.**
$$\rho(cX) = \frac{\ln \mathbf{E}[e^{c\alpha X}]}{\alpha}$$
A simple counterexample for $\alpha = 1$ is if X only assumes the values 0 and 1 with probabilities 0.5 and $c = 2$. Then
$$\rho(2X) = \ln 0.5(1+e^2) \neq 2\rho(X) = 2\ln 0.5(1+e) \quad \times$$
- **Subadditivity.**
$$\rho(X+Y) = \frac{\ln \mathbf{E}[e^{\alpha(X+Y)}]}{\alpha}$$
If X and Y are independent, then $\rho(X+Y) = \rho(X) + \rho(Y)$. However, if X and Y are not independent, there is no reason $\rho(X+Y) \leq \rho(X) + \rho(Y)$. For example, if we use the counterexample for positive homogeneity for X and let $Y = X$, then $\rho(2X) = \ln 0.5(1+e^2) = 1.4338 > 2\rho(X) = 2\ln 0.5(1+e) = 1.2402$. $\times$
- **Monotonicity.** If $X \leq Y$ always, then $e^{\alpha X} \leq e^{\alpha Y}$, from which it follows that $\mathbf{E}[e^{\alpha X}] \leq \mathbf{E}[e^{\alpha Y}]$. $\checkmark$

Only translation invariance and monotonicity are satisfied.

[1/21/2010] On page 91, in the solution to exercise 6.5, on the second line, change the dummy integration variable from x to u, so that the expression after the first equals sign is $\displaystyle\int_0^x \frac{2u\,\text{d}u}{1000^2}$.

[7/5/2009] On pages 96–97, in the answer to Example 7B, on the fourth displayed line, replace 0.44444 with 0.55556. On the first displayed line on page 97, replace 0.47266 with 0.52734. Replace the second displayed line with

$$0.52734 - 0.55555 = \boxed{\mathbf{-0.02822}}$$

[7/17/2009] On page 113, in the solution to exercise 7.21, on the second line, replace $\Pr(X > 1000)$ with $\Pr(X > 500)$. On the fourth line, replace $\Pr(X > 2000)$ with $\Pr(X > 500)>$

[11/30/2009] On page 114, in the solution to exercise 7.22, on the third line of the page, change 1.5147^2 to 1.5174^2.

[11/10/2009] On pages 115–116, in the answer to Example 8A, $F_Y(2)$ should be $F_Y(0)$. This error occurs three times: 2 lines from the bottom of page 115, second non-display line on page 116, and last displayed line of the answer.

[11/30/2009] On page 120, in the solution to exercise 7.48, on the fourth line, change "them" to "the". On the second displayed line, change the denominator $2000+5000$ to $2000+500$.

[7/8/2009] On page 124, replace "Calculating the variance..." to the bottom of the page with the following:

Calculating the variance of payment in the presence of a deductible is not so straightforward. We can temporarily ignore inflation and coinsurance, since each of these multiply the random variable by a factor, and we can adjust the variance by multiplying by that factor squared. So let's calculate the variance of the payment per loss random variable Y^L, defined by

$$Y^L = X \wedge u^* - X \wedge d^*$$

where u^* and d^* are the maximum covered loss and the deductible respectively, adjusted for inflation rate r by dividing by $1+r$. We can calculate the second moment of Y as follows:

$$\begin{aligned}(Y^L)^2 &= (X \wedge u^* - X \wedge d^*)^2 \\ &= (X \wedge u^*)^2 - 2(X \wedge u^*)(X \wedge d^*) + (X \wedge d^*)^2\end{aligned}$$

Now, we would prefer a formula starting with $(X \wedge u^*)^2 - (X \wedge d^*)^2$, so we'll subtract and add $2(X \wedge d^*)^2$.

$$\begin{aligned}(Y^L)^2 &= (X \wedge u^*)^2 - (X \wedge d^*)^2 + 2(X \wedge d^*)^2 - 2(X \wedge u^*)(X \wedge d^*) \\ &= (X \wedge u^*)^2 - (X \wedge d^*)^2 + 2(\underbrace{X \wedge d^*}_{*})(X \wedge d^* - X \wedge u^*)\end{aligned}$$

We can replace the $X \wedge d^*$ with the star below it with d^*. Because if $X < d^*$, then $X \wedge d^* - X \wedge u^* = 0$, since both $X \wedge d^*$ and $X \wedge u^*$ are X, so the factor doesn't matter. And if $X \geq d^*$, then $X \wedge d^* = d^*$.

Making this replacement and taking expectations on both sides, we get the final formula

$$\mathbf{E}\left[(Y^L)^2\right] = \mathbf{E}\left[(X \wedge u^*)^2\right] - \mathbf{E}\left[(X \wedge d^*)^2\right] - 2d\left(\mathbf{E}[X \wedge u^*] - \mathbf{E}[X \wedge d^*]\right)$$

[7/10/2009] On page 126, in exercise 8.1, delete the word "average" on the last line.

[7/10/2009] On page 133, in the solution to exercise 8.1, change both highlighted boxes, 5,104,000 and 5,104,975, to **5,054,400**.

[7/28/2009] On page 136, in the solution to exercise 8.12, on the second displayed line, 5^2 should be 5.

[7/9/2009] On page 136, in the solution to exercise 8.13, 1151.29 is not the final answer. Add the following line at the end of the solution:

With 3 expected losses per year, expected annual claim payments are $3(1151.29) =$ **3453.87**.

[11/30/2009] On page 136, in the solution to exercise 8.14, on the second line, put an **E** before $[X \wedge d]$.

[11/30/2009] On page 137, in the solution to exercise 8.15, change the second word to "question".

[7/14/2009] On page 139, make the following corrections to the solution to exercise 8.22:

- Replace the passage "We can temporarily ignore the 250 ..." up to but not including the displayed equation with "The partial expectation of the amount of a payment for the loss above 1081.14, given that the loss is greater than 1081.14 is"

- On the 3rd line from the end, replace 490.09 with 409.09.
- Replace the last sentence of the solution with "In addition, the insurer pays $0.8(1081.14-250)=664.91$ on each loss above 1081.14. Therefore, the Tail-Value-at-Risk of annual payments is $1401.245+664.91=$ **2066.16**."

[11/30/2009] On page 147, in the solution to exercise 9.1, on the fourth line from the end, delete the extra 0 at the end of 440,0000.

[11/30/2009] On page 148, in the solution to exercise 9.6, on the second displayed line, insert an equal sign between 100 and c.

[7/17/2009] On page 154, in Example 10B, change p_0 to p_0^M.

[1/15/2010] On page 155, in the equation for r (the 8th displayed line of the page), change the right hand side to $1+\frac{-0.9}{0.75}=-0.2$

[12/1/2009] On page 175, in the solution to exercise 11.11, change "if" to "it".

[9/4/2009] On page 177, on the 4th line of Subsection 12.2, delete "or a claim limit". Frequency is unaffected by a claim limit.

[8/1/2009] On page 179, in Table 12.1, there should be parentheses around $1-p_0^M$ on the right hand side of formula (12.1): $(1-p_0^M)\left(\frac{1-p_0^*}{1-p_0}\right)$.

[8/21/2009] On page 184, in the solution to exercise 12.11, change $\frac{b-d}{d}$ to $\frac{b-d}{b}$.

[11/30/2009] On page 212, in the solution to exercise 13.14, on the 5th line, replace "variance" with "second moment".

[12/1/2009] On page 213, in the solution to exercise 13.16, on the third displayed line, change 0.596 to 0.6.

[12/2/2009] On pages 215–216, the solution to exercise 13.22 is too complicated, and has some typos. Here is a better solution:

This exercise is harder than the previous one, since the deductible now affects claim frequency. There are two ways we can do the exercise:

1. We can let N_P be the number of payments and Y^P the payment per payment.
2. We can let N be the number of losses and Y^L the payment per loss, or

Both methods require work. I think the first method is easier, but will demonstrate both ways.

First method The negative binomial has $r\beta=0.3$ and $r\beta(1+\beta)=0.6$, so $\beta=1$, $r=0.3$. The probability of a loss above 3000 is

$$\Pr(X>3000)=\left(\frac{\theta}{3000}\right)^{\alpha}=\left(\frac{2000}{3000}\right)^{3}=\frac{8}{27}$$

The modified negative binomial has $r=0.3$, $\beta=8/27$, so its moments are

$$\mathbf{E}[N_2]=\frac{2.4}{27}=0.088889 \qquad \mathrm{Var}(N_2)=\frac{0.3(8)(35)}{27^2}=0.115226$$

$$\mathbf{E}[N^P]=\frac{2.4}{27}=0.088889 \qquad \mathrm{Var}(N^P)=\frac{0.3(8)(35)}{27^2}=0.115226$$

Y^P is a two-parameter Pareto with modified parameters with parameters $\theta = 3000$ and $\alpha = 3$. Using the tables to calculate its mean and variance:

$$\mathbf{E}[(Y^P)] = \frac{\theta}{\alpha - 1} = \frac{3000}{3-1} = 1500$$
$$\mathbf{E}\left[(Y^P)^2\right] = \frac{2\theta^2}{(\alpha-1)(\alpha-2)} = \frac{2(3000^2)}{2} = 3000^2$$
$$\text{Var}(Y^P) = 3000^2 - 1500^2 = 6{,}750{,}000$$

The variance of aggregate payments is

$$\text{Var}(S) = \mathbf{E}[N^P]\,\text{Var}(Y^P) + \text{Var}(N^P)\mathbf{E}\left[(Y^P)^2\right]^2 = (0.088889)(6{,}750{,}000) + (0.115226)(1500^2) = \boxed{\mathbf{859{,}259}}$$

Second method We computed the mean and variance of Y^P in the first method. Therefore,

$$\mathbf{E}[Y^L] = \mathbf{E}[Y^P]\,\Pr(X > 3000) = \left(\frac{8}{27}\right)(1500) = 444.444$$

The variance is computed by treating Y^L as a compound distribution. The primary distribution is Bernoulli with $q = \Pr(X > 3000)$ and the secondary is Y^P.

$$\text{Var}(Y^L) = \left(\frac{8}{27}\right)(6{,}750{,}000) + \left(\frac{8}{27}\right)\left(\frac{19}{27}\right)(1500^2) = 2{,}469{,}136$$

The variance of aggregate payments is

$$\text{Var}(S) = 0.3(2{,}469{,}136) + 0.6(444.444^2) = \boxed{\mathbf{859{,}259}}$$

[12/1/2009] On page 220, in the solution to exercise 13.36, on the last line, change the 79,875 in the denominator to 79,375.

[8/8/2009] On page 225, in the solution to exercise 13.55:

- On the third displayed line, change $\mathbf{E}[N]$ to $\text{Var}(N)$.
- On the fourth displayed line, change $\mathbf{E}[X]$ to $\mathbf{E}[X \wedge 20{,}000]$.
- On the fifth displayed line, change $\mathbf{E}[X^2]$ to $\mathbf{E}[(X \wedge 20{,}000)^2]$

[9/24/2009] On page 227, two lines above the second displayed line, change 6.17 to 9.9. One line above the fourth displayed line, change 6.16 to 9.8. Two lines below that displayed line, change 4.52 to 6.14. However, Theorem 6.14 is not on the syllabus.

[9/24/2009] On page 229, one line after the answer to Example 14B, change 6.6.2–6.6.4 to 9.9.2–9.9.4.

[10/25/2009] On page 240, on the third displayed line of the page, the upper limit $\lceil d/h \rceil - 1$ should be replaced with $\lfloor d/h \rfloor$.

[7/22/2009] On pages 248–249, in the solution to exercise 15.2, on the 6th and 7th lines, change p_0 to f_0. On the first displayed line of page 249, change f_1 to p_1.

[12/2/2009] On page 251, in the solution to exercise 15.12, on the fifth line, change 0.1 to 0.01.

[2/14/2010] On page 255, in the displayed formula, change the two n's in the summand to j's, so that the fraction is $\dfrac{(x/\theta)^j}{j!}$. Also change $F_X(s)$ to $F_X(x)$.

[8/24/2009] On page 259, on the 12th line from the bottom of the page, change m_1^0 to m_0^1.

[12/2/2009] On page 260, on the line above equations (16.1), change m_k^0 and m_k^1 to m_0^k and m_1^k.

[8/25/2009] On page 268, 4 lines below the answer to Example 17B, change 9.2 and 9.5 to 12.2 and 12.5.

[9/23/2009] On page 272, on the 6th line, delete "a" before "boundary points".

[2/9/2010] On page 279, on the first line of the solution to exercise 17.16, move the first left parenthesis into the sum and put a bar on the X: $\frac{\sum(X_i-\bar{X})^2}{n-1}$.

[11/8/2009] On page 296, in the solution to exercise 19.11, on the fifth displayed line, the right parenthesis after θ should be before θ.

[2/5/2010] On page 334, on the last line of Example 22B, delete the comma after "interval".

[2/5/2010] On page 342, in the solution to exercise 22.11, change $z_{0.025}$ to $z_{0.95}$ and $z_{0.05}$ to $z_{0.975}$ in two places.

[11/9/2009] On page 346, in the solution to exercise 22.31, on the last line, change 0.1439 to 0.01439.

[7/30/2009] On page 358, on the line before the third displayed equation, change "from the variance" to "from the second moment".

[8/1/2009] On page 369, on the second line of the paragraph beginning d_j, change "s study" to "a study". On the 7th line from the bottom of the page, change "an including" to "and including".

[11/10/2009] In the first table on page 371, both tables on page 372, and the first and third tables on page 373, the subscripts on d, u, x, and r should be $j-1$ instead of j.

[11/10/2009] On page 372, in Example 24C, on the first line, add the word "study" after mortality.

[7/2/2009] On page 373, the last line of the answer to Example 24D should read

$$ {}_5\hat{q}_0'^{(d)} = 1-(7.5/8.5)(5.5/6.5) = \boxed{\mathbf{0.2534}} $$

[11/10/2009] On page 374, on the last line, change $100-75$ to $100-25$.

[8/12/2009] On page 376, in exercise 24.7, on the second line from the end, change "loss" to "paid claim".

[5/26/2009] On page 377, in exercise 24.10, α/β notation is no longer used in the syllabus. Delete the phrase "with $\alpha=1$ and $\beta=0$".

[11/6/2009] On page 383, on the fifth line of Subsection 25.1.2, change "the the" to "to the".

[8/3/2009] On page 384, on the 4th lines of Examples 25B and 25C, delete "are assumed".

[12/6/2009] On page 408, in footnote 1, change $f(1000^-)$ and $f(1000)$ to $F(1000^-)$ and $F(1000)$.

[8/18/2009] On page 427, on the 5th and 6th lines of the answer to Example 27B, change 50! to 60!

[9/15/2009] On page 444, in the solution to exercise 27.17,

- On the first displayed line, put an exponent 8 on $S(10;k)$.
- On the third displayed line, replace θ with k.

[6/8/2009] On page 446, in the solution to exercise 27.24, the second displayed line has three errors, and should read

$$ \frac{1}{2}\frac{\mathrm{d}g}{\mathrm{d}\theta} = -\frac{30}{\theta^2}\left(\frac{30}{\theta}-5\right)-\frac{45}{\theta^2}\left(\frac{45}{\theta}-5\right)+\frac{75}{\theta^2}\left(10-\frac{75}{\theta}\right)=0 $$

[8/29/2009] On page 452, change the third and fourth displayed lines to

$$2^{\tau} = \frac{\ln 0.05}{\ln 0.35}$$
$$\tau = \frac{\ln \frac{\ln 0.05}{\ln 0.35}}{\ln 2} = \boxed{\mathbf{1.512764}}$$

[9/10/2009] On page 469, in the solution to exercise 28.12, on the displayed line, replace the first $\mathbf{E}[X \wedge 100]$ with $\mathbf{E}[X \wedge 1000]$.

[9/15/2009] On page 470, in the solution to exercise 28.21, on the 3rd and 2nd lines from the end of the page, replace 10,000 with 100,000 in four places.

[8/29/2009] On page 476, in the solution to exercise 28.40, on the last displayed line of the solution, change the last numerator to $6\sum \ln y_i$.

[8/29/2009] On page 480, in the solution to exercise 28.48, on the second displayed line, change $14\ln 0.6$ to $6\ln 0.6$.

[11/10/2009] On page 480, in the solution to exercise 28.50, on the last line, change $e^{-23{,}500.18/100{,}000}$ to $1 - e^{-23{,}500.18/100{,}000}$.

[8/25/2009] On page 488, in the first sentence of Subsection 29.2.2, add the word "negative" before "the expected value".

[8/25/2009] On page 489, on the fifth displayed line of the page, replace $I(\mathbf{x})$ with $I(\theta)$, and put a negative sign before $\mathbf{E}$. On the seventh displayed line, change $\frac{2\bar{x}}{\theta^3}$ to $\frac{2n\bar{x}}{\theta^3}$.

[8/29/2009] On page 490, on the first displayed line, change the numerator from θ to θ^n.

[8/24/2009] On page 491, the last 5 lines of the solution to Example 29H are incorrect. Replace them with:

$$\frac{\mathrm{d}g}{\mathrm{d}a} = 0.5^a \ln 0.5$$
$$\widehat{\mathrm{Var}}\left(\widehat{\Pr}(X < 0.5)\right) = \left(0.5^{\hat{a}} \ln 0.5\right)^2 (0.76645) = 0.02441$$

The confidence interval is $0.25745 \pm 1.96\sqrt{0.02441} = (-0.04876, 0.56366)$. Since probabilities can't be less than 0, the actual confidence interval would be $\boxed{\mathbf{[0, 0.56366)}}$ This is a pretty wide confidence interval, but there were only five observations in the sample.

[2/16/2010] On page 492, on the second line of the third paragraph, change pth to $100p$th.

[2/11/2010] On page 506, in the solution to exercise 29.25, on the first line, $g(x)$ should be $g(\mu, \sigma)$. On the last line, $g(X, y)$ should be $g(\mu, \sigma)$.

[2/11/2010] On page 507, in the solution to exercise 29.26, in the three displayed equations, change all four L's to $\ln L$'s.

[2/14/2010] On page 510, in the solution to exercise 29.34, 5 lines from the end, reverse the order of the summands in the numerator of the first expression:

$$\frac{\sum (\ln x_i - \mu')^2 - (\ln x_i - 5)^2}{4}$$

[9/15/2009] On page 514, 6 lines from the bottom of the page, change 0.15990 to 0.31981. Replace the last line of the page with

$$= -13.86294 + 10.98612 - 15.96056 - 6.16604 + 3.77900 = -21.2244$$

[2/14/2010] On page 516, on the third and second lines from the bottom, change $5(1)$ to $1(5)$ and $5(1^2)$ to $1(5^2)$.

[9/9/2009] On page 528, in the solution to exercise 30.19, on the last line, replace 8/19 with 10/19. The final answer is 9/10, not 9/8.

[2/14/2010] On page 528, in the solution to exercise 30.20, on the second line, change $e-\lambda$ to $e^{-\lambda}$.

[11/11/2009] On page 531, on the first line, delete "plus *Derivatives Marekts* 18.6". On the first line of the second paragraph, change 13.2 to 16.2.

[1/30/2010] On page 549, in exercise 32.16, on the third line, change "payments of 10,000" to "payments of 9,500".

[1/30/2010] On page 553, in the solution to exercise 32.10, on the last line of the table, change 0.0057 to 0.0053.

[12/7/2009] On page 563, on the first line of the second paragraph, add "is" after "it".

[8/24/2009] On page 601, in the solutions to exercises 35.8 and 35.9, on the first displayed line of each, in the denominator, change 3^{100} to 2.5^{100}.

[9/4/2009] On page 608, on the third line after the enumerated list, replace "average" with "expected" and replace "800" with "900".

[8/6/2009] On page 623, one line above equation (37.3), delete a redundant "number of".

[12/7/2009] On page 625, in the answer to Example 37C, replace 41 with 11.

[12/7/2009] On page 643, in the solution to exercise 38.15, on the fifth line, replace 41 with 11.

[2/4/2010] On page 666, on the second line from the end of the page, after **53,409**, add **(C)**.

[12/7/2009] On page 670, in the solution to exercise 39.21, on the line after "We are given that the weighted posterior sum ...", change $\frac{1}{12}(3)$ to $\frac{2}{12}(3)$.

[12/7/2009] On page 671, in the solution to exercise 39.24, on the fourth line, change 0.2(60,000) to 0.1(60,000).

[10/4/2009] On page 673, in the solution to exercise 39.28, on the displayed line, replace the two 24's in the numerator and denominator with 32's.

[12/8/2009] On page 679, in the Reading paragraph at the top, there should be an "or" after *Loss Models* Third Edition 20.3.1–20.3.3; SN C-21-01 4 is a distinct option.

[12/8/2009] On page 679, on the last line of the page, change 12.28 to 15.17.

[12/8/2009] On page 684, on the first line of Section 40.5, change 12.4.3 to 15.5.3.

[9/15/2009] On page 695, in the solution to exercise 40.9, on the first displayed line of the page, change $\frac{1}{3(4^{x_4+1})}$ to $\frac{3}{4^{x_4+1}}$.

[12/8/2009] On page 700, in the solution to exercise 40.25, on the fourth line of the page, replace "and 4" with "$\alpha=2$ and $y=4$".

[12/8/2009] On page 700, in the solution to exercise 40.28, replace the second displayed line with

$$=-\frac{e^{-2\theta}}{2(1-e^{-k})}\Bigg|_0^k$$

[12/8/2009] On page 701, on the last line of the solution to exercise 40.29, replace the fraction with $\frac{0.021845-0.014006}{0.021845-0.007776}$.

[12/8/2009] On page 710, exercise 41.19 is the same as exercise 11.5.

[12/8/2009] On page 714, in the solution to exercise 41.21, on the second line, change both y's to n's.

[8/5/2009] On page 717, in the second displayed equation, change the last numerator from a to v:

$$\mu_*=Z\bar{x}+(1-Z)\mu=\left(\frac{na}{na+v}\right)\bar{x}+\left(\frac{v}{na+v}\right)\mu$$

[9/6/2009] On page 721, in the solution to exercise 42.5, on the first line, change 20,000 to 2000.

[9/28/2009] On page 722, in the solution to exercise 42.9, on the third displayed line, put a division sign between $\sum \ln x_i$ and 10.

[9/28/2009] On page 723, in the solution to exercise 42.10, replace the third and later lines with

$$\frac{(1500)(900)}{900+1500n} \le 100$$
$$135 \le 9+15n$$
$$n \ge \frac{126}{15}$$

and since n must be an integer, $n \ge \boxed{\mathbf{9}}$.

[12/8/2009] On page 726, 2 lines from the bottom of the page, change $4(0.6)^4$ to $3(0.6)^4$.

[9/11/2009] On page 735, replace the last two lines of the solution to Example 44B with

The expected value of $1/\Delta$ is $\theta/(\alpha-1) = 880/21 = 41.9048$. The expected size of the next loss is the shape parameter times the expected value of $1/\Delta$, or $4(41.9048) = \boxed{\mathbf{167.62}}$.

[10/11/2009] On page 739, in the solution to exercise 44.6, on the last line of the page, remove the last two minus signs in the exponent, replacing the last one with a plus, so that the exponent is $-\theta\left(\frac{1}{100}+\sum\frac{1}{x_i}\right)$.

[9/25/2009] On page 749, in the solution to exercise 45.2, on the first displayed line, change 0.2(1) to 0.1(2).

[9/25/2009] On page 751, in the solution to exercise 45.8, replace the second paragraph with

$Z = n/(n+v/a)$. Decreasing a will increase k, increase the denominator, and decrease the fraction, so the second statement is true. Decreasing v will decrease k, decrease the denominator, and increase the fraction, so the third statement is false.

[9/15/2009] On page 776, in the solution to exercise 46.3, on the second line from the end, change $\frac{4a}{4a+v}$ to $\frac{3a}{3a+v}$.

[10/11/2009] On page 787, in the solution to exercise 46.38, replace the last sentence with

$$Z = \frac{138/49}{138/49+22/21} = \frac{414}{414+154} = \frac{414}{568} = \frac{207}{284} > \frac{18}{29}$$

[12/9/2009] On page 809, in the solution to exercise 47.18, three lines from the end, change 0.375 to 0.0375.

[9/23/2009] On page 809, in the solution to exercise 47.19, replace the last line on the page with

$$\mathbf{E}\left[P^2\right] = \mathbf{E}[P] - v = 0.1 - \frac{106}{1200} = \frac{7}{600}$$

[12/9/2009] On page 814, in the solution to exercise 47.35, on the second line, add the words "the square of" before "the length".

[9/28/2009] On page 831, in Table 49.1, on the first line (Poisson model, Gamma prior), switch the v and a columns: $v = \alpha\theta$ and $a = \alpha\theta^2$.

[12/10/2009] On page 838, in Section 50.2, on the first line of 1, change "expected observations" to "predictive expected value". On the second line of Example 50B, change "expected number of observations" to "expected number of claims".

[12/10/2009] On page 851, on the 8th and 9th lines of Subsection 51.2.2, change page 599 to page 629 and example 16.36 to example 20.34. On the last line of the subsection, change example 16.37 to example 20.35.

[12/10/2009] On page 860, in the solution to exercise 51.3, on the 7th line, change 80,000 in the numerator to 180,000.

[8/27/2009] On page 861, in the solution to exercise 51.4, the first two lines on the page should read

$$\frac{36-x}{2} = \pm 8$$
$$x = \boxed{\mathbf{20,52}}$$

[12/10/2009] On page 873, on the 4th line after the table at the top of the page, change 16.5.2 to 20.4.2 and 16.39 to 20.37.

[12/14/2009] On page 893, on the last line of the answer to Example 53B, change 17.1 to 21.1.

[11/4/2009] On page 893, on the 6th line, change $F(u) \le 500$ to $u \le F(500)$.

[2/20/2010] On page 895, delete the second line "-12pt". On the second line of Table 53.1, equation (53.2), insert a minus sign in the radical: $\theta\sqrt{-\ln(1-u)}$.

There is no need to memorize this table. The tables you get at the exam list $\text{VaR}_p(X)$. Each entry in the table is the u^{th} percentile of the distribution, and $\text{VaR}_p(X)$ is the p^{th} percentile of the distribution, so set $p = u$ and you will have the required formula for the inversion method.

[10/2/2009] On page 913, on the 4th line under the heading "**Mean**", change $z_\pi s_n^2/n$ to $z_\pi s_n/\sqrt{n}$. Two lines further down, change $z_q s_n^2$ to $z_\pi s_n/\sqrt{n}$.

[2/23/2010] On page 914, six lines from the bottom of the page, an n^2 is missing from the denominator:

$$n \ge \frac{z_\pi^2 P_n/n\left(1-P_n/n\right)}{k^2 P_n^2/n^2}$$

[10/13/2009] On page 914, three lines from the bottom of the page, change 90% to 95%.

[6/3/2009] On page 915, on the third line after the itemized list, replace $100r$th with $100q$th.

[11/4/2009] On page 915, on the fifth line after the itemized list, replace Y_{996} with Y_{951}. Also in the last sentence of that paragraph, replace Y_{995} with Y_{950} and Y_{996} with Y_{951}.

[11/4/2009] On page 916, in Table 54.1, on the "Mean" line, change the two denominators of the confidence interval from n to $\sqrt{n}$, and change the number of runs from n_0CV to n_0CV^2. On the "$F(x)$" line, change the P_n after the left parenthesis and the P_n after the comma to $\frac{P_n}{n}$. On the "π_q" line, put $\lfloor$ and $\rfloor$ around the expression for a and $\lceil$ and $\rceil$ around the expression for b.

[12/10/2009] On page 891, delete ", plus *Derivatives Markets 19.2–19.3*" from the first line.

[9/22/2009] On page 920, the solution to exercise 54.8 is incorrect. The correct solution is

The formula for the subscript of the order statistic for the lower bound is

$$a = \left\lfloor 0.5(500) + 0.5 - 1.645\sqrt{(500)(0.5)(0.5)} \right\rfloor = \lfloor 232.11 \rfloor = 232$$

so the answer is $Y_{232} = \boxed{\mathbf{329}}$.

[11/1/2009] On page 924, in equation (55.1), the parenthesized term on the right should be squared:

$$\widehat{\text{Var}}\left(\widehat{\text{TVaR}}_q(X)\right) = \frac{s_q^2 + q\left(\widehat{\text{TVaR}}_q(X) - \widehat{\text{VaR}}_q(X)\right)^2}{n-k+1}$$

[9/24/2009] On page 924, on the 5th line of the answer to Example 55C, replace "floor" brackets $\lfloor 475.5+8.071 \rfloor$ with "ceiling" brackets $\lceil 475.5+8.071 \rceil$. On the sixth line, the final answer should be $\boxed{\textbf{(350.7, 358.0)}}$.

[2/23/2010] On page 924.3, second paragraph of answer to Example 55C, first two lines, change $\text{TVaR}_{0.95}$ to $\text{TVaR}_{0.99}$ and change $\widehat{\text{TVaR}}_{0.95}$ to $\widehat{\text{TVaR}}_{0.99}$.

[11/1/2009] On page 924, replace the last two lines with

$$\widehat{\text{Var}}\left(\widehat{\text{TVaR}}_{0.99}(X)\right) = \frac{0.438 + 0.99(365.76 - 365.1)^2}{5} = 0.17385$$

The confidence interval is $365.76 \pm 1.645\sqrt{0.17385} = \boxed{\textbf{(365.1, 366.4)}}$.

[11/1/2009] On page 940, in the solution to exercise 55.27, replace the last two lines with

$$\widehat{\text{Var}}\left(\widehat{\text{TVaR}}_{0.95}(X)\right) = \frac{78.7 + 0.95(88.2 - 78)^2}{5} = 35.508$$

The confidence interval is $88.2 \pm 1.96\sqrt{35.508} = \boxed{\textbf{(82.24, 99.88)}}$.

[11/1/2009] On page 940, in the solution to exercise 55.28, replace the last two lines with

$$\widehat{\text{Var}}\left(\widehat{\text{TVaR}}_{0.95}(X)\right) = \frac{24^2 + 0.95(325 - 302)^2}{100} = 10.7855$$

and $1.645\sqrt{10.7855} = 5.402$, so the confidence interval is $325 \pm 5.402 = \boxed{\textbf{(319.6, 330.4)}}$.

[11/7/2009] On page 978, question 34 is defective.

[10/4/2009] On page 984, in question 13, add the following paragraph before "Which of the following choices…":

The data are fitted to an exponential distribution with mean θ using maximum likelihood.

[9/2/2009] On page 985, in question 19, on the second line, change 60 to 30.

[10/31/2009] On page 996, in question 27, the fifth line

$$Y = w_1 X_1 + w_2 X_2 + w_3 X_3$$

with

$$f_Y(y) = w_1 f_{X_1}(y) + w_2 f_{X_2}(y) + w_3 f_{X_3}(y)$$

[10/5/2009] On page 1038, in question 34, the ranges should be multiplied by 10 so that they are

(A) Less than 0.1
(B) At least 0.1, but less than 0.2
(C) At least 0.2, but less than 0.3
(D) At least 0.3, but less than 0.4
(E) At least 0.4

[11/4/2009] On page 1049, questions 32 and 35 are the same. Replace question 32 with:

A random variable X has the following properties:

(i) The probability that X is less than 1 is a.
(ii) If $X < 1$, then X is uniformly distributed on $[0, 1]$.
(iii) $F(x) = 1 - (1 - a)/x$ for $x \geq 1$.

X is simulated using the inversion method. The random numbers uniformly distributed on $[0,1]$ used for 2 runs of the simulation are 0.3 and 0.8. The sum of the two simulated values of X that are generated is 4.3375.

Determine a

(A) 0.25 (B) 0.32 (C) 0.33 (D) 0.35 (E) 0.39

[11/8/2009] On page 1051, in the solution to question 21, on the first line, replace "variance" with "standard deviation".

[10/15/2009] On page 1054, in the solution to question 6, on the second displayed line, replace A with B.

[11/5/2009] On page 1071, in the solution to question 20, on the second line from the end, replace 527 with 531.

[9/16/2009] On page 1076, in the answer key, change the answer for 6 to B.

[11/7/2009] On page 1087, the solution to question 34 is incorrect. The second moment of the hypothetical means of aggregate losses is not the product of the second moment of the hypothetical means of frequency and severity. Discard this question.

[9/17/2009] On page 1088, in the answer key, change the answers for 23 and 24 to C and E respectively.

[9/2/2009] On page 1094, in the solution to question 19, on the second line, change 60 to 30.

[10/14/2009] On page 1102, two lines from the end of the solution to question 7, change $\Pr(X > 10 \mid \Theta) = e^{-10\theta/10} = e^{\theta}$ to $\Pr(X > 10 \mid \Theta) = 1 - e^{-10\theta/10} = 1 - e^{-\theta}$. The final answer is the complement of what's shown, or $1 - 0.329155 = 0.670845$. **(E)**

[9/24/2009] On page 1115, the solution to question 15 is incorrect. The correct solution is

The posterior is proportional to

$$\theta^4 e^{-\theta/1000} \theta^3 e^{-\theta\left(\frac{1}{1000}+\frac{1}{2000}+\frac{1}{5000}\right)} = \theta^7 e^{-0.0027\theta}$$

This is the integrand for a gamma distribution with $\alpha = 8$ and scale parameter $\frac{1}{0.0027}$, so its mean is $\frac{8}{0.0027} =$ **2962.96**.

[10/13/2009] On page 1126, the answer key for question 9 should be **(A)** instead of (D). The answer key on page 1123 should be corrected as well.

[9/30/2009] On page 1140, the solution to question 19, starting with the eighth line, is incorrect. The correct solution starting with the eighth line is

The process variance is

$$v(\Theta) = e^{2\Theta+2\sigma^2} - (e^{\Theta+0.5\sigma^2})^2 = e^{2\Theta}(e^8 - e^4)$$

The expected process variance is

$$v = (e^8 - e^4)\mathbf{E}[e^{2\Theta}] = (e^8 - e^4)e^{2(5)+2(3)} = e^{24} - e^{20}$$

For 20 observations, the credibility factor is

$$Z = \frac{20a}{20a + v} = \frac{20(e^{20} - e^{17})}{20(e^{20} - e^{17}) + e^{24} - e^{20}} = 0.261758$$

The credibility premium is

$$P_C = 0.261758(10{,}000) + (1 - 0.261758)(e^{8.5}) = \boxed{\mathbf{6246}} \qquad \textbf{(A)}$$

[9/17/2009] On page 1145, in the answer key, change the answer for 7 to D.

[10/27/2009] On page 1148, in the solution to question 7, on the second line from the end, change $1-0.99$ to $1-0.01$.

[10/31/2009] On page 1150, in the solution to question 13, on the last line of the page, replace 0.5 in the denominator with 0.4.

[10/5/2009] On page 1151, in the solution to question 13, the last two lines of the solution are incorrect and should be replaced with

Claim counts conditional on λ are a mixture of a Poisson with mean λ and a Poisson with mean 2λ, so $\mathbf{E}[X \mid \lambda] = 0.6\lambda + 0.4(2\lambda) = 1.4\lambda$. Therefore, we integrate 1.4λ times the posterior. It is helpful to note that $\int_0^\infty \lambda e^{-c\lambda} d\lambda = \frac{1}{c^2}$.

$$\mathbf{E}[X_2 \mid X_1 = 0] = 1.4\left(\frac{\frac{0.6}{11^2}+\frac{0.4}{12^2}}{\frac{0.6}{11}+\frac{0.4}{12}}\right) = 1.4\left(\frac{0.00773646}{0.0878788}\right) = \boxed{\mathbf{0.12325}} \qquad \textbf{(E)}$$

[10/27/2009] On page 1153, in the solution to question 20, add σ before $\phi(z_p)$.

[10/5/2009] On page 1157, in the solution to question 34, the final answer should be 0.39223.

[11/1/2009] On page 1163, in the solution to question 11, the final line should be

$$\widehat{\mathrm{Var}}\left(\widehat{\mathrm{TVaR}}_{0.95}(X)\right) = \frac{12{,}482.5 + 0.95(9588-9421)^2}{5} = \boxed{\mathbf{7795}}$$

None of the five answer choices is correct.

[11/4/2009] On page 1173, replace the solution to question 32 with

[**Lesson 53**] The distribution function of X on $[0,1]$ is a straight line starting at 0 and ending at a; in other words, $F(x) = ax$ in this interval. Then inversion would take u to $x = \frac{u}{a}$. For $X > 1$, we have

$$u = 1 - \frac{1-a}{x}$$
$$x = \frac{1-a}{1-u}$$

If a is greater than 0.8, we would have

$$\frac{0.3}{a} + \frac{0.8}{a} = \frac{1.1}{a} = 4.3375,$$

from which it would follow $a < 0.8$, a contradiction. If $a < 0.3$, then

$$\frac{1-a}{0.2} + \frac{1-a}{0.7} = 4.3375$$
$$\frac{90(1-a)}{14} = 4.3375$$
$$a = 0.3253,$$

once again a contradiction. This leaves $0.3 < a < 0.8$, giving:

$$\frac{0.3}{a} + \frac{1-a}{0.2} = 4.3375$$
$$0.06 + a(1-a) = 4.3375(0.2)(a) = 0.8675a$$
$$0.06 + a - a^2 - 0.8675a = 0$$
$$a^2 - 0.1325a - 0.06 = 0$$

$$a = \frac{0.1325 \pm 0.5075}{2}$$

$$a = \boxed{\mathbf{0.32}} \qquad \textbf{(B)}$$

[12/1/2009] On page 1187, in the solution to question 18, on the second line from the end, change ruls to rule.

[11/8/2009] On page 1196, in the solution to question 18, on the 4th displayed line, remove the minus sign before $\frac{1}{3\theta^2}$.

[5/26/2009] On page 1233, in Table C.4, question 12 should refer to page 853, and question 13 should refer to 4-F03:16, page 580. Also note that the non-syllabus questions in Tables C.4 and C.5 were deleted from the revised list of 289 questions.