Errata and updates for ASM Exam C/Exam 4 Manual (Tenth Edition) sorted by date

[2/23/2010] On page 942, 6 lines from the bottom, an n^2 is missing from the denominator:

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

[2/23/2010] On page 952, 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 $\widehat{\text{TVaR}}_{0.99}$.

[2/20/2010] On page 923, 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.

[2/16/2010] On page 515, on the second line of the third paragraph, change pth to $100p$th.

[2/14/2010] On page 254, on the displayed line, change $F_X(s)$ to $F_X(x)$.

[2/14/2010] On page 533, in the solution to exercise 29.36, 5 lines from the end, reverse the order of the summands in the numerator of the first expression:

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

[2/14/2010] On page 541, on the third and fourth lines, change 5(1) to 1(5) and $5(1^2)$ to $1(5^2)$.

[2/14/2010] On page 552, in the solution to exercise 30.17, on the second line, change $e-\lambda$ to $e^{-\lambda}$.

[2/14/2010] On page 562, in the solution to exercise 31.2, change the fourth word from "if" to "is".

[2/11/2010] On page 508, 8th line of sidebar, change $a_{2-i,2-j}$ to $a_{3-i,3-j}$.

[2/11/2010] On page 528, in the solution to exercise 29.13, on the last displayed line, in the matrix in the numerator, on the second line, change 12 to -12 and -104 to 104.

[2/11/2010] On page 529, 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 530, in the solution to exercise 29.26, 6 lines from the end, L should be l.

[2/10/2010] On page 388, in the last table of the page, change the heading $\hat{q}'_j$ to either $\hat{p}'_j$ or $1-\hat{q}'_j$.

[2/10/2010] On page 390, in the second table of the page, change the heading $\hat{q}'_j$ to either $\hat{p}'_j$ or $1-\hat{q}'_j$.

[2/9/2010] On page 284, 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: $\frac{\sum(X_i-\bar{X})^2}{n-1}$.

[2/8/2010] On page 468, 3 lines from the bottom, replace the first θ with $1/\theta$.

[2/8/2010] On page 469, on the last line of the answer to Example 28C, change the final equation to $F(5000)=e^{-2442.75/5000}=$ **0.6135**.

[2/6/2010] On page 257, the last 5 lines of the solution to Example 16G are incorrect. Replace them with

Let $u = e^{-x/10,000}$, and multiply through by 4.

$$3u^2 + u - 2 = 0$$
$$u = \frac{-1+\sqrt{25}}{6} = \frac{2}{3}$$
$$e^{-x/10,000} = \frac{2}{3}$$
$$x = -10,000 \ln 2/3 = \boxed{\mathbf{4055}}$$

[2/5/2010] On page 347, in Example 22C's final answer, delete the extra "0." after the comma. On the last line of Example 22D, delete the comma after "interval" and add a right parenthesis before the "=".

[2/5/2010] On page 359, in the solution to exercise 22.26, change $z_{0.975}$ to $z_{0.95}$ and $z_{0.95}$ to $z_{0.975}$ in two places.

[2/4/2010] On page 382, the solution to exercise 23.1 is incorrect. The correct solution is

The kernel density is $1/(2b) = 1/8$, and the five points 37, 39, 42, 42, and 44 are within 4 of 40 (since points on the boundaries count), so the estimate is $\hat{f}(40) = (1/8)(5)(1/8) = \boxed{\mathbf{0.078125}}$.

[2/4/2010] On page 691, on the second line from the end of the page, after $\boxed{\mathbf{53,409}}$, add **(C)**.

[1/31/2010] On page 263, the solution to exercise 16.4 is incorrect. The correct solution is

Frequency is not in the (a,b,i) family $(i = 0,1)$, so it cannot be modified. So we will use a compound model with number of losses and payment per loss.

Frequency of losses has mean $0.25 + 2(0.2) + 3(0.1) = 0.95$ and second moment $0.25 + 4(0.2) + 9(0.1) = 1.95$, hence variance $1.95 - 0.95^2 = 1.0475$. The modified distribution for payment per payment is a Pareto with $\alpha = 4$, $\theta = 100+80 = 180$, as we learned on page **??**. Its mean is $180/3 = 60$ and its variance is $2(180^2)/(3)(2) - 60^2 = 7200$. The payment per loss is a two-component mixture with probability $(100/180)^4$ of a payment and probability $1-(100/180)^4$ of 0. Let's calculate the mean and variance of this two-component mixture random variable Y^L, with I being the component of the mixture.

$$\mathbf{E}[Y^L] = 60\left(\frac{100}{180}\right)^4 = 5.715592$$
$$\begin{aligned}\mathrm{Var}(Y^L) &= \mathbf{E}[\mathrm{Var}(Y^L \mid I)] + \mathrm{Var}(\mathbf{E}[Y^L \mid I]) \\ &= \left(\frac{100}{180}\right)^4 (7200) + \left(\frac{100}{180}\right)^4 \left(1 - \left(\frac{100}{180}\right)^4\right)(60^2) \\ &= 996.1386\end{aligned}$$

Using the compound variance formula on our compound model,

$$\mathrm{Var}(S) = (0.95)(996.1386) + (1.0475)(5.715592^2) = \boxed{\mathbf{980.55}}$$

[1/30/2010] On page 571, in exercise 32.10, on the third line, change "payments of 10,000" to "payments of 9,500".

[1/30/2010] On page 577, in the solution to exercise 32.8, on the last line of the table, change 0.0057 to 0.0053.

[1/27/2010] On page 504, in the solution to exercise 28.52, on the last line, the answer choice should be **(D)**, not (E).

[1/26/2010] On page 296, 4 lines below formula (19.3), change $\mathrm{Var}\big(F_n(x)\big)$ to $\mathrm{Var}\big(f_n(x)\big)$.

[1/26/2010] On page 473, in Table 28.1, the formula for $\hat{\sigma}$ of lognormal is incorrect, and should be $\hat{\sigma} = \sqrt{\dfrac{\sum_{i=1}^n \ln^2 x_i}{n} - \hat{\mu}^2}$.

For both two-parameter and single-parameter Pareto, change $\hat{\theta} = -n/K$ to $\hat{\alpha} = -n/K$. For a single-parameter

Pareto, replace the = between "Single" and "parameter" with -. In the formula for K of a single-parameter Pareto, remove $\theta +$ in the denominator, so that it is $K = \ln \dfrac{\prod_{i=1}^{n+c} \max(\theta, d_i)}{\prod_{i=1}^{n+c} x_i}$.

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

[1/23/2010] On page 402, in formula (25.1), replace $m^2 + t^2$ with $t - m^2$ in two places:

$$\hat{\theta} = \frac{\hat{\sigma}^2}{\bar{x}} = \frac{t - m^2}{m} \qquad \hat{\alpha} = \frac{\bar{x}^2}{\hat{\sigma}^2} = \frac{m^2}{t - m^2} \tag{1}$$

[1/23/2010] On page 407, in Table 25.1, change the formulas for Gamma to $\hat{\alpha} = \dfrac{m^2}{t - m^2}$ and $\hat{\theta} = \dfrac{t - m^2}{m}$. Change the first formula for Lognormal to

$$\hat{\mu} = 2 \ln m - 0.5 \ln t$$

[1/22/2010] On pages 388–390 and page 396–397, the indexing on P_j is incorrect:

1. On page 388, on the first line of the answer to Example 24A, change $P_j = P_{j-1} \ldots$ to $P_{j+1} = P_j \ldots$.
2. On page 390, on the line before Example 24C, change P_{j-1} to P_j.
3. On page 390, on the first line of the answer to Example 24C, change $P_j = P_{j-1} \ldots$ to $P_{j+1} = P_j \ldots$.
4. On page 396, in the solution to exercise 24.1, on the second line, change P_{j-1} to P_j.
5. On page 397, in the solution to exercise 24.2, on the first line, change P_{j-1} to P_j.

[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 $\displaystyle\int_0^x \frac{2u \, du}{1000^2}$.

[1/21/2010] On page 263, replace the last line of the solution to exercise 16.3 with

$$\text{Var}(S) = (0.72)(192) + 0.6624(24^2) = \boxed{\mathbf{519.7824}}$$

[1/16/2010] On page 275, three lines from the bottom, change 98% to 95%.

[1/16/2010] On page 307, 6 lines from the bottom, change the italicized "censored from below" to "censored from above".

[1/15/2010] On page 153, in the equation for r (the 8th displayed line of the page), change the right hand side to $1 + \dfrac{-0.9}{0.75} = -0.2$

[12/14/2009] On page 921, on the last line of the answer to Example 53B, change 17.1 to 21.1.

[12/10/2009] On page 866, 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 879, 6 and 5 lines from the bottom, change page 599 to page 629 and example 16.36 to example 20.34.

[12/10/2009] On page 880, on the second line, change example 16.37 to example 20.35.

[12/10/2009] On page 888, in the solution to exercise 51.3, on the 7th line, change 80,000 in the numerator to 180,000.

[12/10/2009] On page 901, 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.

[12/10/2009] On page 919, delete ", plus *Derivatives Markets 19.2–19.3*" from the first line.

[12/9/2009] On page 837, in the solution to exercise 47.18, three lines from the end, change 0.375 to 0.0375.

[12/9/2009] On page 842, in the solution to exercise 47.35, on the second line, add the words "the square of" before "the length".

[12/8/2009] On page 703, 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 703, on the last line of the page, change 12.28 to 15.17.

[12/8/2009] On page 708, on the first line of Section 40.5, change 12.4.3 to 15.5.3.

[12/8/2009] On page 725, 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 725, 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 726, 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 736, exercise 41.19 is the same as exercise 11.5.

[12/8/2009] On page 740, in the solution to exercise 41.21, on the second line, change both y's to n's.

[12/8/2009] On page 752, 2 lines from the bottom of the page, change $4(0.6)^4$ to $3(0.6)^4$.

[12/7/2009] On page 581, on the second line, add "of" after "exception".

[12/7/2009] On page 587, on the first line of the third paragraph, add "is" after "it".

[12/7/2009] On page 594, in the table for the answer to Example 34J, add 10 to each year in the first column.

[12/7/2009] On page 651, in the answer to Example 37C, replace 41 with 11.

[12/7/2009] On page 669, in the solution to exercise 38.15, on the fifth line, replace 41 with 11.

[12/7/2009] On page 695, 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 696, in the solution to exercise 39.24, on the fourth line, change 0.2(60,000) to 0.1(60,000).

[12/6/2009] On page 428, in footnote 1, change $f(1000^-)$ and $f(1000)$ to $F(1000^-)$ and $F(1000)$.

[12/6/2009] On page 471, on the second line of Section 28.5, change "are fixed" to "is fixed".

[12/4/2009] On page 362, on the fifth line, change fx_i to $f(x_i)$.

[12/4/2009] On page 404, on the last line of Subsection 25.2.4, change the first formula to

$$\hat{\mu} = 2\ln m - 0.5\ln t$$

[12/3/2009] On page 276, on the last line of the answer to Example 17I, change $(0, 0.55208)$ to $(0.55208, 1)$.

[12/2/2009] On pages 211–212, 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

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

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

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

[12/2/2009] On page 237, on the third line, add the word "and" between "empty" and "the".

[12/2/2009] On page 248, in the solution to exercise 15.12, on the fifth line, change 0.1 to 0.01.

[12/2/2009] On page 259, on the line above equations (16.1), change m_k^0 and m_k^1 to m_0^k and m_1^k.

[12/2/2009] On page 263, in the solution to exercise 16.5, change "payment per payment" to "payment per loss".

[12/2/2009] On page 457, in question 27.15, the denominator of (B) should be $f(100;\theta)^3$ and the denominator of (E) should be $\left(1 - F(100;\theta)\right)^3$.

[12/1/2009] On page 173, in the solution to exercise 11.11, change "if" to "it".

[12/1/2009] On page 209, in the solution to exercise 13.16, on the third displayed line, change 0.596 to 0.6.

[12/1/2009] On page 216, in the solution to exercise 13.36, on the last line, change the 79,875 in the denominator to 79,375.

[12/1/2009] On page 1213, in the solution to question 18, on the second line from the end, change ruls to rule.

[11/30/2009] On page 30, in equation (*), the first exponent should be $-H(x \mid \Lambda)$.

[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".

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

[11/30/2009] On page 90, on the last line of the solution to exercise 6.1, change "is" to "are".

[11/30/2009] On page 96, Example 7B should ask for the reduction in the loss elimination ratio, not the excess. On the last line of the answer, interchange 135/256 and 5/9.

[11/30/2009] On page 113, in the solution to exercise 7.22, on the third line of the page, change 1.5147^2 to 1.5174^2.

[11/30/2009] On page 119, 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 $2000+500$.

[11/30/2009] On page 135, in the solution to exercise 8.14, on the second line, put an **E** before $[X \wedge d]$.

[11/30/2009] On page 135, in the solution to exercise 8.15, change the second word to "question".

[11/30/2009] On page 145, 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 146, in the solution to exercise 9.6, on the second displayed line, insert an equal sign between 100 and c.

[11/30/2009] On page 208, in the solution to exercise 13.14, on the 5th line, replace "variance" with "second moment".

[11/29/2009] On page 20, in the solution to exercise 1.10, change "Generalized Pareto" to "Burr".

[11/29/2009] On page 22, in the solution to exercise 1.17, on the last line, $\ln 0.06$ should be $\ln 0.6$.

[11/29/2009] On page 24, on the last line of the solution to exercise 1.23, change 0.035764 to 0.035674.

[11/16/2009] On page 176, on the fifth line of the answer to Example 12B, the part of the line starting with "Revised β to the end should be moved to a separate line.