Errata for 5th And 6th Edition

January 24, 2016

Note: The 6th edition only has errata pertaining to chapters 13-16. Unless specifically labeled, the correction pertains to the 5th edition only.

1 Distributions, Moments, and VaR

1. In Example 1.8, we should have $f_Y(y) = \frac{1}{3}$ so

$$Pr(2 \leq Y \leq 4) = \int_2^4 \frac{1}{3} dy = 2/3$$

2. In Example 1.13, Distribution 3 is actually Unif($\{1, 3, 5\}$).

2 Actuarial Models, Mixtures and Risk

1. Example 2.2 should show "$F_Y(y) = 1 - e^{-y/(c\theta)}$" in two places as opposed to "$F_Y(y) = 1 - e^{-x/(c\theta)}$".

2. Example 3.8 should state that $a(t) = 1$ as in example Example 3.5.

3. After example Example 3.13, the text should state that the normal follows a linear exponential only if it's variance is known. There is a broader range of families called "exponential families" that follow the form $f_X(x|\theta) = h(x)e^{\eta(\theta)T(x) - A(\theta)}$ where θ can be a vector of parameters. This larger set of families includes the normal distribution when the variance is not known. However, this broader set of families is not on the syllabus and we do not discuss it here further.

3 Continuous Models

1. In the end-of-chapter problems and solutions, the following changes are made:
   - Problem 2: θ follows an exponential(1) distribution.
   - Solution to Problem 2: $F(x|\theta) = 1 - e^{-\theta x}$ and $F(x|\lambda) = 1 - e^{-x/\lambda}$.
   - Solution to Problem 11: We should have $A(t) = \int_0^t wx^{w-1}dx = t^w$, which results in a final answer of $S(3) = 0.5247$.

5 Insurance Coverage Modifications

1. Before Theorem 5.16, the coinsurance symbol should be α instead of a.

2. Theorem 5.9, Theorem 5.12, and Theorem 5.16 should read "inflation r" instead of "inflation $1 + r$".

3. In the end-of-chapter problems and solutions, the following changes are made:
   - Problem 10: The maximum covered loss (not policy limit) is $30,000$.

- Solution to Problem 4: For an ordinary deductible, $E(Y^L) = \int_d^\infty (x-d)f(x)dx = 7421.95$, resulting in $E(Y^P) = 20,000$. The same quantities for a franchise deductible are then 7978.59 and $21,500$.
- Solution to Problem 11: The expected cost per payment should be written as $E(Y^P) = \frac{6269}{1-F_X(\frac{5000}{1.05^3})}$. The final answer remains correct as is.

6 Aggregate Loss Models

1. In Theorem 6.11, s_j should be S_j.
2. In Example 6.20, we should have $E[(S-100)_+] = 40$ and $E[(S-200)_+] = 20$. Carrying through the calculation with these new numbers should produce an answer of 28.
3. In Theorem 6.4, the result regarding the probability generating function only holds true if all the x_i are **mutually** independent.

7 Mathematical Statistics

1. In Example 7.4, we could also conclude $\lim_{n\to\infty} \frac{n\theta}{n+1} = \theta$ based on dividing both numerator and denominator by n.
2. Just after Definition 7.10, it should be noted that the UMVUE is often considered a good estimator as it has the minimum variance when considering only the family of estimators that are unbiased.
3. In Section 7.3.2, $\beta = Pr(\text{fail to reject } H_0 | H_0 \text{ is false})$.

8 Analyzing Complete Data

1. In Example 8.10, the expressions for $F_n(x)$ and $f_n(x)$ should be defined over intervals that are in the form of $a \le x < b$, not $a \le x \le b$.
2. In the last paragraph before the start of the problems, $F(X)$ should be replaced by $F(x)$.

9 Analyzing Modified Data

1. In paragraph after Example 9.3, r_j is the number of people at risk at time y_j.
2. To be more consistent with the accompanying formula, the verbal definition of (9.1) should read

   $$r_j = \text{those who died on or after } y_j + \text{those censored on or after } y_j - \text{those who haven't entered before } y_j$$

3. In Example 9.6, when modifying the estimate of $\hat{S}(t)$ for part (1), it should state "assume everyone has died after the study ends" instead of "after the last death time".
4. Definition 9.8 should end before the estimators are introduced.
5. In Section 9.4, our general instructions are for the construction of a $100(1-\alpha)\%$ confidence interval, not a $100\alpha\%$ interval and not necessarily restricted to a 95% confidence interval.
6. In the end-of-chapter problem solutions, Problem 15 should have a $r_3 = 19-1-2 = 16$ and $r_4 = 16-1-0 = 15$. Aside from these minor changes in the table, the subsequent calculations are correct in a)-f).

10 Kernel Density Estimator

1. In the solution for end-of-chapter Problem 2, we should have $\theta = y_j(\alpha - 1)$. The final answer should then be

$$K_{y_j}(x) = 1 - \left(\frac{y_j(\alpha - 1)}{x + y_j(\alpha - 1)} \right)^{\alpha}$$

11 Parametric Estimation

1. In Section 11.2, right after the 2-steps required to interpolate for a percentile matching estimate, we give a quick example where we should have written $j = \lfloor (20+1) \cdot 0.5 \rfloor = \lfloor 10.5 \rfloor = 10$ instead of $j = \lfloor (20+1) \cdot 5 \rfloor = \lfloor 10.5 \rfloor = 10$.

2. In Example 11.17, the following changes are to be made:

   (a) The second equation in Method 1 should be: $L(\theta) = \prod_{i=1}^{n} \frac{e^{-x_i/\theta}}{\theta} = \frac{e^{-\sum x_i/\theta}}{\theta^n}$.

   (b) The first equation in Method 2 should be: $L(\theta) = \frac{e^{\frac{-x_i}{\theta}}}{\theta} \Rightarrow l(\theta) = -\frac{x_i}{\theta} - \ln\theta$. The second set of equations should read:

$$\begin{aligned} -E\left[\frac{\partial^2 l}{\partial \theta^2}\right] &= -\left[-\frac{E(2X_i)}{\theta^3} + E(\frac{1}{\theta^2})\right] \\ &= -\left[-\frac{2\theta}{\theta^3} + \frac{1}{\theta^2}\right] \\ &= \frac{1}{\theta^2} \end{aligned}$$

   (c) The first equation in Method 3 should be: $L(\theta) = \prod_{i=1}^{n} \frac{e^{-x_i/\theta}}{\theta} = \frac{e^{-\sum x_i/\theta}}{\theta^n}$. All similar occurrences of the double summation in $E(\sum X_i^2 + \sum_{i=1}^{n} \sum_{j=1}^{n} X_i X_j)$ should be similarly corrected to exclude the terms where $i \neq j$. The final round in the example should be: $\frac{1}{\theta^4} E[(\sum X_i)^2] - \frac{n^2}{\theta^2} = \frac{2n}{\theta^2} + \frac{n^2}{\theta^2} - \frac{n}{\theta^2} - \frac{n^2}{\theta^2} = \frac{n}{\theta^2}$. All single summations should be $\sum_{i=1}^{n}$ and all double summations should be $\sum_{i=1}^{n} \sum_{j \neq i}$

3. In proposition 11.18:

   (a) part a) should state: $\frac{\partial L(\theta|X)}{\partial \theta} = 0$ has a solution with probability approaching 1 as $n \to \infty$.

   (b) part b) should state: as $n \to \infty$, $\sqrt{I(\theta)}(\hat{\theta}_{MLE} - \theta) \rightsquigarrow N(0,1)$ where $\rightsquigarrow$ means convergence in distribution.

4. Just before example 11.20, the analogue to Proposition 11.18 should state:

   under regularity conditions, as $n \to \infty$,

$$\hat{\theta}_{i,MLE} \text{ is approximately distributed as } N(\theta_i, [I(\theta_i)]_{ii}^{-1})$$

   where $[I(\theta)]_{ii}^{-1}$ is the (i,i)-th element in the inverse of the information matrix $I(\theta)$.

5. The summations in the first two equations under Section 11.3.1 should be iterating over j rather than i.

6. In the opening "Remark" under Section 11.4.2, the correct statement of the Cramer-Rao inequality should read "under appropriate regularity conditions, no unbiased estimator has a variance smaller than $1/I(\theta)$". The current statement might be mistakenly interpreted as the variance must be smaller than *the variance of* $1/I(\theta)$.

7. The second equation in Section 11.4.2 should be:

$$(I(\theta))_{ij} = -E\left[\frac{\partial^2 l(\theta|x)}{\partial\theta_i\partial\theta_j}\right]$$

8. Below the second remark under Section 11.4.2, the explanation of the equation should read "where $[I(\theta)]_{ii}^{-1}$ is the (i,i)-th element in the inverse of the information matrix $I(\theta)$.".

9. In Theorem 11.24, the last line should state that "...$g(\hat{\theta})$ is approximately distributed as $N_p\left(g(\theta), \frac{\nabla g(\theta)^T\Sigma\nabla g(\theta)}{n}\right)$"

12 Bayesian Estimation

1. In Example 12.14, the exponential distribution should have PDF $f(x) = \lambda e^{-\lambda x}$.

13 Model Selection

1. In the alternative statement of the Kolmogorov-Smirnov test statistic in Section 13.4.1, we should have

$$D = \max_{t\leq x\leq u}\{|F_n(x-) - F^*(x)|, |F_n(x) - F^*(x)|\}$$

The current printing included two occurrences of the word "max".

2. **5th & 6th edition:** The second part of Equation 13.4.3 should read: $\sum_{j=1}^{k}\frac{n(\hat{p}_j - p_{n_j})^2}{\hat{p}_j}$ (there is no hat on the p_{n_j}).

14 Simulation

1. In Example 14.2 and Example 14.4, we should have $F_S(s)$ defined on intervals of s rather than x.

2. Section 14.2.2 has the change given here `http://actempire.com/wp-content/uploads/2013/03/250PageReplacement.pdf`.

3. **5th & 6th edition:** In Example 14.9 for part a, the deductible should be "per loss". For part b, simulate "aggregate *payments*" not "aggregate losses".

4. Example 14.10 should include a final line: Thus, $\widehat{VaR_{0.8}}(x) + \widehat{TVaR_{0.8}}(x) = 34 + 36 = 70$.

5. Some of the end of section problems have been changed here `http://actempire.com/wp-content/uploads/2013/03/Solutions10-12Chpt14.pdf`.

15 Traditional Credibility

1. **5th & 6th edition:** Just after Definition Definition 15.2, the sentence *Sometimes we use the term "cost per claim" to mean pure premium*, should be removed.

16 Bayesian Credibility

1. In Example 16.1, the final set of equations should be rewritten as:

$$\begin{aligned}
Pr\,(\text{claim occurs}|\text{claim occurred}) &= Pr\,(\text{type} = A|\text{claim occurred})\,Pr\,(\text{claim occurs}|\text{type} = A) \\
&\quad + Pr\,(\text{type} = B|\text{claim occurred})\,Pr\,(\text{claim occurs}|\text{type} = B) \\
&\quad + Pr\,(\text{type} = C|\text{claim occurred})\,Pr\,(\text{claim occurs}|\text{type} = C) \\
&= 0.2286(0.8) + (0.4286)(0.5) + (0.3429)(0.2) \\
&= 0.46576
\end{aligned}$$

2. In Section 16.3.1 after the box summarizing the posterior, predictive, and prior distributions on the Gamma-Poisson model, our equation for the Bühlmann credibility-weighted estimate should be:

$$E = z \times (\text{observed data}) + (1 - z) \times \text{prior mean}$$