Updates and Errata: ACTEX Study Manual for SOA Exam FM, Fall 2019 Edition as of August 15, 2020

Please note the following errors in the Fall 2019 Edition of the manual.
In each item, the change is shown in red.

Page M1-31, Exercise (1.52).
The first sentence should begin: "A U.S. Treasury bill will mature in 90 days ..."

Page M1-70, Solution to Problem 1.
The last two lines of the solution should read as follows:

$$\text{“}i = \frac{0.009 \pm \sqrt{0.009^2 - 4 \times 1 \cdot (-0.009)}}{2 \times 1} = 0.0995,\ -0.0905$$

The problem states that $i > 0$, so $i = 9.95\%$."

Page M2-50, Example (2.117).
The second line of the Example should begin:
"and agrees to repay the loan over 20 years with level payments ..."

Page M2-53, Exercise (2.124).
The answer should be 5,361.95

Page M2-56, Example (2.129).
The answer (on the last line) should be: 1,242,860.96

Page M2-57, Example (2.131).
The first line of the second formula should be:

$$P \cdot a_{\overline{10}|j} + Q \cdot \frac{a_{\overline{10}|j} - 10 \cdot (1 + j)^{-10}}{j}$$

Page MT1-6, solution to Problem 8.
The one-sentence paragraph just below the middle of the page should begin:

"The last payment will be 564.89 plus ..."

Page M5-16, Problem 6.
The next-to-last sentence should read:

"The fund's time-weighted rate of return for the year is equal to its dollar-weighted rate of return."

Page M7-50, solution to Problem 7.
The entire solution should read as follows:

7. (a) We will first determine the bond's yield. Using its yield, we can find its Macaulay duration. Then, using its yield and Macaulay duration, we will calculate the modified duration.

   On the BA II Plus, set N = 10, PV = –980, PMT = 40, and FV = 1,000. CPT I/Y = 4.2497. The bond's annual effective yield is 4.2497%.

   The Macaulay duration is calculated as follows:

$$D_{\text{mac}} = \frac{F \cdot r \cdot (Ia)_{\overline{n}|} + n \cdot C \cdot v^n}{\text{Bond Price}} = \frac{1{,}000 \times 0.04 \cdot (Ia)_{\overline{10}|4.2497\%} + 10 \cdot 1{,}000 \cdot 1.042497^{-10}}{980}$$

$$= \frac{40 \cdot \dfrac{\ddot{a}_{\overline{10}|} - 10 \cdot v^{10}}{i} + 6{,}595.59}{980} = \frac{40 \cdot \dfrac{8.3515 - 6.5956}{0.042497} + 6{,}595.59}{980}$$

$$= \frac{1{,}652.72 + 6{,}595.59}{980} = 8.4166$$

   Now we can calculate the modified duration:

$$D_{\text{mod}}(i) = \frac{D_{\text{mac}}}{1+i} = \frac{8.4166}{1.042497} = 8.0735$$

   (b) Use the same approach as in 7.(a), but with semi-annual coupons.

   Set N = 20, PV = –980, PMT = 20, and FV = 1,000. CPT I/Y = 2.1238.

   Using this yield per coupon period, calculate the Macaulay duration:

$$D_{\text{mac}} = \frac{F \cdot r(Ia)_{\overline{n}|} + n \cdot C \cdot v^n}{\text{Bond Price}} = \frac{1{,}000 \cdot 0.02 \cdot (Ia)_{\overline{20}|2.1238\%} + 20 \cdot 1{,}000 \cdot 1.021238^{-20}}{980}$$

$$= \frac{20 \cdot \dfrac{\ddot{a}_{\overline{20}|} - 20 \cdot v^{20}}{i} + 13{,}136.89}{980} = \frac{20 \cdot \dfrac{16.5009 - 13.1369}{0.021238} + 13{,}136.89}{980}$$

$$= \frac{3{,}167.99 + 13{,}136.89}{980} = 16.6376$$

   This is the Macaulay duration *in coupon periods* (half-years).

   Divide by 2 to find D_{mac} in years: $D_{\text{mac}}(\text{in years}) = \dfrac{16.6376}{2} = 8.3188$

To calculate D_{mod}, we divide D_{mac} by the accumulation factor *per coupon period*, $\left(1+\frac{i^{(2)}}{2}\right)$:

$$D_{\text{mod}}\left(i^{(2)}\right)=\frac{D_{\text{mac}}}{1+\frac{i^{(2)}}{2}}=\frac{8.3188}{1.021238}=8.1458$$

Note: If you have a BA II Plus <u>Professional</u>, you can confirm the modified durations calculated in (a) *and* (b) *using the Bond worksheet. To do so, you must adjust the bond's face amount to 100, since the BA II Plus's duration calculations always assume a 100 face amount.*

Page M9-51, solution to Problem 5.
The first sentence of the 3rd paragraph of this solution should begin:
"The bank pays the swap rate (the fixed rate of 5.1618%) and receives the variable rate (4%), so…"

Page PE5-4, Problem 19.
The third line of the first paragraph should begin:
"the first deposit will be 1,000."

Page PE5-11, solution to Problem 9.
The third paragraph should read:
"From the forward rates that were provided, we can calculate accumulation factors."

The last sentence of the solution should be:
"The yield rate (and coupon rate) for a par bond is 3.720%."

Page PE5-13, solution to Problem 18.
The second equation should be:

$$i=1.33822^{1/5}-1=0.0600$$

Page PE5-20, solution to Problem 31.
Replace the equation on the 6th line with the following:

$$F\cdot(r-i)\cdot v^{n-t+1}=10{,}000\cdot(0.03-0.04)\cdot 1.04^{-(30-9+1)}=-42.20$$

(The negative value indicates that 42.196 of <u>discount</u> is being amortized.)

Page PE6-11, solution to Problem 5.
The end of the last sentence should read as follows:
which must equal Ben's NPV of –26,243.83*:*

Page PE6-17, solution to Problem 18.
The equation near the middle of the page that gives the value of n should be:

$$n=\ln 1.904046/\ln 1.004074=158.3880$$

(The change is that the minus sign should be deleted.)

Page PE7-10, Problem 34.
The last sentence of the first paragraph should be:
"The amount in the account at the end of the year is 3,350."

Page PE7-16, solution to Problem 13.
The sentence after the equations should be:
"Only the positive result is valid (because 1+i cannot be less than 0)."

Page PE7-18, solution to Problem 18.
The last two sentences of the second paragraph should be:
"Set PMT = –2,251.90. CPT N = 262.41."

Page PE7-25, solution to Problem 33.
The last equation in the solution should be:

$$14{,}926.12 - 26 \times 500 = 1{,}926.1247$$

Page PE9-8, Problem 33.
The first sentence should begin:

"Lisa deposits 3,000 at time 0 and 1,000 at time 4 …"

Page PE9-23, solution to Problem 33.
The second equation should be:

$$X = 3{,}000 \times 1.06200^5 + 1{,}000 \times 1.06200 = 5{,}114.62$$

(i.e., delete the exponent (^{2}) on the second occurrence of 1.06200)

Page PE12-15, solution to Problem 8.
The last equation should be:

$$Bal_5 = 100 \cdot (1 + 0.04317)^5 + 100 \cdot (1 + 2 \times 0.04317)^5 = 274.82$$

Page PE14-12, solution to Problem 8.
The last equation should be:

$$i_{2,3} = \frac{(1+s_3)^3}{(1+s_2)^2} - 1 = \frac{1.0433^3}{1.0349^2} - 1 = 0.0603$$

Page PE14-14, solution to Problem 11.
The last paragraph should begin:

"Mary deposits 111.02 + 0.04 = 111.06 into her savings account …"