Errata and Updates for ASM Exam IFM (First Edition) Sorted by Page

Practice Exams 1:27, 5:27, 8:8, and 11:2 are defective in that none of the five answer choices is correct. Note the correction to Practice Exam 8:20 below (page 595).

[7/24/2018] On page 1, on the first line of item 2 in the first enumerated list, change "over asset" to "over an asset".

[7/24/2018] On page 2, 8 lines from the bottom, delete "short" from "sold something short".

[9/25/2018] On page 4, change the answer choice for exercise 1.6 from (B) to (D).

[3/18/2018] On page 5, in Example 2A, on the third line, delete "in subsequent years". Change the answer to:

The NPV generated during the first 6 years is

$$-5{,}000{,}000 - \frac{1{,}000{,}000}{1.12} + 1{,}000{,}000\left(\frac{a_{\overline{5}|0.12}}{1.12}\right) = -5{,}892{,}857 + 1{,}000{,}000\left(\frac{1-1/1.12^5}{0.12(1.12)}\right) = -2{,}674{,}307$$

After 6 years, free cash flows form a geometric series with first term $900{,}000/1.12^7$ and ratio $0.9/1.12$. The NPV generated after year 6, in millions, is

$$900{,}000\left(\frac{1/1.12^7}{1-0.9/1.12}\right) = 2{,}072{,}582$$

Total NPV is $-2{,}674{,}307 + 2{,}027{,}582 = \boxed{\mathbf{-601{,}725}}$.

[7/24/2018] On page 6, on line 4, delete "at" between "value" and "of".

[4/14/2018] On page 7, on the first line, change -15 to -19.

[3/30/2018] On page 7, in Example 2C, in the table, change Annual sales ($ million) from 4, 5, and 6 to 20, 25, and 30 respectively. In the answer, on the third line, change s to $0.2s$. On the fourth line, change $s=4$ to $s=20$ and $s=6$ to $s=30$.

[8/18/2018] On page 10, in formula (2.7), change the lower limit of the integral from $\mathrm{Var}_\alpha(X)$ to $\mathrm{VaR}_\alpha(X)$.

[7/25/2018] On page 11, in footnote 2, change "does mention" to "does not mention".

[8/18/2018] On page 12, in formula (2.7), change the lower limit of the integral from $\mathrm{Var}_\alpha(X)$ to $\mathrm{VaR}_\alpha(X)$.

[3/29/2018] On page 13, in exercise 2.5, on the first line, change "5 million" to "8 million".

[3/29/2018] On page 14, in the solution to exercise 2.1, on the second line, change $1/(0.1-0.02)$ to $1.5/(0.1-0.02)$.

[3/29/2018] On pages 14–15, replace the solution to exercise 2.2 with

At time 1, the present value of the cash flows from the widgets is $1{,}800{,}000a_{\overline{10}|} + 200{,}000(Ia)_{\overline{10}|}$.

$$a_{\overline{10}|} = \frac{1-1/1.1^{10}}{0.1} = 6.144567$$
$$\ddot{a}_{\overline{10}|} = (6.144567)(1.1) = 6.759024$$
$$(Ia)_{\overline{10}|} = \frac{6.759024 - 10/1.1^{10}}{0.1} = 29.03591$$

So the present value of the cash flows at time 1 is $6.144567(1{,}800{,}000) + 29.03591(200{,}000) = 16{,}867{,}404$. Discounting to time 0 and subtracting the investment, the NPV is $16{,}867{,}403/1.1 - 10{,}000{,}000 = \boxed{\mathbf{\$5{,}334{,}002}}$.

[8/12/2018] On page 16, in the solution to exercise 2.8, on the second line, change "half the upside semi-variance" to "half the total variance".

[8/12/2018] On page 17, on the last line of the solution to exercise 2.13,change $\text{TVaR}_{0.01}$ to $\text{TVaR}_{0.05}$.

[8/12/2018] On page 18, on the last line of the solution to exercise 2.16, change "greater than 0" to "less than 0".

[3/8/2019] On page 29, exercise 3.22 parametrizes the negative binomial distribution the way it is parametrized on Exams STAM and MAS-I, but this parametrization isn't familiar to someone who hasn't studied for one of those exams. Therefore, replace the first sentence of the question with

The number of claims on a policy in one month has a negative binomial distribution with the following probability mass function:

$$p_n = \binom{2+n}{n}\left(\frac{0.2^n}{1.2^{3+n}}\right)$$

[8/1/2018] On page 47, in the solution to exercise 3.35, on the third, fourth, and fifth lines, change N to N^{-1}. On the lsat line, change 0.28618 to 0.23618.

[3/15/2018] On page 53, in the heading, change EHM to EMH. This change should also be made to the running heads of that lesson and to the table of contents.

[7/24/2018] On page 53, onthe second line of item 1 in the first enumerated list, change "on past prices" to "of past prices".

[6/22/2018] On page 55, 8 lines from the bottom of the page, replace the sentence "Bubbles are a type of market anomaly." with

Bubbles are not market anomalies per se, but are an example of a market inefficiency.

[4/15/2018] On the last line of page 64, change 0.00257 to 0.001476. On the second line of page 65, change 0.00257 to 0.001476 and change 0.38080 to 0.21859.

[10/21/2018] On page 66, Example 5G is defective since the correlation of a stock with the portfolio changes as a stock gets added to it. When solved correctly, it is found that their is no real solution to the question.

Replace the example and its solution with:

EXAMPLE 0A A portfolio consists of $4000 of Stock A and $6000 of Stock B. The returns on the two stocks are uncorrelated. The volatility of Stock A is 0.3 and the volatility of Stock B is 0.4

Calculate the contribution of Stock A to the volatility of the portfolio.

SOLUTION: Let A and B the returns on Stocks A and B respectively. The variance of the portfolio is

$$\text{Var}(0.4A+0.6B) = 0.4^2\,\text{Var}(A)+0.6^2\,\text{Var}(B) = 0.4^2(0.3^2)+0.6^2(0.4^2) = 0.072$$

The covariance of Stock A with the portfolio is

$$\text{Cov}(A, 0.4A+0.6B) = 0.4\,\text{Var}(A) = 0.4(0.3^2) = 0.036$$

The correlation of Stock A with the portfolio is $0.036/(0.3\sqrt{0.072}) = 0.447214$. The contribution of Stock A to the volatility of the portfolio is $0.4(0.447214)(0.3) = \boxed{\mathbf{0.053666}}$. □

[11/6/2018] On page 68, on the first displayed line, replace $f(a,b,\lambda)$ with $h(a,b,\lambda)$.

[5/14/2018] On page 71, in exercise 5.10, the solution provides a less efficient portfolio rather than a more efficient one. Change the question to "Determine another percentage of the portfolio that can be invested in HGH that would result in the same volatility as the current portfolio."

[6/15/2018] On page 72, in the solution to exercise 5.1, on the third line, change 24.42 to 24.22.

[5/27/2018] On page 73, in the solution to exercise 5.5, on the second line, change $p\,\text{Var}(X)+(1-p)\text{Var}(Y)$ to $p^2\,\text{Var}(X)+(1-p)^2\,\text{Var}(Y)$.

[4/24/2018] On page 74, in the solution to exercise 5.11, replace the last 4 lines with

$$0.136x^2 - 0.016x = 0$$
$$0.136x - 0.016 = 0$$
$$x = \boxed{\mathbf{0.117647}}$$

[3/30/2018] On page 77, on the line after equation (6.3), change "The right side of this inequality is" to "The right side of this inequality plus the risk free rate is".

[3/30/2018] On page 78, in the answer to Example 6A, change the second sentence to

The variance of the portfolio's return is $0.5^2(0.2^2) + 0.5^2(0.5^2) + 2(0.8)(0.5)(0.5)(0.2)(0.5) = 0.1125$.

Change the last three lines to

$$\beta_C^P = \frac{0.033}{0.1125} = 0.293333$$

The portfolio's expected return is $0.5(0.1) + 0.5(0.2) = 0.15$.

The required return is $r_f + \beta_C^P(\mathbf{E}[R_P] - r_f) = 0.02 + 0.293333(0.15 - 0.02) = \boxed{\mathbf{0.058133}}$.

[7/12/2018] On page 86, in the solution to exercise 6.8(III), add "beta times" before "the market premium".

[8/6/2018] On page 88, in the solution to Quiz 6-2, on the first line, change "Let x" to "Let p".

[4/8/2018] On page 91, change Example 7B to:

The cost of debt capital for company XYZ is 0.05. For bonds issued by XYZ, the probability of default is 0.1. If a default occurs, the recovery rate on the amount owed including interest is 30%.

Calculate the yield on XYZ's bonds.

In the answer, on the first line, change "debt cost of capital" to "yield".

[4/11/2018] On page 91, on the first displayed line in the solution to Example 7C, change 0.025 to 0.25.

[4/27/2018] On page 92, in Example 7D, on the second line, change "market premium" to "market risk premium".

[5/22/2018] On pages 94 and 99, exercises 7.11, 7.12, 7.14, and 7.15 and their solutions are defective. See the pages at the end of the errata for corrected exercises and solutions.

[5/3/2018] On page 99, in the solution to exercise 7.10, change the final answer 0.03 to 0.003.

[5/22/2018] On page 101, in the solution to exercise 7.29, replace the last five lines with

$$\beta_{\text{total}} = \frac{16}{23}(\beta_{\text{total}}^{\text{equity}})$$
$$\beta_{\text{total}}^{\text{equity}} = \frac{23}{16}(0.9) = 1.29375$$
$$\beta_{\text{total}}^{\text{equity}} = \frac{5}{8}(\beta_A^{\text{equity}}) + \frac{3}{8}(\beta_B^{\text{equity}})$$
$$1.29375 = \frac{5}{8}(1.8) + \frac{3}{8}(\beta_B^{\text{equity}})$$
$$\beta_B^{\text{equity}} = \frac{1.29375 - 1.125}{3/8} = \boxed{\mathbf{0.45}}$$

[6/15/2018] On page 105, in equation (8.2), add $r_f +$ after the equality sign:

$$\mathbf{E}[R_s] = r_f + \sum_{n=1}^{N} \beta_s^{Fn}\,\mathbf{E}[R_{Fn}]$$

Make the same correction in Table 8.1 on page 106.

[8/12/2018] On page 107, in the solution to exercise 8.1, on the sixth line, change 39.781 to 39.71.

[7/3/2018] On page 108, replace the solution to exercise 8.7 with

$$0.04+0.88(0.07-0.04)+0.21(0.03)-0.44(0.02)+0.05(0.04)=\boxed{\mathbf{0.0659}}$$

[11/6/2018] On page 109, the second paragraph discusses NPV, but NPV is not relevant to Modigliani-Miller. Replace the second paragraph with the following two paragraphs:

What is the best combination of debt and equity to finance a project? Which combination maximizes the value of the company's securities? Usually, the cost of debt capital is less than the cost of equity capital. Suppose a company has only one project. The project generates 1.5 million of cash flows per year perpetually. If the cost of equity capital is 15%, then the present value of future cash flows is 1.5/0.15 million = 10 million. That is the market value of the company's equity.

Now assume the company issues 5 million of bonds to fund the project. The cost of debt capital is 5%, so the company pays annual interest of 0.05(5,000,000) = 250,000. The annual net cash flows after interest will be 1,500,000 − 250,000 = 1,250,000. The present value of future cash flows is 1.25/0.15 million = $8\frac{1}{3}$ million. Thus the total value of the company's equity and debt, its enterprise value, is now $8\frac{1}{3}$ million + 5 million = $13\frac{1}{3}$ million. Seemingly the total value of the company's securities has increased as a result of issuing bonds. However, this assumes that the cost of equity capital is still 15% after the bonds are issued. This assumption is not correct.

[11/6/2018] On the second line of the third paragraph of page 109, change "value of a project" to"value of a company's securities".

[4/27/2018] On page 110, three lines from the bottom, change "weighted cost of capital" to "weighted average cost of capital".

[4/27/2018] On page 111, on the last line, change "$D/E = 1.25-1$" to "D/E=7/6-1".

[11/6/2018] On page 113, in the box before exercise 9.3, on the second-to-last line, change "the cost of capital is 0.10" to "the cost of equity capital is 0.10".

[6/12/2018] On page 114, in exercise 9.8, change "a pre-tax WACC" to "an equity cost of capital".

[6/12/2018] On page 115, in exercise 9.16, add the following sentence after "The company uses 4,000,000 cash to pay off the debt.":

Assume the debt beta does not change.

On the last line, add the word "equity" before "beta".

[4/27/2018] On page 116, in the solution to exercise 9.6, on the last line, change 4629.92 to 4620.92.

[5/24/2018] On page 116, in the solution to exercise 9.10, on the third-to-last line and on the last line, change 0.108 to 0.102.

[4/27/2018] On page 117, in the solution to exercise 9.14, on the first line, change "cash is 1,000,000" to "cash is 10,000,000".

[6/12/2018] On page 117, change the solution to exercise 9.16 to

The company's unlevered beta is

$$\beta_U=\frac{20}{56}(1)+\frac{40}{56}(0.1)=\frac{3}{7}$$

After paying off debt,

$$\beta_E=\beta_U+\frac{D}{E}(\beta_U-\beta_D)=\frac{3}{7}+\frac{36}{20}\left(\frac{3}{7}-0.1\right)=1.02$$

The change in equity beta is **0.02**.

[6/22/2018] On page 118, the last two lines of the solution to exercise 9.18 may be difficult to understand. Replace them with this longer explanation:

The market risk premium is $0.095-0.045=0.05$. If the project is financed with equity, then equity rises to $1{,}000+100=1{,}100$ million and earnings rise to $100+11=111$ million, so the rate of return on equity becomes $111/1{,}100=0.100909$. Then by the CAPM equation,

$$0.100909 = 0.045+\beta(0.095-0.045)$$
$$\beta = \frac{0.100909-0.045}{0.05} = \boxed{\mathbf{1.118182}}$$

If the project is financed with debt, then equity is unchanged at 1,000 million and earnings after interest become $100+11-0.05(100)=106$ million. Then by the CAPM equation,

$$0.106 = 0.045+\beta(0.095-0.045)$$
$$\beta = \frac{0.106-0.045}{0.05} = \boxed{\mathbf{1.22}}$$

[6/22/2018] On page 124, the solution to exercise 10.7 assumes taxes are paid at the beginning of the year. If you assume taxes are paid at the end of the year, the last two lines of the solution become:

$$\frac{5.25}{1.04}\sum_{k=0}^{\infty}\left(\frac{1.02}{1.04}\right)^k = \frac{5.25/1.04}{1-1.02/1.04} = 262.5$$

in millions, or **262,500,000**.

In practice, companies pay estimated taxes quarterly, so perhaps an assumption that taxes are paid in the middle of the year is most appropriate.

[6/22/2018] On page 125, in the solution to exercise 10.10, on the second line, change "20%" to "21%".

[8/31/2018] On page 125, in the solution to exercise 10.11, on the fifth line, change $1-0.21$ to $1-0.20$.

[4/17/2018] On page 125, in the solution to exercise 10.11, on the second line, change 0.03 in the denominator to 0.05.

[4/27/2018] On page 127, on the fourth line of Section 11.1, change "it it" to "if it".

[4/27/2018] On page 130, on the first line of the second paragraph of Section 11.3, change "it the company" to "if the company".

[2/14/2019] On page 133, in exercise 11.8, on the second line, change "ia" to "is". Also note that you should ignore the tax shield when doing this exercise.

[5/30/2018] On page 135, in the solution to exercise 11.7, on the second line, delete the parenthesis after x.

[2/14/2019] On page 136, change the solution to exercise 11.8 to

Market capitalization before the loan is 14,000,000, and the value of the loan is 10,000,000. Thus after the loan $D/E=10/4$. The equity beta with the loan is

$$\beta_E = 1+\frac{10}{4}(1-0.2) = 3$$

Therefore the beta of distress costs is $0.03-3(0.05)=-0.12$ The expected present value of distress costs (taking into account their probability) is $0.3(1{,}000{,}000/(1-(-0.12)))=340{,}909$. Thus the value of equity decreases by 340,909 as a result of bankruptcy costs. There are $1{,}000{,}000 - 10{,}000{,}000/14 = 285{,}714$ shares outstanding after the loan. The new share value is $14 - 340{,}909/285{,}714 = \boxed{\mathbf{12.81}}$.

[5/30/2018] On page 137, in the solution to exercise 11.16, on the third line, change 0.5(3) to 0.5(30).

[6/27/2018] On page 137, in the solution to exercise 11.17, on the first line, change "ir" to "is".

[4/27/2018] On page 140, on the second line of item 3 in the answer to Example 12A, at the end of the line, change "liquidate" to "liquidation".

[3/15/2018] On page 142, in the second paragraph after the answer to Example 12C, in the second sentence, change "than" to "then", and change the second "company" to "country".

[5/31/2018] On page 145, in the solution to exercise 12.4, on the first line, change $8/(8+x)$ to $x/(8+x)$. On the third line, change $12/(12+y)$ to $y/(12+y)$.

[6/11/2018] On page 146, replace the solution to exercise 12.7 with:

Series C must receive at least $6{,}000{,}000(0.8)(1.5) = 7{,}200{,}000$ and Series B shareholders must receive at least 6,000,000. However, Series C is better off converting to common stock. Then Series B shareholders get $\boxed{\mathbf{6{,}000{,}000}}$. From the remaining 9,000,000 Series C shareholders get $(6/7)(9{,}000{,}000) = \boxed{\mathbf{7{,}714{,}286}}$ and Series A receives $(1/7)(9{,}000{,}000) = \boxed{\mathbf{1{,}285{,}714}}$.

[2/19/2019] On page 148, on the last line of the page, change "intereset" to "interest".

[8/31/2018] On page 149, in exercise 13.1, add "level" after "state or local". None of the answer choices to exercise 13.1 is correct. Only Ginnie Maes are taxable at the state and local level.

[10/25/2018] On page 169, in exercise 15.8, change the last line to

Determine the lowest price per unit such that the futures contract does not require a margin call.

[10/8/2018] On page 174, on the second line from the end of the page, change "buy buying" to "by buying".

[6/25/2018] On page 181, in exercise 16.21, add

(vi) The price of the stock follows a lognormal distribution.

and move the exercise to Lesson 23, which discusses the lognormal distribution.

[1/14/2019] On page 187, in each of the first two displayed lines of Section 17.2, change Ke^{-rt} to Ke^{-rT}.

[6/25/2018] On page 195:

- In the first bullet, replace "when the expiry stock price is $K_3 > K_2 > K_1$", with "when $S_T \geq K_3$".
- In the second bullet, put a negative sign before $K_3 - K_2$: "the payoff is $-(K_3 - K_2)$".
- Also in the second bullet, replace "when the expiry stock price is $K_3 > K_2$" with "when $S_T \geq K_3$".

[6/27/2018] On page 222, in exercise 18.31, change statement (i) to

(i) the annual effective risk-free rate is 5%.

[6/15/2018] On page 274, in exercise 20.26, delete statement (ii).

[6/28/2018] On page 281, iun the solution to exercise 20.19, change the final answer 3.5137 to 3.5136.

[3/15/2018] On page 304, in the solution to exercise 21.1, replace the last two lines are

$$C = \frac{0.559126^2(66.25) + 2(0.559126)(1-0.559126)(3.75)}{1.06} = \boxed{\mathbf{21.28}} \qquad \textbf{(D)}$$

[9/21/2018] On page 342, change the final answer to exercise 23.15 from −33.0040 to −33.0440.

[3/20/2018] On page 342, replace the solution to exercise 23.16 with

Since you've written the option, the worst case is when the option pays the most, or when the stock price falls the most. The normal parameters are $m = 0.12 - 0.5(0.2^2) = 0.10$ and $v = 0.2$. The 10^{th} percentile of the stock's price at the end of one year is

$$50\exp\bigl(0.10 - 1.28155(0.2)\bigr) = 42.76470$$

We use equation (23.6) to calculate the expected value of the stock given that it is less than 39.02822. We will mechanically calculate $\hat{d}_1$ and $\hat{d}_2$, but you can save work if you realize that by the definition of $\hat{d}_2$, $N(-\hat{d}_2) = 0.1$.

$$\begin{aligned}
\hat{d}_1 &= \frac{\ln(50/42.76470) + 0.12 + 0.5(0.2^2)}{0.2} = 1.48155\\
\hat{d}_2 &= 1.48155 - 0.2 = 1.28155\\
N(-\hat{d}_1) &= 0.06923 \qquad N(-\hat{d}_2) = 0.1\\
E[S_1 \mid S_1 < 42.76470] &= \frac{50e^{0.12}(0.06923)}{0.1} = 39.0282
\end{aligned}$$

The expected payoff on the put given that the stock price is less than 42.76470 is $50 - 39.0282 = 10.9718$ and the TVaR of the payoff is $\boxed{\mathbf{-10.9718}}$.

[11/3/2018] On page 351, in Table 24.2, in the formula for call premium on futures, replace the two ts with Ts.

[7/4/2018] On page 354, in exercise 24.11(ii), delete the last two words "compounded continuously".

[6/25/2018] On page 385, in Table 25.6, on the lines for ρ and Ψ, in the second column, replace $0.01T$ with $0.01(T - t)$.

[6/10/2018] On page 506, three lines from the bottom, delete "of" after "NPV".

[4/27/2018] On page 507, on the second line of the page, change "of 0.8 million" to "or 0.8 million".

[4/27/2018] On page 507, on the fifth line of the answer to Example 30A, change "end of the year" to "beginning of the year". On the third line from the end, change "if interest rates are 0.4" to "if free cash flows are 1.2 million per year".

[11/6/2018] On page 507, in Example 30B, in the first paragraph, change the last two sentences to "If you wait one year, the expected present value of the oil at the current time is 15 million with volatility 0.2. The annual effective risk-free interest rate is 0.05."

[6/10/2018] On page 507, change the last two lines of the answer to Example 30B to

"The value of waiting one year is the excess of the value of the call option over the value of drilling immediately, which is $15 - 10 = 5$ million. The value of waiting one year is $5.485767 - 5 = \boxed{\mathbf{0.485767}\text{ million}}$, so you should wait one year."

[4/8/2018] On page 508, change the sixth through ninth lines to:

$$\begin{aligned}
d_1 &= \frac{\ln\frac{14.21928}{10/1.05} + 0.5(0.2^2)}{0.2} = 2.10402\\
d_2 &= 2.10402 - 0.2 = 1.90402\\
N(d_1) &= 0.98231 \qquad N(d_2) = 0.97155\\
C &= 14.21928(0.98231) - \frac{10}{1.05}(0.97155) = \boxed{\mathbf{4.714884}\text{ million}}
\end{aligned}$$

[4/27/2018] On page 508, on the fourth line, change "forward price" to "prepaid forward price".

[3/24/2019] On page 510, in exercise 30.9, add the following sentence after the second sentence of the second paragraph:

But if these preliminary studies are unfavorable, the probability of success of the drug is 0%.

[4/8/2018] On page 511, in exercise 30.11, on the fourth line, change "4 million" to "5 million". In working out this exercise note that:

- Beta for an option is beta of the stock times the elasticity of the option.
- The elasticity of an option, $S\Delta/C$, may also be computed as $F^P(S)N(d_1)/C$.

[6/10/2018] On page 511, on the second line of the solution to exercise 30.3, change "you return" to "your return".

[4/8/2018] On page 511, in the solution to exercise 30.1, on the last line, change 1500 to 1400.

[6/10/2018] On page 512, replace the solution to exercise 30.4 with

You have three options: build now, sell now, wait one year.

If you build now, the NPV in millions is

$$\frac{0.4(150)+0.6(50)}{1.1}-100=-18.182$$

so you would not build.

If you sell the plot now, you get 5 million. If you wait a year, you get

$$\frac{0.4(10)+0.6(5)}{1.1}=6.364 \text{ million}$$

If you wait a year and then build, you would only build if the subway station is built; otherwise you would sell. Your NPV if you built only if the subway station is built in millions is

$$\frac{0.4(150/1.1-100)+0.6(5)}{1.1}=15.950$$

Thus without the option of waiting, the NPV of the best strategy is 6.364 million, while with the option of waiting, the NPV of the best strategy is 15.950 million. The option is worth **9.587 million**.

[8/6/2018] On page 513, in the solution to exercise 30.11, change the last line to

$$\beta_{\text{option}}=\beta_{\text{stock}}\Omega=\beta_{\text{stock}}\left(\frac{F^P(S)N(d_1)}{C}\right)=1.5\left(\frac{5.54545(0.73430)}{1.05405}\right)=\boxed{\mathbf{5.7948}}$$

[10/19/2018] On page 515, on the second line of the paragraph containing the displayed line $\int_0^\infty P(t)f_{T_x}(t)\,\mathrm{d}t$, change $\max(0,K-S_T)$ to $S_T+\max(0,K-S_T)$, and change "So it is" to "So it contains".

[6/10/2018] On page 519, on the second line of the second paragraph, delete "a" between "the" and "rainbow".

[11/12/2018] On page 521, in exercise 31.3, change the five choices to (only (B), (D), and (E) are changed):

(A) $\int_0^{10}\big(C(S,55000,t)+55{,}000(1-e^{-rt})\big)f(t)\,\mathrm{d}t+F(10)C(S,50000,10)$

(B) $\int_0^{10}\big(C(S,50000,t)+50{,}000(e^{-rt}-1)\big)f(t)\,\mathrm{d}t+F(10)\big(C(S,55000,10)+55000e^{-10r}-50000$

(C) $\int_0^{10}\big(C(S,50000,t)+50{,}000(e^{-rt}-1)\big)f(t)\,\mathrm{d}t+\big(1-F(10)\big)\big(C(S,55000,10)+55000e^{-10r}-50000$

(D) $\int_0^{10}\big(C(S,50000,t)+50{,}000(1-e^{-rt})\big)f(t)\,\mathrm{d}t+\big(1-F(10)\big)C(S,55000,10)$

(E) $\int_0^{10}\big(C(S,55000,t)+50{,}000(e^{-rt}-1)\big)f(t)\,\mathrm{d}t+\big(1-F(10)\big)\big(C(S,55000,10)+55{,}000e^{-10r}-50000$

[11/12/2018] On page 522, on the second line from the end of the solution to exercise 31.3, change 55000 to 50000.

[6/4/2018] On page 595, in question 20, delete 1− on the second line so that it reads

$$F(x) = e^{-(1000/x)^{0.5}} \qquad x > 0$$

[5/31/2018] On page 634, in the solution to question 27, on the second to last line, change 1940 to 2040 and change 1040 to 1140.

[8/21/2018] On page 637, change the answer choice for question 10 from (D) to (B). Also correct the table on page 635.

[5/22/2018] On page 638, in the solution to question 16, on the second-to-last line, change $P(10)$ to $P(20)$ and change $e^{-0.4}$ to $e^{-0.8}$.

[10/28/2018] On page 644, in the solution to question 13, on the second displayed line, change 0.66589 to 0.42858.

[6/22/2018] On page 650, replace the solution to question 4 with:

Let A and B represent the returns on the two stocks.

$$\bar{A} = 0.0822 \qquad \bar{B} = 0.0846$$
$$\widehat{\text{Var}}(A) = \frac{0.082^2 + \cdots + (-0.020)^2}{5} - 0.0822^2 = 0.003726$$
$$\widehat{\text{Var}}(B) = \frac{0.072^2 + \cdots + (0.048^2)}{5} - 0.0846^2 = 0.000635$$

We computed the variances with division by 5 rather than 4, but we'll also compute the covariance with division by 5. When the latter is divided by the former, the 5s will cancel out.

$$\widehat{\text{Cov}}(A,B) = \frac{(0.082)(0.072) + \cdots + (-0.02)(0.048)}{5} - (0.0822)(0.0864) = 0.001482$$
$$\widehat{\text{Corr}}(A,B) = \frac{0.001482}{\sqrt{(0.003726)(0.000635)}} = \boxed{\mathbf{0.962963}} \qquad \textbf{(E)}$$

[3/2/2019] On page 653, in the solution to question 11, change the answer key from (B) to (C). Make the same change on page 650.

[9/4/2018] On page 663, replace the solution to question 27 with

The risk-free investment has a beta of 0. Let $10{,}000x$ be the amount invested in Stock C in the revised portfolio.

$$\frac{0.2}{0.4+x}(0.8) + \frac{0.2}{0.4+x}(1) + \frac{x}{0.4+x}(1.6) = 1$$
$$0.16 + 0.2 + 1.6x = 0.4 + x$$
$$0.6x = 0.04$$
$$x = \frac{1}{15}$$

We want 666.67 of Stock C in the revised portfolio. Sell $\boxed{\mathbf{533.33}}$ of Stock C.

[9/6/2018] On page 672, in question 30, the answer key is (A). Correct the table on page 622 as well.

[9/11/2018] On page 683, in the solution to question 8, on the last line, add after "Stock A":

and $50{,}000 - 28{,}571.4 = \boxed{\mathbf{21{,}428.6}}$ in Stock B.

None of the answer choices are correct.

[6/8/2018] On page 707, replace the last two lines of the solution to question 2 with

$$\frac{\sum A_i B_i}{5} = \frac{(0.06)(0.03)+(0.17)(0.02)+(-0.05)(0.15)+(0.22)(0.2)+(0.1)(0.15)}{5} = 0.01134$$

$$\operatorname{Cov}(A,B) = \frac{5}{4}\big(0.01134-(0.1)(0.11)\big) = \boxed{\mathbf{0.000425}} \qquad \textbf{(B)}$$

7.4. The market consists of the following four stocks:

Stock	Number of Shares	Price per Share
A	10,000	27
B	5,000	75
C	2,000	326
D	2,000	12

A market portfolio includes 50 shares of stock A.

Determine the number of shares of stock B in this portfolio.

7.5. The market consists of the following four stocks:

Stock	Number of Shares	Price per Share
A	10,000	27
B	5,000	75
C	2,000	326
D	2,000	12

The value of shares of stock A in a market portfolio is 25,000.

Calculate the value of the shares of stock C in this portfolio.

7.6. The value of the market is 6 billion. The market pays 10 million of dividends at the end of the year. Dividends are expected to grow at a rate of 5% per year.

Using a fundamental approach, calculate the expected return of the market.

7.7. Give three reasons why the market risk premium has declined over time.

7.8. The market's expected return is 8% and the expected return of stock A is 9%. The beta of stock A is 0.75. The annual effective risk-free interest rate is 4%.

Calculate alpha for stock A.

7.9. **[2-F00:46]** An analysis of 72 monthly rates of return on a company's common stock indicates a beta of 1.75 and an alpha of 0.005 per month. One month later, the market is up by 1.0% and the stock is up by 2.0%.

What is the abnormal rate of return?

(A) −0.250% (B) 0.125% (C) 0.250% (D) 0.500% (E) 1.000%

7.10. The Sharpe ratio for the market is 0.4.

QRS stock has a Sharpe ratio of 0.33 and has 0.8 correlation with the market. Its volatility is 0.3.

Calculate alpha for QRS.

7.11. A company issues bonds. The annual probability of default on these bonds is 0.015. The loss per dollar of debt on a defaulted bond is $0.60.

The debt cost of capital is 0.05.

Calculate the yield on the bonds.

7.12. A company issues bonds. The debt cost of capital is 0.04. The annual probability of default on these bonds is 0.04. The recovery rate on defaulted bonds is 40%.

Calculate the yield on these bonds.

Exercises continue on the next page . . .

7.13. A company issues BBB-rated bonds. Beta for these bonds is 0.31. The risk-free rate is 0.03 and the market risk premium is 0.08.

Calculate the debt cost of capital.

7.14. The debt cost of capital is evaluated in two ways: using default probabilities and using CAPM. You are given:

(i) The annual effective risk-free interest rate is 0.03.
(ii) The annual effective yield on the company's bonds is 0.08.
(iii) The annual probability of default is 0.05.
(iv) The loss per dollar of debt on defaulted bonds is 70%.
(v) The market risk premium is 0.06.

Determine the beta that makes the two estimates of the debt cost of capital equal.

7.15. For a company, the debt cost of capital is 0.04 and the yield on the company's bonds is 0.06. The recovery rate for defaulted bonds is 20%.

Calculate the assumed annual default rate implicit in the debt cost of capital.

7.16. **[2-F01:22]** A firm's market value balance sheet is as follows:

Asset Value	500	Debt	200
		Equity	300
Firm Value	500	Firm Value	500

The risk-free rate of interest is 3.5%, β_{equity} is 1.2, β_{debt} is 0.2, and the return on the market portfolio is 14.4%.

Calculate the company's cost of capital.

(A) 5.7% (B) 7.2% (C) 10.0% (D) 12.2% (E) 16.6%

7.17. **[2-F00:15]** You are given the following information:

Long-term debt outstanding:	200,000
Long-term debt is risk free and financed at an interest rate of:	8.0%
Number of shares of common stock:	50,000
Price per share:	16.00
Book value per share:	12.00
Stock's beta:	1.10

The expected market return is 12.0%.

What is the company's before-tax cost of capital?

(A) 11.0% (B) 11.2% (C) 11.5% (D) 11.9% (E) 12,4%

7.18. **[2-S01:39]** A firm has a debt ratio of 0.4. The firm also has a debt beta of 0.75 and an equity beta of 1.50 . The expected return on the market is currently 11% and the risk-free interest rate is 5%.

What is the required return on an investment project that expands the firm's existing operations while maintaining the current target capital structure?

(A) 10% (B) 11% (C) 12% (D) 14% (E) 15%

Exercises continue on the next page . . .

2. Easier to invest in diversified portfolio through mutual funds and ETFs.
3. Volatility has declined.

7.8.

$$(0.09 - 0.04) = 0.75(0.08 - 0.04) + \alpha$$
$$\alpha = \boxed{\mathbf{0.02}}$$

7.9. The normal return is $\alpha + \beta r_{\text{Market}} = 0.005 + 1.75(0.01) = 0.0225$. The actual return is 0.02, which is $\boxed{\textbf{0.250\% less}}$. **(A)**

7.10. Let r be the expected return, and let ρ be the correlation between QRS and the market.

$$\begin{aligned} r_{\text{QRS}} - r_f &= \beta(r_{Mkt} - r_f) + \alpha \\ \frac{r_{\text{QRS}} - r_f}{\sigma_{\text{QRS}}} &= \frac{\sigma_{\text{QRS}}\rho}{\sigma_{\text{QRS}}\sigma_{Mkt}}(r_{Mkt} - r_f) + \frac{\alpha}{\sigma_{\text{QRS}}} \\ &= \rho\left(\frac{r_{Mkt} - r_f}{\sigma_{Mkt}}\right) + \frac{\alpha}{\sigma_{\text{QRS}}} \\ 0.33 &= 0.8(0.4) + \frac{\alpha}{0.3} \\ \alpha &= \boxed{\mathbf{0.003}} \end{aligned}$$

7.11. The debt cost of capital is set equal to the yield on the bonds minus the lost interest upon default.

$$\begin{aligned} r_D &= y - pL \\ 0.05 &= y - 0.15(0.6) \\ y &= 0.05 + 0.015(0.6) = \boxed{\mathbf{0.059}} \end{aligned}$$

7.12. Let y be the yield. The loss rate per dollar of debt on defaulted bonds is

$$(1 + y)(1 - 0.4) = 0.6(1 + y)$$

The expected return on the bonds should be the 0.04. So

$$\begin{aligned} 0.04 &= y - 0.04\big(0.6(1 + y)\big) \\ &= -0.024 + 0.976y \\ y &= \frac{0.064}{0.976} = \boxed{\mathbf{0.06557}} \end{aligned}$$

7.13.

$$r_D = 0.03 + 0.31(0.08) = \boxed{\mathbf{0.0548}}$$

7.14. From the default probability calculation,

$$r_D = 0.08 - 0.05(0.7) = 0.045$$

This is equivalent to the following β:

$$\begin{aligned} 0.03 + 0.06\beta &= 0.045 \\ \beta &= \frac{0.015}{0.06} = \boxed{\mathbf{0.25}} \end{aligned}$$

7.15. Let p be the default rate. Then

$$\begin{aligned} r_D &= y - pL \\ 0.04 &= 0.06 - p(1.06)(1-0.2) \\ 0.02 &= 0.848p \\ p &= \frac{0.02}{0.848} = \boxed{\mathbf{0.023585}} \end{aligned}$$

7.16. Debt is 40% of firm value. The firm's beta is therefore 0.4(0.2) + 0.6(1.2) = 0.8. Then the company's cost of capital is

$$0.035 + 0.8(0.144 - 0.035) = \boxed{\mathbf{0.1222}} \qquad \textbf{(D)}$$

7.17. Equity is 50,000(16) = 800,000. Equity is 80% of capital. The cost of equity capital is 0.08 + 1.1(0.12 − 0.08) = 0.124. The company's cost of capital is

$$0.8(0.124) + 0.2(0.08) = \boxed{\mathbf{0.1152}} \qquad \textbf{(C)}$$

7.18. The risk-free interest rate is 5% and the market risk premium is 6%, so the cost of debt capital is 0.05 + 0.75(0.06) = 0.095 and the cost of equity capital is 0.05 + 1.5(0.06) = 0.14. The required return is

$$0.4(0.095) + 0.6(0.14) = \boxed{\mathbf{0.122}} \qquad \textbf{(C)}$$

7.19. The 20%/80% book value proportions given in the question are meant to mislead you. You must use market value of debt and equity to determine the split. We compute the split from the betas. Let p be the proportion that is equity.

$$\begin{aligned} 0.78 = 1.5p + 0.3(1-p) &= 0.3 + 1.2p \\ 1.2p &= 0.48 \\ p &= 0.4 \end{aligned}$$

The firm's cost of capital is $0.4(0.15) + 0.6(0.10) = \boxed{\mathbf{0.12}}$. **(B)**

7.20. The cost of equity capital is 0.045 + 0.9(0.123) = 0.1557. The unlevered cost of capital, $r_{\text{assets}} = 0.11$, is a weighted average of the cost of debt capital and the cost of equity capital, and we can derive the amount of equity capital:

$$\begin{aligned} 0.11 &= 0.1557\left(\frac{E}{E+D}\right) + 0.07\left(\frac{D}{E+D}\right) \\ &= 0.1557\left(\frac{E}{E+800}\right) + 0.07\left(1 - \frac{E}{E+800}\right) \\ &= 0.0857\left(\frac{E}{E+800}\right) + 0.07 \\ \frac{E}{E+800} &= \frac{0.04}{0.0857} = 0.466744 \\ E &= \frac{800(0.466744)}{1-0.466744} = 700 \end{aligned}$$

Total firm value is $800 + 700 = \boxed{\mathbf{1500}}$. **(B)**

7.21. Enterprise value is the sum of equity plus debt minus cash.

$$21(10{,}000{,}000) + 50{,}000{,}000 - 30{,}000{,}000 = \boxed{\mathbf{230{,}000{,}000}}$$