1. Stock A has an expected return of 15% and a standard deviation of 20%, while stock B has an expected return of 12% and a standard deviation of 16%. Assume that the correlation between the returns of A and the returns of B is 0.5. What is the standard deviation of a portfolio consisting of 75% invested in stock A and 25% invested in stock B?

\[
\sigma_P = \sqrt{(.75 \times 20\%)^2 + (.25 \times 16\%)^2 + 2 \times .75 \times .25 \times 16 \times .5}
\]

\[= \sqrt{10.225 + .0016 + .0006} = 17.35\%
\]

2. You have a portfolio consisting of stocks A, B and C. The investment proportions are: 20% are invested in stock A, 30% are invested in stock B, 50% are invested in stock C. Furthermore you are given the following information:

<table>
<thead>
<tr>
<th>Expected Return</th>
<th>Standard Deviation</th>
<th>Coefficient of Variation</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock A (20%)</td>
<td>8%</td>
<td>1.25</td>
<td>0.7</td>
</tr>
<tr>
<td>Stock B (30%)</td>
<td></td>
<td>16%</td>
<td>1.1</td>
</tr>
<tr>
<td>Stock C (50%)</td>
<td></td>
<td>24%</td>
<td></td>
</tr>
<tr>
<td>Portfolio (A,B,C)</td>
<td>18.46%</td>
<td></td>
<td>1.27</td>
</tr>
</tbody>
</table>

(1) What is the standard deviation of stock A?

- a. 8.0%
- b. 8.3%
- c. 10.0%
- d. 13.2%
- e. 18.0%

(2) You sell all of your investments in stocks A and B and invest the proceeds in the risk-free asset. The risk-free rate is 4%. The coefficient of variation of your new portfolio (consisting of 50% of stock C and 50% of the risk-free asset) is

- a. 0.845
- b. 0.917
- c. 1.000
- d. 1.091
- e. 1.300
3. Exactly 4 years ago you took a $150,000 30-year mortgage with an interest rate of 7.75% p.a. Today (i.e. exactly after your 48th payment) you do a "no-cost refinancing" by switching to a 15-year mortgage with an interest rate of 6.0%. What will be the monthly payment on the new 15-year mortgage? (Hint: "No-cost refinancing" means that the total initial amount of the new mortgage equals the remaining principal of the old mortgage after the 48th payment)

   a. 863.74
   b. 1,032.10
   c. 1,074.62
   d. 1,215.70
   e. 1,356.05

   1. PV = 150,000, N = 360, I = 7.75/12
      FV = 0, CPT Pmt = 1079.62

   2. without change, change N = 48
      CPT FV = 144,064.82

   3. PV = 144,064.82, N = 180, I = 6/12, FV = 0, CPT Pmt

4. The present value of the following set of cash flows is +$4,000 when evaluated at a nominal interest rate of 6%. The cash flows are as follows; Year 1 = $1,000, Year 2 = $2,000, Year 3 = $3,000, Year 4 = ????, and Year 5 = $5,000. To within $5, what is the value of the missing cash flow in Year 4?

   a. $6,285
   b. $4,980
   c. $4,000
   d. +$4,980
   e. +$8,980

   1. Compute NPU of known assuming unknown = $0
      NPU @ 6% = 8978.53

   2. Difference = Expected NPU - 4000 = 4978.5

   3. PV = 4978.55, N = 6, CPT FV = 7,457.30

5. Exactly five years ago you have purchased a ZeroBond (i.e. a bond with a coupon of 0%) with a principal value of $1,000 and a remaining maturity of 25 years. At the time of the purchase the YTM of the ZeroBond was 6%. Today you are selling the ZeroBond, and the today's YTM of the ZeroBond is 5%. How much did you win/lose during the 5 years (amount in $)?

   a. $37.70
   b. $62.30
   c. $76.70
   d. -$143.90
   e. $376.90

   1. FV = 1000, N = 25, I = 6, Pmt = 0, PV = 2830

   2. FV = 1000, N = 20, I = 5, Pmt = 0, PV = 57688

   3. 376.88 - 233 = 143.88
6. Your company is not expected to pay any dividends for the next 3 years. In year 4, it will pay an initial dividend of $3.00 per share (the dividend will be paid at the end of year 4). At that point, dividends are expected to grow at a constant annual rate of 4%. If your required rate of return is 9%, calculate the current price of a share of the firm’s common stock.

a. $60.00  
b. $46.33  
c. $42.51  
d. $36.55  
e. $26.55

7. Consider a project that requires an investment at t=0 of $400 and pays $100 a year forever (starting in one year). If the appropriate discount rate is 20%, which of the following statements is correct?

a. The NPV is $100  
b. The NPV is $0  
c. The payback period is 5 years  
d. The IRR is 20%  
e. The PI (profitability index) is 1.0

8. The CEO of Nautica Shipping is considering the purchase of a new ship. She has hired you to evaluate the project. The ship will cost $400 million and it is classified in the 3-year MACRS class. The purchase of the ship will require an increase in net working capital of $20 million (in year 0), which is recovered in the final year of the project. The ship will increase the firm’s sales by $250 million per year, but will also increase costs (excluding depreciation) by $50 million per year. The ship is expected to be used for 3 years, and then sold for $75 million. The firm’s marginal tax rate is 40% and the project’s cost of capital is 14%. Use the following MACRS rates for 3-year property: 33%; 45%; 15%; 7%.

(1) What is the total net cash flow in year 3 (rounded off to 1 decimal)?

a. $144.0 million  
b. $200.2 million  
c. $220.2 million  
d. $239.0 million  
e. $256.2 million

(2) What is the NPV of the project?

a. -$9.99 million  
b. $23.49 million  
c. $27.95 million  
d. $34.45 million  
e. $40.64 million

9. At a 7% annual rate of return, how long does it take money to triple?

a. 16.24 years  
b. 10.24 years  
c. 23.44 years  
d. 20.49 years  
e. none of the above are within 2 years of the correct answer
10. You have just borrowed $20,000 which you will repay in 10 equal annual payments. The bank's stated rate on its loans is 9%. Based on this information, how much principal will you repay in the 9th (i.e. the next to last) year of the loan?
   a. $1,316.40
   b. $2,365.69
   c. $2,859.08
   d. $2,623.02
   e. not enough information

11. Niven Rings Inc. just paid a regular dividend of $1.50 per share. The regular dividend is expected to grow at a rate of 10 percent per year for the next three years, at a rate of 7 percent per year for the next two years, and after that at a rate of 4 percent per year forever. In addition to the regular dividend, Niven Rings is expected to pay a special dividend of $5.00 at the end of year 2. (NOTE: A special dividend is a one time only payment that will not recur. It is not considered in calculating the amount of future dividends). The appropriate discount rate is 14 percent per year.
   What is the price of the stock?
   a. $19.02
   b. $21.67
   c. $22.43
   d. $22.86
   e. $24.36

12. You are analyzing a capital budgeting project. Someone spilled coffee on the page and, as shown by the ???, several numbers are unreadable. You can read the following information:
   Cash Flows at the end of: Year 0 = ($24,300)
   Year 1 = $10,800
   Year 2 = $6,000
   Year 3 = $2,600
   Year 4 = $???
   Year 5 = $9,300.

   The Cost of Capital is 12%, the NPV = $???, the IRR = 14%, the PI = 1.14. Your boss, ignoring the important (and true) fact that we should accept the project, is demanding to know the Cash Flow in Year 4. The Cash Flow in Year 4 is closest to:
   a. ($10,000)
   b. ($5,000)
13. The Q-Tar Corp. is considering making the following capital investment in a new machine which has an estimated useful life of 3 years. The machine will be depreciated according to the MACRS recovery allowances for a 3-year class investment, resulting in depreciation of 33%, 45%, 15%, and 7% respectively in years 1 through 4. The initial cost of the machine is $100,000 plus $20,000 shipping and installation. The machine will result in an annual operating savings of $50,000 per year, and will allow a reduction in inventory of $9,500 over the useful life of the machine. After 3 years, inventory will return to its previous level. It is estimated that the machine can be sold for its salvage value of $7,000 at the end of 3 years. The firm’s marginal tax rate is 40%.

(1) What is the net cash investment in Year 0 (CF0) for Q-Tar if Q-Tar purchases the new machine?
(2) What is the net operating cash inflow for Q-Tar in Year 2 if Q-Tar purchases the new machine?
(3) What is the additional (non-operating) cash flow at the end of the project (i.e., in Year 3)?

14. Stock A has a beta of 1.5 and a standard deviation of returns of 21.5%. Stock B has a beta of 2.5 and a standard deviation of returns of 16.5%. The risk-free rate is 5%. The expected return on the market is 11% and the standard deviation of the return on the market is 9%. You invest 40% in A and 60% in B. What is the required return on the portfolio?

\[
\left(0.40 \times 1.5\right) + \left(0.60 \times 2.5\right) = 2.1 \\
0.05 + 2.1 \times (11 - 0.05) = 17.6\% 
\]

15. Consider the following project data:
   - In Phase I, the company will spend $500,000 (at t = 0) to introduce a new product to a test market (i.e., Georgia).
   - If the test indicates potential, the firm will spend $1,500,000 at t = 1 to expand the market to
the entire east coast. If the test does not indicate potential, the company will abandon the project. Abandoning and selling off the project's assets is expected to produce a cash inflow of $250,000 in year 1.

- The best estimate now is that there is an 80 percent chance that the test market will indicate potential, and a 20 percent chance that it will not.
- If sales from the east coast expansion are better than expected, the company will spend another net amount of $3,000,000 at t=2 to expand the market to the entire country. This expansion is expected to produce cash inflows to the company of $1,500,000 per year for the next 5 years (i.e., years 3, 4, 5, 6 and 7). If sales from the east coast expansion are as expected, the company expects net cash flows of $500,000 per year for the next 6 years (i.e., in years 2, 3, 4, 5, 6 and 7).
- The best estimate now is that there is a 75 percent chance that sales from the east coast expansion will be as expected and a 25 percent chance that sales from the east coast expansion will be better than expected.

If the appropriate cost of capital is 10 percent, what is the project's expected NPV? (Round your answer to the nearest thousand dollars).

15. You purchased a bond (with $1,000 principal value) five years ago at a price of $990.50. At the time of purchase, this bond had 20 years to maturity and a coupon rate of 8 percent with coupon payments made twice every year. Today, the nominal annual yield to maturity on similar bonds is one percent lower than when you purchased the bond five years ago. What is the market price of the bond today?

1. \( P_0 = 990.50 \), \( N = 20 \times 2 = 40 \), \( FV = 1000 \), \( Pmt = 80 / 2 = 40 \), \( i = 4 \times 8 \times 2 = 8.1 \), \( \text{NPV} = 1082.57 \)

2. \( N = 15 \times 2 = 30 \), \( FV = 1000 \), \( Pmt = 70 \), \( i = 3.848 \), \( \text{NPV} = 1082.57 \)

16. ZInc is expected to pay a dividend of $1 at \( t = 1 \). The growth rate for the next two dividends is expected to be 20% per year and the growth rate for the following two years (to compute dividends at \( t = 4 \) and \( t = 5 \)) is expected to be 15%. After that the growth rate will be 6 percent per year for ever. If the investors require a return of 13 percent from this stock, what should be the stock price today?

\[
\begin{align*}
C_0 &= 0 \\
C_1 &= 1.2 \\
C_2 &= 1.44 \\
C_3 &= 1.99 \\
C_4 &= 2.98 \\
C_5 &= 3.92
\end{align*}
\]

\[
\frac{2.98}{3.92} = \frac{D_5}{D_6} = \frac{2.02}{y - g} = \frac{2.02}{13\% - 6\%}
\]

\[
\text{NPV} = 13
\]

\[
\begin{align*}
C_0 &= 0 \\
C_1 &= 1 \\
C_2 &= 1.2 \\
C_3 &= 1.99 \\
C_4 &= 2.98 \\
C_5 &= 3.92
\end{align*}
\]
17. TransTech is expected to pay no dividends for the next two years. After that, it will pay a dividend of $2 at the end of each of the next three years. Subsequent dividends are expected to grow at the rate of 5 percent per year for ever. If the investor’s required rate of return from this stock is 11 percent, what is the price of the stock today?

\[
\text{Price} = 2 \cdot \frac{1}{1.1} + 2 \cdot \frac{2.1}{1.1^2} + 2 \cdot \frac{2.1^2}{1.1^3} + \frac{2.1^3}{0.11 - 0.05} \\
\frac{3.5}{0.37}
\]

18. Scientific Games Inc. (SGI) is trying to estimate its optimal capital structure. Presently, SGI has a capital structure that consists of 100% equity. The risk-free rate is 6% and the market risk premium is 5%. Currently the company’s cost of equity, which is based on the CAPM, is 12% and its tax rate is 40%. What would be SGI’s estimated cost of equity if it were to change its capital structure to 50% debt and 50% equity?

Unlevered Beta: \( 12 = 6 + 8.5 \Rightarrow B = 1.2 \)

Hamada

Leased \( B = 1.2 \left( 1 + \left( \frac{1 - 40\%}{50\%} \right) \right) = 1.92 \)

\( r_s = 6\% + 1.92(5\%) = 15.6\% \)

19. Armagnac Corp. is trying to determine its optimal capital structure. Right now its debt/equity ratio is 1.0, and at this level the company estimates that its equity beta is 1.4. Armagnac’s CFO calculates that for debt/equity ratios of 0.667, 1.0, and 1.5, the corresponding pre-tax cost of debt is 6%, 8%, and 12% respectively. The risk-free rate is 4%, and the market risk premium is 6%. The firm’s tax rate is 40%.

\[
1.4 = B_a \left[ 1 + (1 - 40\%) \left( \frac{1}{1.5} \right) \right] \\
\Rightarrow B_a = 1.875 \\
1.6625 = 1.875 \left[ 1 + \left( \frac{1 - 40\%}{1.5} \right) \right]
\]

Question: The equity beta for the company at a debt/equity ratio of 1.5 is closest to?

Note: \( \frac{D}{E} = 1.5 \Rightarrow \frac{D}{E} = \frac{1.5}{1} \Rightarrow 2.5 = 1.5 + 1 \)

\( \therefore \frac{D}{TA} = \frac{1.5}{2.5} = .666 \) USe this for WACC calculation.
20. Stock A has an expected return of 20%, and stock B has an expected return of 4%. However, the risk of stock as measured by its variance is 3 times that of stock B. If the two stocks are combined equally in a portfolio, what would be the portfolio's expected return?

A) 4%
B) 12%
C) 20%
D) Greater than 20%
E) Need more information to answer

\[(15 \times 20) + (5 \times 4)\]

21. You can purchase an annuity that pays $1000 per year for 5 years. The first payment will be received exactly one year from today. If the interest rate is 8%, compounded quarterly, what is the most you would be willing to pay for the annuity (rounded to the nearest $)?

   a. $4,088
   b. $3,791
   c. $3,967
   d. $4,713
   e. $6,105

22. John starts to save money for his retirement. Beginning today he will deposit the same fixed amount each year for the next 20 years into a retirement savings account (i.e., he will make 20 equal annual deposits). Starting one year after making his final deposit, he will withdraw $100,000 annually for each of the following 10 years (i.e., he will make 10 withdrawals in all). Assume that the retirement fund earns 6% annually over both the period that he is depositing money and the period he makes withdrawals. In order for John to have sufficient funds in his account to fund his retirement, how much should he deposit annually (rounded to the nearest dollar)?

23. An investment pays $3,000 at the beginning of years 3, 6, 9, 12, 15, 18, 21, 24, 27, and 30 (i.e. 10 payments of $3,000 each). What is the PV as of today of these cash flows, if discounted at a nominal annual rate of 4% (rounded to the nearest $)? (6 points)
24. ABC Company just paid out a dividend of $2 and expects this dividend to grow indefinitely at a rate of x% per year. ABC has 100,000 shares outstanding with a current market price of $26 per share. ABC’s Beta is 1.5, the return on the market is 9%, and the risk-free rate is 3%.
   a) Calculate ABC’s required rate of return, based on the CAPM
   b) Calculate the growth rate x so that the market is in equilibrium (i.e., the CAPM-based return on ABC shares equals the Dividend-Growth-Model based return)

\[ 9 + 1.5(4 - 3) = 12\% \]

\[ 26 = \frac{2}{12\% - g} \]

\[ 3\times 12 - 26 = 2 + 2g \]

25. The fifth cash flow in the following cash flow stream is missing. If the future value at the end of year 7 (that is, at t = 7) of this cash flows stream is $6,193.69 at a nominal annual interest rate of 8 percent, compounded semiannually, what is the amount of the missing cash flow?

<table>
<thead>
<tr>
<th>End of year</th>
<th>Cash Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>500</td>
</tr>
<tr>
<td>2</td>
<td>500</td>
</tr>
<tr>
<td>3</td>
<td>700</td>
</tr>
<tr>
<td>4</td>
<td>700</td>
</tr>
<tr>
<td>5</td>
<td>???</td>
</tr>
<tr>
<td>6</td>
<td>900</td>
</tr>
<tr>
<td>7</td>
<td>900</td>
</tr>
</tbody>
</table>

\[ 8\text{nom} = 8\% \]

\[ \text{EFF} = 8.16 \]

1. NPV of Known assuming unKnown = 0 \[ \Rightarrow \text{NPV} = 8.16 \]

\[ = 3036.79 \]

2. PV of Missing  
\[ = 6193.69 - 3036.79 = 3157.11 \]

3. \[ \text{PV} = \frac{4673.29}{1.08^{1.5}} \]

\[ I = 8.16 \quad N = 5 \]

26. Fintrag Corp. has the following financing outstanding: (8 points)
   - 40,000 bonds with a 7% coupon, annually paid and compounded, principal = $1,000, price = 125%, 10 years maturity
   - 100,000 zerobonds, principal = $1,000, price = 50%, maturity = 15 years (use annual compounding for calculation of YTM)
   - 2,000,000 shares of common stock, price = $50, beta = 1.25

Additional information: Tax rate = 30%, Return on the market = 9%, risk-free rate = 3%
Calculate the following numbers: (show your calculations)
   a) The market value of total debt, expressed as a percentage of the total market value of [total debt + common stock] (in %, 1 decimal place)
   b) The average cost of debt (in %, 1 decimal place)
   c) The cost of common stock (in %, 1 decimal place)
   d) The company’s WACC (in %, 1 decimal place)
27. Viratech Inc. wants you to calculate the NPV of the following project: (14 points) The unit sales for a new product are:

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Sales</td>
<td>100,000</td>
<td>120,000</td>
<td>150,000</td>
<td>130,000</td>
</tr>
</tbody>
</table>

Production of the products will require $500,000 in NWC to start and additional NWC investments each year equal to 10% of the projected sales increase for the following year. Total fixed costs are $1,000,000 per year, variable production costs are $200 per unit, and the units are priced at $250 each. The equipment needed to begin production has an installed cost of $10 million, and qualifies for the 5-year MACRS category (20, 32, 19, 12, 11, 6%). In four years the equipment can be sold for 25% of its acquisition cost, and at that time NWC will revert to its initial before-project level. The company is in the 40% marginal tax bracket and has a required return on all its projects of 18%.

\[
\text{NPV} = 18\% = \frac{+1,136,278.00}{1} \text{ Accept} \]

\[
\begin{align*}
\text{Year} & \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \\
\text{Equipment} & \quad -10,000,000 \\
\text{NWC} & \quad -500,000 \\
\text{Revenue} & \quad 25,000,000 \\
\text{Fixed} & \quad 100,000 \\
\text{V.C.} & \quad -20,000,000 \\
\text{Depr} & \quad 2,000,000 \\
\text{EBIT} & \quad 20,000,000 \\
\text{Tax} & \quad 809,000 \\
\text{Net PAT} & \quad 12,000,000 \\
\text{Depr} & \quad 2,000,000 \\
\text{Op C.F.} & \quad 32,000,000 \\
\text{Salvage} & \quad +25,000,000 \\
\text{Net Cash Flow} & \quad 27,000,000 \\
\text{C1} & \quad 35,300,000 \\
\text{C2} & \quad 46,600,000 \\
\text{C3} & \quad 77,100,000 \\
\text{C4} & \\
\text{Year 3 - NWC both 0 and -500,000 accepted. NWC affects only balance sheet, there for no tax adjustment.} \\
\end{align*}
\]