MBA 8135 - Corporate Finance  
CUMULATIVE FINAL EXAM - Summer 2009  
August 1, 2009

Name (please print)__________________________

Instructor: Hodges

PART I: MULTIPLE CHOICE – Choose the letter of the most correct answer for each question. Record only one answer per question. (4 pts each)

1) Which of the following statements is incorrect:
   a. Usually each share of a corporation’s stock entitles the holder to one vote per share on matters requiring a vote.
   b. Partnerships are subject to double-taxation.
   c. Partnership units are subject to substantial restrictions on transferability, and there is usually no established trading market for partnership units.
   d. General partners are personally liable for obligations of the partnership.
   e. Partnerships are not taxable, partners pay personal taxes on partnership profits.

2) You took out a 30-year mortgage for $150,000 exactly 5 years ago (i.e. you just made your 60th payment). The loan had an nominal annual interest rate of 6% with monthly payments. Assuming all of your payments have been made on-time, your loan balance after the 60th payment is closest to?
   a. $120,000
   b. $125,000
   c. $130,000
   d. $135,000
   e. $140,000

3) Same initial situation like before: You took out a 30-year mortgage for $150,000 exactly 5 years ago (i.e. you just made your 60th payment). The loan had a nominal annual interest rate of 6% with monthly payments. Assuming all of your payments have been made on-time, how much of your next payment will go towards interest?
   a. $139.58
   b. $697.91
   c. $201.41
   d. $899.12
   e. $449.66

4) 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 next $)?
   a. $4,088
   b. $3,791
   c. $3,967
   d. $4,713
   e. $6,105
5) 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)?

a. $18,876  

b. $19,600  

c. $20,008  

d. $21,209  

e. $21,801

6) A fixed coupon bond with par value of $1,000 pays a fixed coupon of $30 every six months. The current annual nominal market interest rate (yield to maturity) for this bond is 5.2 percent. Therefore the bond is selling:

a. at a discount  

b. at a premium  

c. at par value.  

d. below the market price  

e. above the market price

7) Three years ago an investor purchased a zero coupon bond with a remaining maturity of 18 years at a price of (at that time) 36%. Today, i.e. three years after the purchase, the investor realizes that the zero coupon bond has exactly the same YTM like it had three years ago (i.e. at the time of purchase). Based on this information, which of the following answers is correct:

a. The price of the zero coupon bond today is still 36% X  

b. Overall, the profit for the investor from this investment over the three years is Zero X  

c. The zero coupon bond will be paid back 15 years from today at a price of 36% X  

d. If the investor held the zero coupon bond until maturity, the overall return from this investment over the 18 years would be 36% X  

e. None of the above answers is correct

8) Which of the following would cause the price of a constant growth dividend stock to increase?

a. A decrease in the expected growth rate of the firm’s future dividends X  

b. A decrease in the dividend expected to be paid one year from today X  

c. A decrease in the discount rate.✓  

d. Both a and b will cause the price of the stock to increase.  

e. All of the above would cause the price of the stock to increase

9) Which of the following statement is correct?

a. A well diversified portfolio diversifies essentially all market risk of a stock. ✓  

b. A well diversified portfolio diversifies essentially all risk of a stock. X  

c. A well diversified portfolio diversifies essentially all firm-specific risk of a stock. ✓  

d. A well diversified portfolio guarantees that you will receive at least the risk-free rate. X  

e. A well diversified portfolio maximizes the ratio of firm-specific risk to market risk. X
10) A portfolio consists of two stocks (stock GGG and stock HHH) with the following characteristics:

<table>
<thead>
<tr>
<th>Stock</th>
<th>GGG</th>
<th>HHH</th>
</tr>
</thead>
<tbody>
<tr>
<td>$40</td>
<td>$120</td>
<td></td>
</tr>
<tr>
<td>1200</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>7%</td>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>15%</td>
<td>25%</td>
<td></td>
</tr>
</tbody>
</table>

\[
\text{Correlation (GGG, HHH) } = -0.6
\]

The standard deviation of the portfolio is closest to:

(a) 12.4%
(b) 16.2%
(c) 14.4%
(d) 21.0%

11) Stock U has a beta of 1.5, and stock V has a beta of 0.8. A portfolio consists of $3 million invested in stock U and $2 million invested in stock V. The risk-free rate is 2% and the market risk premium is 6%. Which of the following answers is correct:

a. Stock U must have the higher standard deviation of its returns that stock V
b. Based on the CAPM, the required rate of return on stock V must be higher than the required rate of return on stock U

c) The beta of the portfolio is less than 1.5
d. The portfolio’s standard deviation will be higher than the standard deviation of stock U and also higher than the standard deviation of stock V
e. None of the above answers is correct

\[
\sigma^2 = \frac{3}{5} \cdot 1.5^2 + \frac{2}{5} \cdot 0.8^2
\]

12) Comparing two otherwise equal firms, the cost of debt of a levered firm will be .......... the cost of debt of an unlevered firm.

(a) equal to
(b) significantly less than
(c) slightly less than
(d) greater than
e. exactly double

13) Barcamare Inc. is trying to estimate its optimal capital structure. Presently, the company has a capital structure that consists of 100% equity. The risk-free rate is 3% and the market risk premium is 8%. Currently the company’s cost of equity, which is based on the CAPM, is 9% and its tax rate is 30%. If Barcamare were to change its capital structure to 40% debt and 60% equity, the company’s estimated cost of equity would be closest to

(a) 9%
(b) 10%
(c) 11%
(d) 12%
e. 13%

\[
\beta_{\text{leverage}} = \beta_{\text{unlevered}} \left[ \frac{1 + (1 - t) \frac{D}{E}}{\left(1 + \frac{D}{E}\right)^2} \right]
\]

\[
\beta_{\text{leverage}} = \beta_{\text{unlevered}} \left[ 1 + \left(1 - \frac{D}{E}\right) \frac{40}{60} \right]
\]

\[
\beta_{\text{leverage}} = \beta_{\text{unlevered}} \left[ 1 + \frac{1}{1.4} \right]
\]

\[
\left(1 + \left(1 - \frac{D}{E}\right) \frac{40}{60} \right)
\]
PART II: PROBLEMS – solve each of the following problems. Show your work in the space provided for possible partial credit. Circle your final numerical answer.

14) 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)

\[
P = \frac{3000}{(1.04)^2} + \frac{3000}{(1.04)^5} + \frac{3000}{(1.04)^8} + \frac{3000}{(1.04)^{11}} + \frac{3000}{(1.04)^{14}} + \frac{3000}{(1.04)^{17}} + \frac{3000}{(1.04)^{20}} + \frac{3000}{(1.04)^{23}} + \frac{3000}{(1.04)^{26}} + \frac{3000}{(1.04)^{29}}
\]

\[
P = \frac{3000}{1.0816} + \frac{3000}{1.2167} + \frac{3000}{1.3686} + \frac{3000}{1.5395} + \frac{3000}{1.7317} + \frac{3000}{1.9495} + \frac{3000}{2.1911} + \frac{3000}{2.4627} + \frac{3000}{2.7732} + \frac{3000}{3.1166}
\]

\[
P = 2793.67 + 2465.69 + 2192.02 + 1945.68 + 1732.40 + 1540.17 + 1369.18 + 1217.19
\]

\[
= 21728.15
\]

15) 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

\[
\text{Exp. return} = RF + \beta \times (\text{mkt. ret.} - RF)
\]

\[
= 0.03 + 1.5 \times (0.09 - 0.03)
\]

\[
= 0.03 + 0.09
\]

\[
= 0.12 \Rightarrow 12\%
\]

b) 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)

\[
\text{Exp. return} = \frac{D_1}{P_0} + g = \frac{D_0 (1+g)}{P_0} + g = 0.12
\]

\[
\frac{2.00 (1+g)}{26} + g = 0.12
\]

\[
\frac{2.00 (1+g)}{26} = 0.12 - g
\]

\[
2 + 2g = 3.12 - 26g
\]

\[
28g = 3.12
\]

\[
g = 0.11
\]
16) 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? (6 points)

<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>

\[ FV_7 = \frac{900}{(1.04)^7} = 515.80 \]

\[ FV_6 = 900 \times (1.04)^6 = 1169.92 \]

\[ 6,193.69 - 515.80 = FV_5 = 935.89 \]

\[ 935.89 = x \times (1.04)^4 \times 1.1699 \]

\[ x = \frac{935.89}{1.1699} = 799.27 \]

17) You know the following characteristics of stocks X and Y and a portfolio consisting of 80% invested in stock X and 20% invested in Stock Y:

\[ \text{Exp. } R_{P} = w_x R_x + w_y R_y \]

<table>
<thead>
<tr>
<th></th>
<th>Standard Deviation of returns</th>
<th>Beta</th>
<th>CAPM-based required rate of return, if risk-free rate = 3%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock X</td>
<td>12%</td>
<td>0.75</td>
<td>7.5%</td>
</tr>
<tr>
<td>Stock Y</td>
<td>18%</td>
<td>1.5</td>
<td>12%</td>
</tr>
<tr>
<td>Portfolio</td>
<td>10.9%</td>
<td>0.9</td>
<td>8.4%</td>
</tr>
</tbody>
</table>

The correlation between the returns of stock X and stock Y is 0.2. Calculate the four missing numbers (required return stock Y, three numbers for the portfolio). (8 points)

\[ \text{Exp. } R_x = R_f + \beta_x (\mu_{market} - R_f) \]

\[ \beta_x = 0.75 \]

\[ \text{Exp. } R_y = R_f + \beta_y (\mu_{market} - R_f) \]

\[ \beta_y = 0.25 \]

\[ \sigma_p^2 = \sigma_x^2 + \sigma_y^2 + 2 \rho_{xy} \sigma_x \sigma_y \]

\[ \rho_{xy} = 0.2 \]

\[ \sigma_p^2 = 0.03^2 + 0.03^2 + 2 \times 0.2 \times 0.03 \times 0.03 = 0.00012 + 0.000009 + 0.000018 = 0.000147 \]

\[ \sigma_p = \sqrt{0.000147} = 0.01214 \]

\[ \sigma_x = 0.003 \times 0.75 \]

\[ \sigma_y = 0.003 \times 1.5 \]

\[ \sigma_x = 0.00225 \]

\[ \sigma_y = 0.0045 \]

\[ \sigma_p = \sqrt{0.000147} = 0.01214 \]
18) Fintrag Corp. has the following financing outstanding: (8 points)

- 40,000 bonds with an 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)

b) YTM on 7% bonds: \( n = 16 \), \( PV = 1250 \), \( PMT = 70 \), \( FV = 1000 \)

\[ \text{YTM} = 3.93\% \]

YTM on zeros: \( n = 15 \), \( PV = 500 \), \( PMT = 0 \), \( FV = 1000 \)

\[ \text{YTM} = 4.73\% \]

\[ K_D = W_7\% \text{ Bonds} \cdot \text{YTM} + W_\text{zeros} \cdot \text{YTM} \]

\[ = .5 \cdot 0.0393 + .5 \cdot 0.0473 \]

\[ = 0.1965 + 0.2365 \]

\[ = 0.433 = \boxed{\text{4.3}\%} \]

\[ K_{\text{After tax}} = 0.433 \cdot (1 - 0.3) = 0.303 \]

\[ = \boxed{\text{3.0}\%} \]

c) \( K_S = RF + \beta \cdot (\text{YTM} - RF) \)

\[ K_S = 0.03 + 1.25 \cdot (0.09 - 0.03) \]

\[ = 0.03 + 1.25 \cdot 0.06 \]

\[ = 0.03 + 0.075 = \boxed{0.105 = 10.5\%} \]

d) \( WACC = W_D \cdot K_D + W_B \cdot K_B \cdot (1 - T) \)

\[ = 0.433 \cdot 0.105 + 0.5 \cdot 0.065 \cdot (1 - 0.30) \]

\[ = 0.0452 + 0.01505 \]

\[ = 0.06025 = \boxed{6.025\%} \]
19) 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. 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 costs, 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%.

Feel free to use the matrix on the following page.

**Initial cash flows**

\[
\begin{align*}
-10,000,000 & \quad \text{equipment} \\
-500,000 & \quad \text{NWC} \\
\hline
-10,500,000 & \quad t = 0
\end{align*}
\]

**Terminal cash flows**

\[
\begin{align*}
+500,000 & \quad \text{recover NWC} \\
+2,500,000 & \quad \text{salvage equip.} \\
-320,000 & \quad \text{taxes on salvage} \\
\hline
+2,680,000 & \quad t = 4
\end{align*}
\]

**Book value of equipment at salvage**

\[
\begin{align*}
10,000,000 & \times 0.17 = 1,700,000 \\
2,500,000 & \times 0.70 = 1,700,000 \\
320,000 & \times 0.40 = 128,000 \\
\hline
2,238,000 & \quad \text{tax} = 0.90 \times 2,238,000 = 2,014,200
\end{align*}
\]

\[
\begin{align*}
t = 1
\end{align*}
\]

\[
\begin{align*}
\$250 & \times 100,000 = 25,000,000 \text{ revenues} \\
\$800 & \times 100,000 = 80,000,000 \text{ var. costs} \\
1,000,000 & \times 1,000,000 \text{ fixed costs} \\
10,000,000 & \times 0.20 = 2,000,000 \text{ depreciation} \\
\hline
\$730,000,000 & \text{ t = 1 revenue} \\
\end{align*}
\]

\[
\begin{align*}
t = 2
\end{align*}
\]

\[
\begin{align*}
\$250 & \times 170,000 = 42,500,000 \text{ revenues} \\
\$800 & \times 170,000 = 136,000,000 \text{ var. costs} \\
1,000,000 & \times 1,000,000 \text{ fixed costs} \\
10,000,000 & \times 0.37 = 3,800,000 \text{ depreciation} \\
\hline
\$265,900,000 & \text{ t = 2 revenue}
\end{align*}
\]

\[
\begin{align*}
t = 3
\end{align*}
\]

\[
\begin{align*}
\$250 & \times 150,000 = 37,500,000 \text{ revenues} \\
\$800 & \times 150,000 = 120,000,000 \text{ var. costs} \\
1,000,000 & \times 1,000,000 \text{ fixed costs} \\
10,000,000 & \times 0.19 = 1,900,000 \text{ depreciation} \\
\hline
\$187,000,000 & \text{ t = 3 revenue}
\end{align*}
\]

\[
\begin{align*}
t = 4
\end{align*}
\]

\[
\begin{align*}
\$250 & \times 130,000 = 32,500,000 \text{ revenues} \\
\$800 & \times 130,000 = 104,000,000 \text{ var. costs} \\
1,000,000 & \times 1,000,000 \text{ fixed costs} \\
10,000,000 & \times 0.17 = 1,700,000 \text{ depreciation} \\
\hline
\$107,000,000 & \text{ t = 4 revenue}
\end{align*}
\]

\[
\begin{align*}
t_1 & : \text{REV - COSTS - DEPR} \\
275,000,000 & - 7,000,000 - 1,900,000 = 25,000,000 \\
\hline
268,000,000 & \text{taxes} = 0.40 \times 268,000,000 = 107,200,000 \\
\hline
260,800,000 & \text{after-tax cashflows} = 260,800,000 - 107,200,000 = 153,600,000
\end{align*}
\]

\[
\begin{align*}
t_2 & : \text{REV - COSTS - DEPR} \\
30,000,000 & - 24,000,000 - 1,800,000 = 4,200,000 \\
\hline
4,400,000 & \text{taxes} = 0.40 \times 4,400,000 = 1,760,000 \\
\hline
2,640,000 & \text{after-tax cashflows} = 2,640,000 - 1,760,000 = 880,000
\end{align*}
\]

\[
\begin{align*}
t_3 & : \text{REV - COSTS - DEPR} \\
37,500,000 & - 30,000,000 - 1,000,000 = 7,500,000 \\
\hline
9,400,000 & \text{taxes} = 0.40 \times 9,400,000 = 3,760,000 \\
\hline
5,640,000 & \text{after-tax cashflows} = 5,640,000 - 3,760,000 = 1,880,000
\end{align*}
\]

(continued on creative page)
<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>

| Price/unit | $250 | Tax Rate | 40% |
| VC/unit    | $200 | Req. return | 18% |
\[ \text{CF}_0: \quad -10,500,000 \]

\[ \text{CF}_1: \quad +25,000,000 \quad \text{rev} \]
- 20,000,000  
- 1,000,000  
- 500,000  
\[ +3,200,000 \]

\[ \text{CF}_2: \quad +30,000,000 \quad \text{rev} \]
- 24,000,000  
- 1,000,000  
- 720,000  
\[ +9,280,000 \]

\[ \text{CF}_3: \quad +33,300,000 \quad \text{rev} \]
- 30,000,000  
- 1,000,000  
- 1,830,000  
\[ +4,660,000 \]

\[ \text{CF}_4: \quad +2,680,000 \quad \text{terminal cash flow} \]
+ 22,500,000  
- 26,000,000  
- 1,000,000  
- 1720,000  
\[ +64,600,000 \]

Discounted at 18%.

\[ \text{NPV} = +1,458,109.77 \]