F371 – Financial Management

Final Exam information

There will be 20 to 25 multiple-choice questions on the Final Exam. Questions will be both calculation problems and concept questions.

Approximately three-fourths of the exam will be based upon the new material: CAPM and beta, security market line, geometric average, weighted averages, diversification, and WACC. Then about one-fourth of the exam will be on TVM, NPV and the key points of other material covered on the first two exams.

You should focus your studying on the following types of problems:

- **TVM**: Calculating **EAR**, **FV**, **PV**, interest rates, **APR**, payments
- Stock valuation: Computing a stock price with the growing perpetuity equation
- Bonds: Solving for a bond price, **YTM** on semiannual bonds
- Capital budgeting criteria: Basic calculations of **OCF**, **NWC** and capital spending cash flows, and computing **NPV** and **IRR** from a given set of cash flows
- Return calculations: Geometric average, arithmetic average, portfolio weighted average return
- Portfolio investment theory: Diversification and portfolio risk, systematic risk and beta, computing a weighted average beta
- CAPM and the security market line: Calculating the CAPM return, using the CAPM and the SML to make an accept-reject decision on a given project
- **WACC**: Computing a weighted average cost of capital, how a project’s risk should affect the discount rate used for that project

The best way to study for the exam is to review and repeatedly rework practice problems from the most recent homework and quizzes, and work the Final Exam practice problems provided below (answers shown in italics). Problem 34 is a good WACC practice problem, and the detailed solution is shown on the last page of this document.
1. What is the rate of return on the following portfolio?

<table>
<thead>
<tr>
<th>Asset</th>
<th>Investment</th>
<th>Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$200</td>
<td>-8%</td>
</tr>
<tr>
<td>B</td>
<td>$300</td>
<td>10%</td>
</tr>
<tr>
<td>C</td>
<td>$500</td>
<td>15%</td>
</tr>
</tbody>
</table>

*Weighted average return = 8.9%*

2. Consider the securities below.

<table>
<thead>
<tr>
<th>Security</th>
<th>Std. Dev.</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>10%</td>
<td>1.4</td>
</tr>
<tr>
<td>Y</td>
<td>14%</td>
<td>0.9</td>
</tr>
<tr>
<td>T-bills</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

Which security has the most total risk?

*Y – higher standard deviation*

Which security has the most systematic risk?

*X – higher beta*

3. Suppose you form a portfolio from the securities in Question 2. Your portfolio consists of 60% in X, 30% in Y, and 10% in T-bills. If the expected return on the market is 13%, and the T-bill return is 5%, what would the expected return on your portfolio be?

*13.88%*

4. A firm has 2,000,000 shares of common stock outstanding with a market price of $2 per share. The firm also has 2,000 bonds outstanding with a market value of $1,200 per bond. The bonds have a 10% coupon rate (semiannual coupons) and mature in 15 years. The firm’s beta is 1.2, the T-bill rate is 5%, and the market risk premium is 7%. If the tax rate is 34%, what is the WACC?

*10.28%*

5. Over the last three years, the price of a certain stock has gone up and down a great deal. At the beginning of the first year the price was $80 per share. At the beginning of the second year, the price was $100. At the beginning of the third year, the price was $60. At the end of the third year, the price was $69. Compute the arithmetic average of the three annual rates of return. What was the geometric average rate of return?

*Arithmetic average = 0%*  
*Geometric average = −4.81%*
6. Dietz Oil’s last dividend was $3.00. Over the next three years, dividends are projected to grow at a rate of 7% per year, after which they will grow at a constant rate of 4%, forever. If the T-bill rate is 5%, the market risk premium is 8%, and Dietz Oil’s beta is .875, what should the stock sell for?

\[ D1 = 3.21 \]
\[ D2 = 3.43 \]
\[ D3 = 3.68 \]
\[ D4 = 3.82 \]

\[ Perp \ value \ at \ Year \ 3 = \frac{3.82}{r - g} \]

\[ r = .05 + .875(.08) \]
\[ = 0.12 \]

\[ Price = $42.20 \]

7. What is the IRR of an investment that costs $77,500 and pays $27,500 a year for 4 years?

15.64%

8. You own a portfolio equally invested in a risk-free asset and two stocks. If one of the stocks has a beta of 1.6 and the total portfolio is equally as risky as the market, what must the beta be for the other stock in your portfolio?

\[ \beta = 1.4 \]

9. An all equity firm is considering the following projects:

<table>
<thead>
<tr>
<th>Project</th>
<th>Beta</th>
<th>Predicted Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>.60</td>
<td>11%</td>
</tr>
<tr>
<td>X</td>
<td>.85</td>
<td>13%</td>
</tr>
<tr>
<td>Y</td>
<td>1.20</td>
<td>15%</td>
</tr>
<tr>
<td>Z</td>
<td>1.50</td>
<td>19%</td>
</tr>
</tbody>
</table>

The current rate on the appropriate Treasury securities is 5%, and the expected return on the market is 14%. The firm is considering using a 14% hurdle rate to accept or reject new projects.

a. Which projects have a higher expected return than the firm’s 14% hurdle rate?
b. Which projects are underpriced, given their individual predicted returns?
c. Which projects should be accepted?
d. Which projects would be incorrectly accepted or rejected if the firm’s hurdle rate is used as the decision rule?
a. Y and Z  
b. W, X, and Z  
c. W, X and Z  
d. W and X would be incorrectly rejected. Y would be incorrectly accepted.

10. The forecast for your division for next year is sales revenue of $250,000, but interest expense will be $9,000. Operating expenses will be $195,000 in variable costs and $35,000 in fixed costs. Depreciation expense will be $18,000. If the applicable tax rate is 39%, what is the forecast OCF for next year?

$19,220

11. The returns on Midwest Control Product’s stock for the last 7 years have been:  
12%, 5%, -23%, -6%, 18%, 9%, and 11% per year.
What is the arithmetic average return on the stock?  
What is the geometric average return?  
If you purchased the stock 7 years ago for $47.50, what is the stock worth today?

Average return = 3.714%  
Geometric average = 2.82%  
Price today = $57.72

12. Given the following information:

<table>
<thead>
<tr>
<th>Security</th>
<th>Return</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>15%</td>
<td>1.2</td>
</tr>
<tr>
<td>Y</td>
<td>12%</td>
<td>0.9</td>
</tr>
<tr>
<td>Risk-free</td>
<td>5%</td>
<td>?</td>
</tr>
</tbody>
</table>

What is the portfolio beta if you invest 30% in X, 30% in Y, and 40% in the risk-free asset?

$\beta = 0.63$

13. Friendly Freddy’s Used Cars will sell you a 1989 Ford Ranger truck for $3000 with no money down. You agree to make weekly payments of $40 for 2 years, beginning one week after you buy the car. What is the EAR of the loan?

_Hint: First compute the rate per week for the weekly payments. Then convert that weekly rate to an annual rate (EAR)._  

$EAR = 40.94\%$
14. Suppose Firm X is considering a new project. The risk-free rate is 8% and the market risk premium is 8.5%. According to the CAPM, which of the following independent projects should be accepted? Be sure to explain why.

\[ \begin{array}{ccc}
\text{Proj.} & \text{Beta} & \text{Predicted IRR} \\
I & 0.65 & 12\% \\
II & 0.90 & 17\% \\
III & 1.40 & 19\% \\
\end{array} \]

Reject project I \[ R_{\text{capm}} = 13.53\% \]
Accept project II \[ R_{\text{capm}} = 15.65\% \]
Reject project III \[ R_{\text{capm}} = 19.9\% \]

15. McIver's Meals, Inc. currently pays a $1.00 annual dividend. Investors believe that the firm (and dividends) will grow at 15% next year, 10% annually for the two years after that, and 5% annually thereafter. Assume the required return is 10%. What is the current market price of the stock?

Current price = $25.09

16. Given the following information, what is Angus Corporation's weighted average cost of capital (WACC)?

Common Stock: 2 million shares outstanding at $30 per share; stock beta = 0.5

Bonds: 80,000 bonds outstanding
$1,000 face value for each bond
7% semiannual coupon
10 years to maturity
Selling at 108.25% of face value

Market risk premium: 7%
Risk free rate: 5%
Tax rate: 34%

\[ WACC = 5.78\% \]

17. Your monthly mortgage payment on a 30-year mortgage with a rate of 8.3% compounded monthly is $1100. How much did you borrow?

\[ PV = $145,736.95 \]
18. As vice president of your firm, you must make a decision about whether to invest in a proposed new project. The initial investment would be $1 million. It’s a five-year project, and the forecast cash flows for the five years are:

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-15,000</td>
</tr>
<tr>
<td>2</td>
<td>50,000</td>
</tr>
<tr>
<td>3</td>
<td>225,000</td>
</tr>
<tr>
<td>4</td>
<td>500,000</td>
</tr>
<tr>
<td>5</td>
<td>600,000</td>
</tr>
</tbody>
</table>

Your company has no debt, so your cost of capital is equal to your cost of equity. The company’s beta is 0.75. If the risk-free rate is 4% and the market risk premium is 6%, should this project be accepted? Use the NPV rule to justify your answer.

\[
\text{Cost of equity} = 4\% + 0.75(6\%) = 8.5\%
\]

NPV at a discount rate of 8.5% is $-35,383.

NPV is negative. Reject that miserable project.

19. A stock has an expected return of 13%, the risk-free rate is 7%, and the market risk premium is 8%. What must the beta of this stock be?

\[\beta = 0.75\]

20. To save for my retirement, I have a tax-deferred Individual Retirement Account (IRA) (i.e., I pay no taxes on the money earned until I retire). I currently have $25,000 in this account. I have 25 years until I retire, and I anticipate an average 10% per year return on the account. If I want to have $1 million at retirement in 25 years, what are the equal payments I must make each year into my IRA over the next 25 years?

\[\text{PMT} = $7413.87\]

21. Suppose Kellogg’s issues a bond today with a $1000 face value and a coupon rate of 8%. If the bond has a life of 15 years, makes coupon payment semiannually and has a yield to maturity of 9%, what will the bond sell for today? Suppose one year after the bonds are issued, interest rates fall from 9% to 8%. What will happen to the price of the bond?

\[\text{Price of bond today} = $918.56\]
\[\text{Price next year} = $1000\]

22. A share of a certain stock is priced today at $25. The most recent dividend was $1.75, and dividends are expected to grow at a rate of 5% indefinitely. What must be the required return on the stock?

\[R = 12.35\%\]
23. Suppose you purchase 100 shares of stock at a price of $60 per share. One year later, the
shares are selling for $55. In addition, a dividend of $3 per share is paid at the end of the
period. What was the total percentage return on this investment?

\[ Return = -3.33\% \]

24. What is the expected return for the following portfolio?

<table>
<thead>
<tr>
<th>Stock</th>
<th>#Shares</th>
<th>Price/Share</th>
<th>E(R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>20</td>
<td>$30</td>
<td>20%</td>
</tr>
<tr>
<td>Y</td>
<td>20</td>
<td>$20</td>
<td>15%</td>
</tr>
<tr>
<td>Z</td>
<td>20</td>
<td>$25</td>
<td>18%</td>
</tr>
</tbody>
</table>

\[ E(R_p) = 18\% \]

25. Entling, Inc. just paid a dividend of $3. Dividends are expected to grow at a rate of 6% for
the next 2 years, and then at a rate of 3% forever. If Entling, Inc. has a beta of 0.8, the T-bill
rate is 5.4%, and the expected market risk premium is 7%, what is the price of Entling’s stock
today?

\[ Price = $40.82 \]

26. You own a portfolio that has $600 invested in stock A and $1,200 invested in stock B. If the
expected returns on these stocks are 13 percent and 22 percent respectively, what is the
expected return on the portfolio?

\[ E(R_p) = 19\% \]

27. A portfolio is invested 20 percent in stock G, 60 percent in stock J, and 20 percent in stock K.
The expected returns on these stocks are 15 percent, 25 percent, and 35 percent, respectively.
What is the portfolio’s expected return?

\[ E(R_p) = 25\% \]

28. A stock has a beta of 1.2, the expected return on the market is 17%, and the risk-free rate is
8%. What must the expected return on this stock be?

\[ 18.8\% \]

29. A stock has an expected return of 17 percent, its beta is 0.9, and the risk-free rate is 7.5%.
What must the expected return on the market be?

\[ 18.06\% \]
30. All County Insurance, Inc. promises to pay Ted $1 million on his 65th birthday in return for a 
one-time payment of $75,000 today. (Ted just turned 25.) At what rate of interest would Ted 
be indifferent between accepting the company's offer and investing the premium on his own? 

6.69%

31. Stock Y has a beta of 1.8 and a predicted return of 16%. Stock Z has a beta of 0.7 and a 
predicted return of 11%. If the risk-free rate is 5% and the market risk premium is 7%, are 
these stocks correctly priced?

\[
\text{CAPM return for Y} = 5\% + 1.8(7\%) = 17.6\%
\]

Y plots below the SML. Its predicted return is below the market average return at that 
beta (CAPM). Its return is below the required return for that level of risk, so its price 
must be too high. Y is overpriced.

\[
\text{CAPM return for Z} = 5\% + 0.7(7\%) = 9.9\%
\]

Z plots above the SML. Its predicted return is above the market average return at that 
beta (CAPM). Its return is above the required return for that level of risk, so its price 
must be too low. Z is underpriced.

32. The Baby Bell Corporation’s common stock has a beta of 1.10. If the risk-free rate is 6 
percent and the expected return on the market is 13 percent, what is Baby Bell’s cost of 
equity?

\[
R_{\text{CAPM}} = 13.70\%
\]

33. As a securities analyst, you are trying to determine the cost of debt at Eli Lilly & Co. The 
firm has a bond issue outstanding with 12 years to maturity. The current price of the bonds is 
115 percent of face value. The issue makes semiannual payments and has a coupon rate of 
6.57 percent. What is Lilly’s pretax cost of debt, based on this bond? If the tax rate is 35%, 
what is the after-tax cost of debt?

\[
\text{Pretax cost} = 4.902\%; \quad \text{After-tax cost} = 3.19\%
\]

34. Independence Mining Corporation has seven million shares of common stock outstanding, 
and 100,000 8-percent semiannual bonds outstanding, par value $1,000 each. The common 
stock currently sells for $32.60 per share and has a beta of 1.3. The bonds have 15 years to 
maturity and sell for 93.1 percent of par. The market risk premium is 6.5 percent, 10-year 
Treasury bonds are yielding 4.7 percent, and Independence Mining’s tax rate is 34 percent.

a. What is the firm’s market value capital structure? (that is, what are the weights?)

b. If Independence Mining is evaluating a new investment project that has the same risk as 
the firm’s typical project, what rate should the firm use to discount the project’s cash 
flows?

See solution on page 10.
35. Indiana University has just revealed an innovative college education-financing plan for parents with small children (2 years old in this example). The plan allows parents to make a lump-sum contribution of $9,575.80 now to cover 4 years of level tuition payments starting 16 years from now. If the plan assumes an annual interest rate of 10%, what annual tuition does this plan imply?

*Hint: The payments begin in Year 16, so Time Zero of the 4-year annuity is Year 15. The lump-sum contribution must grow to the required amount by the end of Year 15.*

*Assumed annual tuition = $12,618.99*

36. Modigliani Manufacturing has a target debt-to-equity ratio of 25%. In other words, the market value of debt should be 25% of the market value of equity. Its cost of equity is 16% and its cost of debt is 9%. If the tax rate is 34%, what is Modigliani’s WACC?

\[
Debt\text{-to}\text{-equity ratio} = 0.25. \text{Debt in that ratio = .25 and equity = 1.} \\
\text{Therefore, the total is 1.25. Weight of debt = 0.25 / 1.25 = 0.20.} \\
\text{Weight of equity = 1 / 1.25 = 0.80.} \\
\text{WACC} = (.8 \times 16\%) + (.2 \times 9\% \times .66) = 13.99\%
\]

37. A certain stock has a beta of 1.20 and an expected return of 11.8%. Treasury bills, a risk-free asset, have an expected return of 3.8%. If a portfolio of these two assets has an expected return of 11%, what will be the beta of that portfolio?

*Hint: From the information about the stock, you can compute the market risk premium. With that MRP, use the CAPM to solve for the beta of the portfolio at an expected rate of return of 11%.*

\[
\text{Portfolio } \beta = 1.08
\]

38. Investment A and Investment B have standard deviations and betas as shown below. If these investments were being considered for addition to a portfolio, which investment would be riskier?

<table>
<thead>
<tr>
<th></th>
<th>Standard Deviation</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment A</td>
<td>13%</td>
<td>1.67</td>
</tr>
<tr>
<td>Investment B</td>
<td>19%</td>
<td>0.38</td>
</tr>
</tbody>
</table>

Although Investment B has more total risk (higher standard deviation), it has less systematic risk (lower beta). Thus, Investment B must have more unsystematic risk, but unsystematic risk can be diversified away in a portfolio. The greater amount of systematic risk with Investment A cannot be diversified away. Therefore, Investment A is the riskier asset in a portfolio. Another way to see this is to compute the CAPM returns for each. Assume a reasonable value for \( R_f \) and for MRP. The CAPM return for Investment A will be much higher. Higher returns are associated with higher risk, so Investment A must be riskier.
### Solution to Final Exam Practice Problem 34

#### Given information:

**Common stock**
- Number of shares: 7,000,000
- Current price per share: $32.60
- beta: 1.30

**Bonds**
- Number of bonds: 100,000
- Par value: $1,000
- Years to maturity: 15
- Coupon rate (semiannual): 8%
- Current price (percent of par): 93.1

**Other rates**
- Yield on 10-yr Treasury bonds: 4.7%
- Market risk premium: 6.5%
- Firm's tax rate: 34%

#### Step 1: Determine the weights
- Market value of equity (E) = $228,200,000
- Market value of debt (D) = $93,100,000
- Total market value (V) = $321,300,000
- Weight of equity (E/V) = 0.71
- Weight of debt (D/V) = 0.29

#### Step 2: Cost of equity

Use CAPM

\[
\text{Cost of equity} = R_f + \beta (\text{market risk premium})
\]

1.30

#### Step 3: Cost of debt

Yield or interest rate on the firm's debt

Compute yield to maturity on the bonds:

<table>
<thead>
<tr>
<th>N</th>
<th>I/Y</th>
<th>PV</th>
<th>PMT</th>
<th>FV</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>?</td>
<td>-931.00</td>
<td>40</td>
<td>1,000</td>
</tr>
<tr>
<td>4.42%</td>
<td>x2</td>
<td>YTM = 8.84%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Step 4: Compute WACC

\[
\text{WACC} = (\text{weight of equity} \times \text{cost of equity}) + (\text{weight of debt} \times \text{cost of debt} \times (1 - \text{tax rate}))
\]

11.03%