

Notes: 1) If a problem asks you to “set up the calculations needed to determine...” then all points are earned for writing down the appropriate equations and plugging in the appropriate numbers. Calculations do not affect your grade. All other problems will require some calculations to solve them and final answers may be worth a few points.
2) Throughout the exam, an annuity or perpetuity may have constant, growing, or shrinking cash flows.

Short Answer (15 points each)

For short-answer questions 1 through 8, assume that when your boss asked you to check some calculations done by a new hire you found an error (or errors) in the variables the new hire used. Use words not symbols in your answers.

1. Assume your corrections increased the future value of an annuity. Which of the variables might you have reduced?
2. Assume your corrections increased the effective annual interest rate on a bank account. Which of the variables might you have increased?
3. Assume your corrections reduced the real interest rate. Which of the variables might you have increased?
4. Assume your corrections increased free cash flow and unlevered net income two years from today. Which variables might you have reduced?
5. Assume that you have switched from straight-line depreciation to MACRS depreciation. How will the change affect the project's unlevered net income over its life?
6. Assume your corrections reduce the standard deviation of a portfolio. Which variables might you have increased?
7. Assume markets are perfect, that the firm is currently unlevered, and that the new hire has calculated the expected return on the stock were the firm to issue debt and repurchase common shares. Your corrections increased the expected return on the firm's stock after the debt issue. Which variables might you have increased?
8. Assume your corrections reduced the value of a put. Which variables might you have increased?
9. Assume that when you set the Black-Scholes value of Airbus stock equal to its market value of \$500 million, you find that d_1 equals 1.1405 and that d_2 equals -0.0648. Airbus's bonds mature for \$485 million five years from today and have a current market value of \$300 million. If the beta of Airbus's unlevered equity equals 0.6, set up the calculations needed to determine the beta of Airbus's bonds.
10. In a graph show how the portfolios you can achieve change if you hold only long positions in three assets and the standard deviation of returns on each asset falls by 2%. Note: Be sure to clearly identify “before” and “after” the change.

Problems (75 points each)

1. Assume that Sysco's stock price currently equals \$37.62 and that you can buy or sell options that expire on 2/21 (65 days from today) with a strike price of \$40. The price of the call equals \$0.40 and the price of the put equals \$2.96. Assume also that you can buy or sell U.S. Treasuries with returns that vary by maturity as follows (all less than 1% per year): 12/19 = 0.020%, 1/23 = 0.0005%, 2/13 = 0.020%, 2/20 = 0.025%, 2/27 = 0.030%. What transactions will create an arbitrage profit today? Show that the conditions of arbitrage are met if Sysco's stock price ends up at \$35 and if its stock price ends up at \$45 when the option expires.

Use the following information to answer questions 2 and 3 below.

Skybound Farms is considering whether or not to build a new processing facility on land it purchased three years ago for \$10 million and which could be sold today for an after-tax cash flow of \$11 million. Based on the architect's plans which were delivered this morning, the new facility could be built for \$150 million (a single payment today to the contractor). The payment of \$1 million for the plans is due today and will be a tax-deductible expense for the firm. If built, the new facility would produce its first net, after-tax cash flow of \$8 million ten months from today. Subsequent cash flows would occur semiannually thereafter through nine years and four months from today and would shrink by 1% each. Building the facility would increase the firm's net working capital today by \$3 million but would not change over the life of the project. Skybound's marginal tax rate equals 35%.

The facility can be expanded at any time over the next three years at a cost of \$75 million. This expansion would be expected to produce five years of additional cash flow of \$15 million per year with the first cash flow occurring one year after the expansion. The facility can also be sold at any time over the next year for \$125 million.

The beta of the project is 0.9 and of the expansion is 1.1. This compares to an overall beta of the firm of 0.8. The standard deviation of returns on the project over its life equals 35%, but equals 43% over the next year. The standard deviation of returns on the expansion over its life equals 51% but equals 58% over the next three years. The market risk premium equals 6% and the risk-free rate per year varies by maturity as follows: 1-year = 0.15%, 2-year = 0.31%, 3-year = 0.65%, 4-year = 1.07%, 5-year = 1.46%, 6-year = 1.86%, 7-year = 2.11%, 8-year = 2.27%, 9-year = 2.47%, 10-year = 2.79%, 15-year = 3.32%, 20-year = 3.99%.

2. Set up the calculations needed to determine the net present value of the project excluding any options.
3. Set up the calculations needed to determine how the possibility of expanding the facility affects the net present value of the project.
4. Budget Deal Inc. has a current stock price of \$50 and over each of the next two years, Budget's stock price is expected to rise by 10% or fall by 5% per share. The risk-free rate equals 1.5% and is not expected to change. Assume you want to build and maintain a portfolio that behaves like a put on Budget's stock that has a strike price of \$55 and which expires two years from today. What trades would be required one year from today to rebalance your portfolio if Budget's stock price rises in the first year?
5. Assume there is a 20% chance that GM (Governmentless Motors) will earn \$100 million, a 25% chance that GM will earn \$250 million, a 40% chance that GM will earn \$400 million, and a 15% chance that GM will earn \$650 million. Assume the corporate tax rate equals 35%, the personal tax rate on equity income equals 18%, and the personal tax rate on interest income equals 27%.
 - a. Determine GM's tax-optimal leverage. Note: calculations required.
 - b. Would the presence of conflicts between stockholders and managers tend to raise or lower GM's optimal leverage (compared to your answer in part "a")? Note: no justification or calculations needed.
6. Based on the following information, set up the calculations needed to determine the beta and required return on Boeing (BA). Assume that the risk-free interest rate equals 2.8% and that you expect the return on the market to equals 8% going forward.

Return on:

<u>Year</u>	<u>Boeing</u>	<u>Tyson</u>	<u>S&P500 Index</u>
2013	84%	54%	21%
2012	2%	20%	14%
2011	9%	14%	2%
2010	18%	20%	20%