

FM 2555A
Assignment No. 1
Due Date: 12:30, 11 October 2016
BGS 165

NOTE: Only solutions to problems marked with ♣ (see pages 7-8) are required for submission. The other problems are practice exercises.

GUIDELINES ON SUBMITTING ASSIGNMENTS

- **Your assignment paper must include the Marking Scheme as a cover page.** This marking scheme can be downloaded from the course website. *Failure to follow this instruction can result to a 2-point deduction on your assignment mark.*
- Do not submit your rough work! Do the problem set and then re-write it at least once - neatly, with adequate amount of clear explanation. The rewriting stage is the most important one for finding errors in one's work, and it will also deepen your understanding of the subject matter. Assignments are marked for both technical correctness and elegance of presentation.
- Bear in mind to include a sufficient amount of explanation about your work so that any marker does not have to guess what you mean. The grader of your work will determine if you understand what you are writing, not merely that you reach the particular correct answer.
- On questions where a computer output is required, include the output in the text of your answer at the appropriate locations - do not put it all in a bunch at the end of your assignment. Unless, you are instructed to submit your work in a CD or disc, you are expected to hand in a PRINTED COPY. *Assignments sent via e-mail will not be accepted.*
- YOU MUST WRITE YOUR OWN WORK IN YOUR OWN WORDS, using full sentences and proper English grammar. It is your responsibility to familiarise yourself with the provisions of the University Regulation concerning academic integrity and honesty. *Any behaviour that can potentially lead to plagiarism and cheating (including copying from/sharing with another student answers in assignments and exams) is a serious offence and carries with it severe penalty.*

Problems below, unless indicated otherwise, were taken from Brealey, R. (2017), *Principles of Corporate Finance*, 12th edition, McGraw-Hill Education, New York. *N.B.: For problems not required for submission, you will learn and benefit more if you attempt solving them first before looking at their solutions.*

NOTE: Problem number format: [x/y], where x is the number of the problem and y is the page number in the 12th ed of the Brealey et al. textbook.

Problem [2/14]

Investment and financing decisions: Which of the following are real assets, and which are financial?

- A share of stock
- A personal IOU
- A trademark
- A factory
- Undeveloped land
- The balanced in the firm's checking account
- An experienced and hardworking sales force
- A corporate bond.

Problem [3/15]

Investment and financing decisions: Vocabulary test. Explain the differences between:

- Real and financial assets
- Capital budgeting and financing decisions
- Closely held and public corporations
- Limited and unlimited liability

Problem [6/15]

Opportunity cost of capital: F&H Corp. continues to invest heavily in a declining industry. Here is an excerpt from a recent speech by F&H's CFO:

We at F&H have of course noted the complaints of a few spineless investors and uninformed security analyst about the slow growth of profits and dividends. Unlike those confirmed doubters, we have confidence in the long-run demand for mechanical encabulators, despite compelling digital products. We are therefore determined to invest to maintain our share of the overall encabulator market. F&H has a rigorous CAPEX approval process, and we are confident of returns around 8% on investment. That's a far better return than F&H earns on its cash holdings.

The CFO went on to explain that F&H invested excess cash in short-term U.S. government securities, which are almost entirely risk-free but offered only a 4% rate of return.

- a. Is a forecasted 8% return in the encabulator business necessarily better than a 4% safe return on short-term U.S. government securities? Why or why not?
- b. Is F&H's opportunity cost of capital 4%? How in principle should the CFO determine the cost of capital?

Problem [7/15]

Corporate goals: We can imagine the financial manager doing several things on behalf of the firm's stockholders. For example, the manager might:

- a. Make shareholders as wealthy as possible by investing in real assets.
- b. Modify the firm's investment plan to help shareholders achieve a particular time pattern of consumption
- c. Choose high- or low-risk assets to match shareholders' risk preferences.
- d. Help balance shareholders' checkbooks.

But in well-functioning capital markets, shareholders will vote for *only one* of these goals. Which one? Why?

Problem [11/16]

Agency issues: Many firms have devised defenses that make it more difficult or costly for other firms to take them over. How might such defenses affect firm's agency problems? Are managers of firms with formidable takeover defenses more or less likely to act in the shareholder's interests rather than their own? What would you expect to happen to the share price when management proposes to institute such defenses?

Problem [4/40]

Present values: A project produces a cash flow of \$432 in year 1, \$137 in year 2, and \$797 in year 3. If the cost of capital is 15%, what is the project's PV? If the project requires an investment of \$1,200, what is its NV?

Problem [5/40]

Opportunity cost of capital: Which of the following statements are true? The opportunity cost of capital:

- a. Equals the interest rate at which the company can borrow.
- b. Depends on the risk of the cash flows to be valued.

- c. Depends on the rates of return that shareholders can expect to earn by investing on their own.
- d. Equals zero if the firm has excess cash in its bank account and the bank account pays no interest.

Problem [8/40]

Perpetuities and annuities: The interest rate is 10%.

- a. What is the PV of an asset that pays \$1 a year in perpetuity?
- b. The value of an asset that appreciates at 10% per annum approximately doubles in seven years. What is the approximate PV of an asset that pays \$1 in perpetuity beginning in year 8?
- c. What is the approximate PV of an asset that pays \$1 a year for each of the next seven years?
- d. A piece of land produces an income that grows by 5% per annum. If the first year's income is \$10,000, what is the value of the land?

Problem [11/41]

Compounding intervals: You are quoted an interest rate of 6% on an investment of \$10 million. What is the value of your investment after four years if interest is compounded:

- a. Annually?
- b. Monthly? or
- c. Continuously

Problem [14/41]

Present values: A factory costs \$800,000. You reckon that it will produce an inflow after operating costs of \$170,000 a year for 10 years. If the opportunity cost of capital is 14%, what is the net present value of the factory? What will the factory be worth at the end of five years?

Problem [18/42]

Present values and opportunity cost of capital: Halcyon Lines is considering the purchase of a new bulk carrier for \$8 million. The forecasted revenues are \$5 million a year and operating costs are \$4 million. A major refit costing \$2 million will be required after both the fifth and tenth years. After 15 years, the ship is expected to be sold for scrap at \$1.5 million.

- a. What is the NPV if the opportunity cost of capital is 8%?

- b. Halcyon could finance the ship by borrowing the entire investment at an interest rate of 4.5%. How does this borrowing opportunity affect your calculation of NPV?

Problem [22/42]

Annuities: Kangaroo Autos is offering free credit on a new \$10,000 car. You pay \$1,000 down and then \$300 a month for the next 30 months. Turtle Motors next door does not offer free credit but will give you \$1,000 off the list price. If the rate of interest is .83% a month, which company is offering the better deal?

Problem [25/42]

If the rate of interest is 8% rather than 10%, how much would you need to set aside to provide each of the following?

- \$1 billion at the end of each year in perpetuity.
- A perpetuity that pays \$1 billion at the end of the first year and that grows at 4% a year.
- \$1 billion at the end of each year for 20 years.
- \$1 billion a year spread evenly over 20 years.

Problem [5/71]

Prices and yields: Construct some simple examples to illustrate your answers to the following:

- If interest rates rise, do bond prices rise or fall?
- If the bond yield to maturity is greater than the coupon, is the price of the bond greater or less than 100?
- If the price of a bond exceeds 100, is the yield to maturity greater or less than the coupon?
- Do high-coupon bonds sell at higher or lower prices than low-coupon bonds?
- If interest rates change, do the prices of high-coupon bonds change proportionately more than that of low-coupon bonds?

Problem [6/71]

Spot interest rates and yields: Which comes first in the market for U.S. Treasury bonds:

- Spot interest rates or yields to maturity?
- Bond prices or yields to maturity?

Problem [11/72]**Duration:** True or False? Explain

- Long-maturity bonds necessarily have longer durations.
- The longer a bond's duration, the lower its volatility.
- Other things equal, the lower the bond coupon, the higher its volatility.
- If interest rates rise, bond durations rise also.

Problem [14/73]**Real interest rates:** The one-year interest rate is 10% and the expected annual inflation rate is 5%.

- What is the expected real interest rate?
- If the expected rate of inflation suddenly rises to 7%, what does Fisher's theory say about how the real interest rate will change? What about the nominal rate?

Problem [15/73]**Prices and yields:** Here are the prices of three bonds with 10-year maturities:

Bond Coupon (%)	Price (%)
2	81.62
4	98.39
8	133.42

If coupons are paid annually, which bond offered the highest yield to maturity? Which had the lowest? Which bonds had the longest and shortest durations?

Problem [27/74]**Term-structure theories:** Suppose the spot interest rates constitute a *downward-sloping* term structure: $r_1 = 4.6\%$, $r_2 = 4.4\%$, $r_3 = 4.2\%$, and $r_4 = 4.0\%$. What can you deduce about the one-year spot interest rate in three years if

- The expectations theory of term structure is right?
- Investing in long-term bonds carries additional risks?

Problem [28/74]**Nominal and real returns:** Suppose that you buy a two-year 8% bond at its face value.

- What will be your total nominal return over the two years if inflation is 3% in the first year and 5% in the second? What will be your real return?
- Now suppose that the bond is a TIPS. What will be your total 2-year real and nominal returns?

♣ Required Assignment Question 1 (Not from the textbook) [4 points]

Mr Williams expects **to retire in 30 years** and would like to accumulate \$1 million in his pension fund. If the annual interest rate is 12%, how much should Mr Williams put into his pension fund each month in order to achieve his goal? (Assume that Mr Williams will deposit the same amount each month into his pension fund, using monthly compounding).

♣ Required Assignment Question 2 (Problem [30/43]) [5 points]

Several years ago *The Wall Street Journal* reported that the winner of the Massachusetts State Lottery prize had the misfortune to be both bankrupt and in prison for fraud. The prize was \$9,420,713, to be paid in 19 equal annual installments. (There were 20 installments, but the winner had already received the first payment.) The bankruptcy court judge ruled that the prize should be sold off to the highest bidder and the proceeds used to pay creditors.

- If the interest rate was 8%, how much would you have been prepared to bid for the prize? [2.5 pts]
- Enhance Reinsurance Company was reported to have offered \$4.2 million. Use Excel to find the return that the company was looking for. [2.5 pts]

♣ Required Assignment Question 3 (Problem [34/43]) [6 points]

Dear Financial Adviser

My spouse and I are each 62 and hope to retire in three years. After retirement we will receive \$7,500 per month after taxes from our employer's pension plans and \$1,500 per month after taxes from Social Security. Unfortunately our monthly living expenses are \$15,000. Our social obligations preclude further economies.

We have \$1,000,000 invested in a high-grade, free-tax municipal-bond mutual. The return on the fund is 3.5% per year. We plan to make annual withdrawals from the mutual fund to cover the difference between our pension and Social Security income and our living expenses. How many years we run out of money?

Sincerely,
Luxury Challenged
Marblehead, MA

You can assume that the withdrawals (one per year) will sit in a checking account (no interest) until spent. The couple will use the account to cover the monthly shortfalls.

♣ Required Assignment Question 4 (Problem [33/75]) [5 points]

Duration: The duration of a bond that makes an equal payment each year in perpetuity is $(1 + \text{yield}) / \text{yield}$. Prove it.