

FINC 430 TA Session 4
Midterm Review
Solutions

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Question 1

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$$\text{Effective Monthly Rate} = \frac{2.4\%}{12} = 0.2\%$$

$$\begin{aligned}\text{Effective Annual Rate} &= (1 + 0.2\%)^{12} - 1 \\ &= 2.43\%\end{aligned}$$

Question 2

After building a successful FinTech company, you are ready to IPO on the NASDAQ stock market. You plan to pay an initial dividend of \$1/share in one year, with dividends growing at a constant rate of 6% per year forever. Cash flows with equivalent risk have a discount rate of 10% per year. What is the fair price for your firm's IPO (on a per share basis)?

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$$\begin{aligned} \text{Perpetuity Value}_0 &= \frac{\text{Dividend}_1}{r - g} = \frac{1}{10\% - 6\%} \\ &= 25 \end{aligned}$$

Question 3

You find a well-preserved 165-year-old half-dollar coin in the basement of University Hall. 165 years ago, the half-dollar could purchase about \$15 of equivalent goods today. What is the average rate of inflation over the past 165 years (in %)? Note: A half-dollar is \$0.50 or 50 cents.

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$$\textit{Rate of Inflation} = \left(\frac{15}{0.5} \right)^{\frac{1}{165}} - 1 = 2.08\%$$

Question 4

Which of the following is a potential application of our present value techniques? List all that are appropriate.

- (a) Estimating the returns to a Kellogg education
- (b) Deciding among financing plans for a new Tesla
- (c) Ordering a \$9.99 large pizza from Papa John's or Domino's
- (d) Conducting a cost-benefit analysis of new bank regulations
- (e) Choosing between renting and buying a home

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All except (c)

Question 5

You are advising a wealthy client who has a two-year-old child. The client's dream is for her child to attend an elite four-year college in her hometown (Chicago) in 16 years. However, she is concerned about the rising cost of education. You agree to help advise her.

Your research uncovers the following information:

- An elite private university like Northwestern currently costs \$70,000 per year.
- Colleges charge students at the start of the school year.
- College costs are expected to grow at 5% annually in nominal terms.
- The annual market interest rate is 4%.

(a) Assuming that your client stops saving when her child goes to college, what is the present value of the child's college education costs as of 16 years from now? Equivalently, how much money should your client have in the bank just before her child goes to college?

(b) Your client is considering two savings plans. The first is a lump sum payment today and the second is a monthly installment plan with fixed payments.

(i) What is the size of the lump sum payment today that would finance the child's college education?

(ii) What is the size of the monthly payments (starting at the end of the month) that would finance the child's college education? Hint: What is the effective monthly rate of interest? What is the number of payments?

(c) Your client's business empire grows at 0.2% a month, so she is therefore considering a monthly savings plan with this same growth rate. Assuming that she prefers a *monthly* installment plan, how much does she save in the first month?

See Excel file

Question 6

The release of the next Star Wars movie has been postponed. Originally expected to premiere in 1.5 years, the movie's release is now expected to occur in 2 years. Your task as an analyst at New Republic Bank is to estimate the losses incurred by Disney using your knowledge of term structure and the time value of money.

You check your Bloomberg terminal today to find the following information on the current term structure:

Risk-free US Treasury zero-coupon bonds with face value of \$1,000	
Maturity	Bond Price
1 year	\$970
1.5 years	\$950
2 years	\$925
2.5 years	\$890

In addition, you make the following assumptions:

- Production costs are \$500 million and will be incurred one year from now regardless of the release schedule.
- The film will earn \$1 billion at release and \$500 million six months later.
- The film's future cash flows are risk-free.

(a) Calculate the risk-free interest rate (i.e., spot rate) of each of the zero-coupon bonds.

(b) Calculate the change in net present value and the change in internal rate of return (IRR) to Disney associated with the six-month delayed release.

See Excel file

Question 7

Your firm is considering leasing or purchasing a new computer system, which will last for six years.

- Your firm can purchase the system upfront for a cost of \$300,000 or you can lease the system from the manufacturer for a \$14,000 payment per quarter (every three months).
- You would make the lease payments for six years.
- Your firm can borrow at an interest rate of 7% APR compounded quarterly (every three months).
- At the end of six years, regardless of whether you buy it or lease it, the new computer system will have no value.

Should your firm purchase the system outright or lease it for \$14,000 per quarter for six years?

See Excel file

Question 8

You are considering acquiring a privately held company in the computer equipment industry. The company pays dividends once a year, annually.

The company provides you with the following data:

Today, at $t=0$, the company has no debt.

- The company expects healthy growth over the next 4 years. During this period:
 - The company will be reinvesting 60% of its earnings, paying out the rest as dividends.
 - The company's earnings will start at \$44 per share at $t=1$ and then grow by 13.2% per year.
- From year 5 onward in perpetuity, things will slow down. During this period:
 - At $t=5$ the company's earnings will fall to \$16.42 per share.
 - The company is planning to reinvest only 20% of earnings, paying the rest out as dividends.
 - The company's earnings will grow by 3% per year.
- The company's opportunity cost of capital is 18%.

(a) What is the dividend at $t=1$?

(b) What is the dividend at $t=5$?

(c) What is the value of the company at $t=0$?

See Excel file

Question 9

You are considering a new line of business of selling Android phones. You will outsource most of the production to a foreign company. You will run this line of business for only four years ($t=1$ to $t=4$) and then you will shut it down. You have the following information about the financial implications of outsourcing over the next four years. Your company is listed on the stock exchange and has no debt.

- You will need to buy some equipment worth \$60 million at time 0 ($t=0$), which will be depreciated straight line over the next 6 years. You will sell the used equipment right at the end of the fourth year, $t=4$ for \$25 million.
- Your outsource partner will charge you \$50 million at the end of each year for the phones that they have produced for you. You will pay the outsource partner one year after they charge you for the phones.

- You will have selling, administration and additional production costs (SG&A) of 12% of your sales.
- You expect that sales will be \$80 million per year for years 1 to 4, and then you will close this line of business down.
- There are no other costs or working capital items besides those listed.
- Your firm's tax rate is 30% and its relevant cost of capital (discount rate) is 10%.

(a) Determine the appropriate free cash flows for this new line of business for years $t=0$ to $t=5$.

(b) Calculate the relevant NPV and state whether the firm should go into this line of business or not.

(c) Calculate the internal rate of return for this new line of business. If the firm has a hurdle rate of 10%, should they go into this business using the IRR rule?

See Excel file