

Econ 358: Introduction to Financial Economics
Whitman College
Spring 2011

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Office hours are the following, or by appointment:

Monday 2:30-3:00

Tuesday 11:00-11:30, 2:00-3:00

Wednesday 11:00-11:30, 2:30-3:00

Thursday 2:00-3:00

Friday 11:00-11:30

Office hours will be modified February 28- March 11 because of major exams.

This course introduces the theoretical framework for understanding financial markets. We will analyze the decisions individuals and firms make as they use the financial system to allocate scarce resources over time. These decisions generally involve risk, so we will use modern portfolio theory to analyze financial risk. The course textbook is Corporate Finance, 9th Edition by Stephen Ross, Randolph Westerfield and Jeffrey Jaffe. Each day's reading assignment is marked on the attached reading list. I also encourage you to regularly read a newspaper with financial coverage such as the *Wall Street Journal*.

There will be fourteen problem sets, three midterm exams, a comprehensive final exam, and a 10-point in-class discussion. Each problem set is 10 points, each midterm is 100 points, and the final is 200 points. The dates for the exams and discussion are marked on the attached reading list. Problem sets are due in class at the beginning of class on the days marked on the reading list. I will not accept late or illegible problem sets, nor will I offer exams at times other than scheduled. Please arrange your schedule now to avoid any conflicts with exam or assignment dates. Because unforeseen problems do arise, I will drop your lowest problem set score. You may work together on the problem sets, but must write up your answers individually.

If you have a registered disability that requires special accommodation for exams, see me a week before each exam so that we can make arrangements. To help you study, old exams are available via my webpage, <http://people.whitman.edu/~hazlett/>. Or, you can go directly to the exams at <http://people.whitman.edu/%7ehazlett/econ358/econ358.html>. All cell phones must be turned off and packed away during exams.

As a courtesy to others, please do not leave class except in emergencies.

The grading scale for the course is as follows. Note that there is no disadvantage to studying with others, as your grade does not depend on anyone else's performance.

Total Points	(% of 640)	Grade	Total Points	(% of 640)	Grade
627	0.98	A+	493	0.77	C+
595	0.93	A	467	0.73	C
576	0.90	A-	448	0.70	C-
557	0.87	B+	429	0.67	D+
531	0.83	B	403	0.63	D
514	0.80	B-	384	0.60	D-

Reading List, Assignment and Exam Dates

- Jan 18 Introduction
- Jan 19 Firm organization and financial markets chp 1
- Jan 21 Income statements, balance sheets, economic value vs accounting estimates pp. 20-8
- Jan 25 The budget constraint in Fisher's simple savings model
To prepare, review your intermediate microeconomic theory on budget lines.
- Jan 26 Consumer equilibrium and general equilibrium in the simple savings model
To prepare, review your intermediate micro theory on indifference curve analysis.
PROBLEM SET 1 DUE
- Jan 28 Net Present Value in the simple savings model pp. 87-90
- Feb 1 Investment and NPV for multi-period projects pp. 91-101
- Feb 2 Simplifying tools for calculating PV: perpetuity and annuity pp. 106-114
(skip page 107 on growing perpetuities) PROBLEM SET 2 DUE
- Feb 4 More useful tools: growing perpetuity and growing annuity pp. 107-8, 115-6
- Feb 8 Examples of NPV calculations and investment decisions using NPV pp. 116-21, 135-8
PROBLEM SET 3 DUE
- Feb 9 Alternative to the NPV rule: Payback Period Rule pp. 138-141
- Feb 11 EXAM 1
- Feb 15 Alternative to the NPV rule: using the Internal Rate of Return pp. 141-144
- Feb 16 More on the IRR pp. 144-154
- Feb 18 No class
- Feb 22 Opportunity costs, sunk costs, side effects, sensitivity analysis pp. 171-3, 206-9
- Feb 23 Expected NPV pp. 223-5 PROBLEM SET 4 DUE
- Feb 25 NPV with inflation, Bond features pp. 181-186, 234-57
- Mar 1 Bond and stock prices in equilibrium pp. 268-73
Read chapter 20 for background on how firms issue securities to the public.
- Mar 2 Stock prices for firms with growth opportunities pp. 278-82, 285
PROBLEM SET 5 DUE
- Mar 4 Returns (dollar, percentage, and holding period), arithmetic and geometric averages
pp. 300-311, 316-7
- Mar 8 Historical risk premium puzzle, variance and standard deviation for a sample pp. 311-22
PROBLEM SET 6 DUE
- Mar 9 Expected return and variance pp. 329-332
- Mar 11 EXAM 2

Mar 29 Covariance and correlation pp. 332-5
 Mar 30 Risk and return for portfolios, the diversification effect pp. 335-9
 Apr 1 The feasible set of risk and return for two assets pp. 339-344 PROBLEM SET 7 DUE

 Apr 5 Risk and return for portfolios of many risky assets, diversifiable risk pp. 344-350
 Apr 6 Adding a riskless security pp. 350-2
 Apr 8 The Capital Market Line pp. 352-4 PROBLEM SET 8 DUE

 Apr 13 Deriving the Capital Asset Pricing Model
 Apr 15 Interpreting the Capital Asset Pricing Model

 Apr 19 The Security Market Line pp. 356-61
 Apr 20 CAPM and the choice of a discount rate pp. 392-401 PROBLEM SET 9 DUE
 Apr 22 Discussion:
 "Markets: The Credit Rating Agencies." By Lawrence J. White
 in *Journal of Economic Perspectives*, Spring, 2010 24(2): 211–26.
 Posted on the course Cleo page and also available at
 <http://www.aeaweb.org/articles.php?doi=10.1257/jep.24.2.211>.
 PROBLEM SET 10 DUE

 Apr 26 The Efficient Markets Hypothesis pp. 428- 59
 Apr 27 EXAM 3
 Apr 29 Firm's choice of debt vs equity financing: Modigliani-Miller Proposition I pp. 488-95

 May 3 More on Modigliani-Miller I PROBLEM SET 11 DUE
 May 4 Modigliani-Miller Proposition II, assuming no taxes or distress costs pp. 495-504
 May 6 Modigliani-Miller Proposition II with taxes and distress costs pp. 505-6, 520-32
 PROBLEM SET 12 DUE

 PROBLEM SET 13 DUE by 4pm Monday, May 9. Please slip it under my office door.

 May 10 Topics in the current financial crisis PROBLEM SET 14 DUE

 The comprehensive final exam is in class Friday, May 13 at 9am.

Use the following information to answer all of the questions below.

Suppose that on January 1, 1990, Company X purchases a new piece of equipment, called a widget producer, for \$45,000. It is the nature of widget producers to wear out and be completely worthless after five years of life. The market value of this widget producer during the first four years of its life is given in the following table.

<u>Date</u>	<u>Market value</u>
Jan. 1, 1990	\$45,000
Jan. 1, 1991	\$30,000
Jan. 1, 1992	\$21,000
Jan., 1, 1993	\$10,000
Jan., 1, 1994	\$7,000

1. (a) (1pt) Define depreciation. (Note that economists and accountants have different definitions of depreciation. Please provide the definition that economists use.)
- (b) (1pt) Calculate depreciation in the value of the widget producer during calendar year 1992. Show your work.

2. Suppose you are given the following information on Company X.

Cash Revenues and Cash Expenses for Company X during calendar year 1992:

Sales	\$1,000,000		
Cost of goods sold		\$600,000	
Selling, general, and administrative expenses			\$250,000
Interest payments on debt	\$100,000.		

- (a) (1pt) Suppose that Company X's only fixed asset is the widget producer described above. Assume that Company X's accountant uses a straight-line depreciation allowance formula. Calculate Company X's pre-tax accounting profits for 1992. Show your work.
- (b) (2pts) Does using the straight-line depreciation allowance result in an over-estimate or an under-estimate of the true value generated by Company X's operations during 1992? Explain.
- (c) (1pt) What are the reasons that accountants use depreciation allowance formulas rather than calculating depreciation? Explain.

3. Consider the following information on Company X's assets and liabilities on January 1, 1993.

Cash	\$2,000		
Accounts receivable	\$150,000		
Accounts payable		\$120,000	
Inventory	\$400,000		
Widget producer, adjusted for the depreciation allowance			\$_____
Note payable to bank	\$130,000		
Mortgage payable		\$200,000	

- (a) (1pt) Calculate the accounting value of the widget producer, adjusted for the depreciation allowance, assuming still the use of a straight-line depreciation allowance formula.
- (b) (1pt) Arrange the above data into a balance sheet. On your balance sheet, be sure to indicate the accounting measure of net worth.
- (c) (2pts) Does using the depreciation allowance result in an under-estimate or an over-estimate of the true net worth of Company X? Explain.

Consider a two-period pure exchange economy in which there is one non-durable consumption good at each date. Each consumer in this economy is alive at each date and is endowed with some positive quantity of each good at each date. Individuals are not identical in their endowments or their preferences.

1. (2pts) Define a general equilibrium for this economy.
2. (4pts) Consider a particular individual with endowment Y_1 at date 1 and Y_2 at date 2. Let c_1 stand for his quantity of date 1 consumption and c_2 stand for his quantity of date 2 consumption. Let r be the equilibrium interest rate between date 1 and date 2. Write the equation of this consumer's budget line. Graph the budget line. Be sure to label your axes and both intercepts of the budget line.
3. (4pts) Theories of savings often claim that if the interest rate falls while everything else stays constant, then the individual's desired savings falls. Use the simple savings model described in this problem set to determine whether it is necessarily true that as the market interest rate falls, an individual's consumer equilibrium amount of savings falls. That is, could an individual's consumer equilibrium amount of savings possibly rise when the market interest rate falls? Refer to budget-line/indifference curve graphs in your explanation.

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Problem Set 3

Walla Walla County has the opportunity to undertake an investment project. The project is to build a bridge over the Touchet River at the end of a dead-end road. Constructing the bridge would cost \$800,000 in the current period. Maintenance on the bridge would cost \$100 per year for each of the 50 years of the bridge's life span. The only people who will use the bridge are two farming families who own farmland on the other side of the bridge, and some fishermen. Together the two farming families would receive total benefits of \$2000 per year from the use of the bridge. All of the fishermen together would receive total benefits of \$100 per year from use of the bridge.

Assume that the government can borrow or lend at a 6% rate of interest.

1. (8pts) What is the net present value of this project? Be sure to define net present value. Show your work.

2. (2pts) Explain, with reference to the net present value rule, whether this project should be undertaken. Be sure to define the net present value rule.

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 Problem Set 4

1. Consider two mutually exclusive projects. Project I requires an expenditure at period 0 of \$100 and provides benefits in period 1 of \$30 and in period 2 of \$90. Project II requires an expenditure at period 0 of \$200 and provides benefits in period 1 of \$0 and in period 2 of \$240.

(a) (3pts) Calculate the internal rate of return of each project. Show your work.

(b) (3pts) Which project, if any, should be undertaken? Explain.

2. (4pts) Suppose that you have recently joined a company that uses a payback period rule to make its investment decisions. The cut-off date under your company's payback period rule is the end of period 3. You know of two project proposals subjected to this investment rule. The real benefits and costs associated with these projects are given below. These projects are **not** mutually exclusive.

	PROJECT I		PROJECT II	
<u>Period</u>	<u>Benefits</u>	<u>Costs</u>	<u>Benefits</u>	<u>Costs</u>
0	\$0	\$295	\$0	\$400
1	100	0	100	0
2	100	0	100	0
3	100	0	100	0
4	10	0	100	0
5	10	0	100	0
6	0	0	100	0

Your company accepted Project I and rejected Project II. Personally, you are appalled. Write a memorandum to your boss explaining the deficiencies of the payback period rule. In order to help you illustrate your points, use Projects I and II and the fact that your company can borrow or lend at an interest rate of 5%.

The Better Living Through Chemistry pharmaceutical company has just finished a marketing survey. The results of the survey reveal the revenues the firm could earn if it were to develop a pill that turns people's skin brown. The survey cost \$20,000. Now, the firm is considering beginning the research and development of such a drug. The research and development (R&D) would cost \$100,000 in period 0. With a 10% probability, the R&D efforts would result in the successful discovery of such a pill. With a 90% probability, the R&D efforts would result in the discovery of nothing.

If the firm does discover this drug, it will receive a patent giving it the exclusive right to produce the drug for 17 years, i.e. periods 1 through 17. Sales of the pill would generate revenues of \$130,000 per year for 17 years. The annual production costs for this drug would be \$30,000. After the patent expired, the firm's competitors would enter the market for this pill and drive the economic profits on pill production to zero for all future years.

The firm is currently producing a patented cream that turns people's skin a funny shade of orange. The results of the marketing survey predict that everyone who is currently buying the orange cream would switch to the brown pill, if the pill were developed. The firm's patent on orange cream expires at the end of period three. In each of periods one through three, economic profits from the sales of the cream would be \$10,000. These profits would be driven to zero by competition as soon as the patent for cream expired.

All of the above costs and benefits are in real terms. The real interest rate at which the firm may borrow or lend is 4%. If the firm cares only about expected net present value, should the firm undertake the research and development project? Explain. Show all of your work.

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Problem Set 6

Lactose, Inc. is a corporation that acts as a cash cow. That is, Lactose pays out all of its after tax profits as dividends on its stock, rather than retaining any of these earnings to use for investment projects. Lactose has 10,000 outstanding shares of its stock. Every period Lactose earns with certainty \$50,000 in after tax profits.

Suppose that the market interest rate at which one may borrow or lend is 8%.

(a) (1pt) What is the only price for a share of Lactose stock that could prevail in equilibrium? Show your work.

(b) (2pts) Prove that the price you found in part (a) is the only price that could prevail in equilibrium.

Suppose that another firm, Sucrose, Inc., is identical to Lactose in every respect but one. Sucrose also has 10,000 shares of its stock outstanding, and Sucrose earns with certainty \$50,000 in after tax profits each period. However, Sucrose has the opportunity to undertake an investment project. This project requires an expenditure in period 4 of all of its \$50,000 in after-tax profits, and provides, with certainty, revenues of \$80,000 in period 6. There are no other costs or benefits associated with this project.

(c) (4pts) What is the only price that could prevail in equilibrium at period 0 for a share of Sucrose stock? Show your work.

(d) (1pt) Calculate the price-to-earnings ratio at period 0 of Lactose stock and of Sucrose stock. Show your work.

(e) (2pts) Suppose a friend suggests that when choosing between Lactose and Sucrose, one should choose the stock with the lower price-to-earnings ratio because it is the better deal. How would you respond? (Remember, as you answer this question, that there is no uncertainty associated with the earnings of either firm.)

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Problem Set 7

1. Suppose you bought a share of Ink Corp. stock on August 1, 1990, and sold it on August 1, 1992. While you held your share, you collected two annual dividend payments of 20 cents each. The market price of Ink Corp. stock is given below.

<u>Date</u>	<u>Market Price</u>
August 1, 1988	\$2.50
August 1, 1989	3.00
August 1, 1990	3.10
August 1, 1991	4.00
August 1, 1992	4.30

(a) (2pts) What was your annual percentage return during the first year you owned Ink Corp.? Show your work.

(b) (2pts) What was your annual percentage return during the second year you owned Ink Corp.? Show your work.

2. Consider the following information on Security A and Security B.

<u>Outcome</u>	<u>Probability</u>	<u>Return on A</u>	<u>Return on B</u>
Expansion	1/4	0.04	0.06
Boom	1/4	0.24	0.06
Recession	1/2	0.04	0.10

(a) (3pts) Calculate the expected return of each of the securities.

(b) (3pts) Find the standard deviation of each of the securities.

I suggest that to avoid making mistakes in these calculations, you leave the above returns in decimal form, i.e. 0.04 rather than 4%. I make this suggestion because when you square this term, you are taking 4% of 4%, which is 0.0016. It is more obvious that $(0.04)^2$ is 0.0016 than that $(4\%)^2$ is 0.0016.

Consider the information on Securities A and B given in Question 2 on Problem Set 7.

1. (2pts) Find the covariance between Securities A and B.
2. (1pt) Find the correlation between Securities A and B.
3. (4pts) Find the portfolio of A and B that has the smallest standard deviation. What is the composition of this portfolio? What is the portfolio's standard deviation?
4. (1pt) What is the expected return of the portfolio you found in Question 3?
5. (1pt) Graph the feasible set of portfolios of A and B.
6. (1pt) On your graph from Question 5, indicate the efficient set of portfolios of A and B.

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Problem Set 9

Suppose the risk-free rate of return is 6%. The expected return on the market portfolio is 18%. The variance of the market portfolio is 0.03.

Consider the following information about the Securities N, O, P, and Q.

<u>Security</u>	<u>Standard Deviation of the Security</u>	<u>Covariance of the Security with the Market</u>
N	0.10	0.06
O	0.30	0.06
P	0.20	0.03
Q	0.25	0.09

(a) (2pts) Which one of securities N, O, P and Q, if owned alone, would be the riskiest? Explain.

(b) (4pts) Suppose the assumptions of the CAPM hold. List these assumptions. Which of securities N, O, P and Q is the riskiest? Explain.

(c) (2pts) Under the CAPM assumptions, what is the expected return of Security Q?

(d) (2pts) How much of Security Q's expected return is compensation for risk? Explain.

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Problem Set 10

Suppose the Capital Asset Pricing Model assumptions hold. The variance of the market portfolio (M) is 0.01. The expected return on the market portfolio is 12%. The risk-free rate is 6%. The following table gives the standard deviations and covariances with the market portfolio of four securities.

<u>Security</u>	<u>Standard Deviation of the security</u>	<u>Covariance of security with M</u>
A	0.20	0.015
B	0.10	0.020
C	0.15	0.025
D	0.25	0.030

Consider an investment project, which costs \$100 today. The project's expected benefits next year are \$110. The standard deviation of the project's return is 0.15. The covariance of the project's return with the market portfolio is 0.015. Find the net present value of the project.

You are a janitor with a \$19,000 annual salary and no chance of getting a better job. You have 11 years until retirement. You happen to work at the headquarters of Sante Fe Inc. Yesterday you overheard a private conversation in which Ms. Atchison, a candidate for the job of Chief Executive Officer of Sante Fe Inc., was guaranteed the job by Sante Fe's Board of Directors. The Board will announce Ms. Atchison's hiring at the end of next week. Until then, the decision is strictly confidential. This evening you are visiting a friend who is a professional stock-picker. Your friend tells you that he has heard two rumors. One rumor is that Sante Fe will hire Ms. Atchison. The other is that Sante Fe will hire Mr. Topeka for its CEO. Your friend believes that Ms. Atchison is by far the better candidate. He tells you that he is certain that Sante Fe's stock will double from its current price of \$40 per share if the company announces that it has hired Ms. Atchison. Your friend tells you that if you can confirm the rumor of Ms. Atchison's hiring, then he will give you 2000 shares of Sante Fe's stock for free, before the price doubles. You are certain that if you accept your friend's deal, your company will find out, fire you, and put you on a janitorial black list so that you remain forever unemployed. However, there will be no legal action taken against you. Suppose that when pondering your friend's deal, you care only about the financial affects. You can borrow or lend at an interest rate of 12%.

(a) (5pts) Suppose you believe that the semi-strong form of the Efficient Markets Hypothesis holds, but you believe that the strong form does not hold. Would you accept your friend's deal? Explain.

(b) (5pts) If you believe that the strong form of the Efficient Markets Hypothesis holds, would you accept your friend's deal? Explain.

Suppose that the Modigliani-Miller assumptions hold.

Consider the following information on Firm B. The market value of Firm B's stock is \$100,000. The firm has no debt. There are 10,000 shares of Firm B outstanding. The firm pays out all of its earnings as dividends. There are three equally likely outcomes: recession, normal, and expansion. The firm's profits in a recession are \$3,000, in normal times \$10,000, and in an expansion \$17,000.

(a) (2pts) What are the firm's dividends in each outcome? What is the firm's expected dividend? What is the return on a share of stock in each outcome? What is the expected return on a share of stock? Show your work.

The firm's management is considering issuing enough debt at 5% interest to buy back and retire 6,000 shares of Firm B's stock.

(b) (3pts) What would the firm's dividends be in each outcome? What would be the firm's expected dividend? What would be the return on a share of stock in each outcome? What would be the expected return on a share of stock? Show your work.

(c) (5pts) Suppose that stockholders too can borrow at 5% interest. Describe a homemade leverage strategy that gives stockholders the same return in each outcome as the leverage strategy management is considering. Show that your homemade leverage strategy gives stockholders the same return in each outcome as the leverage strategy management is considering.

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Problem Set 13

Suppose that the Modigliani-Miller assumptions hold.

Consider the following information about Company C. The market value of its assets is \$75 billion. The market value of its debt is \$70 billion. The expected return on the firm as a whole is 8.2%. The interest rate on its debt is 4%. The firm pays no taxes.

- (a) (2pts) Define the Modigliani-Miller Proposition II (MMII).
- (b) (2pts) Use MMII to calculate the firm's expected return on equity.

Now suppose that Company C issues another two billion dollars of debt and uses the proceeds to buy back stock.

- (c) (3pts) What is the expected return on the firm as a whole now? How is your answer related to Modigliani-Miller Proposition I?
- (d) (3pts) What is the firm's expected return on equity now? What accounts for the difference (or lack of difference) between your answer now and your answer to Part (b)?

Problem Set 14

- (a) (5pts) Write a question for the final exam.
- (b) (5pts) Answer your question.

Note from Professor Hazlett:

I will use your question on the final exam, if I like the question. You can make your question more appealing by coordinating with the rest of the class. If you coordinate, you can arrange so that you are not all writing questions on the same topic, and you can read each other's questions and make suggestions that will improve those questions, thereby making them more likely to appear on the exam. You can use the Cleo course email address to contact the other students in the class.