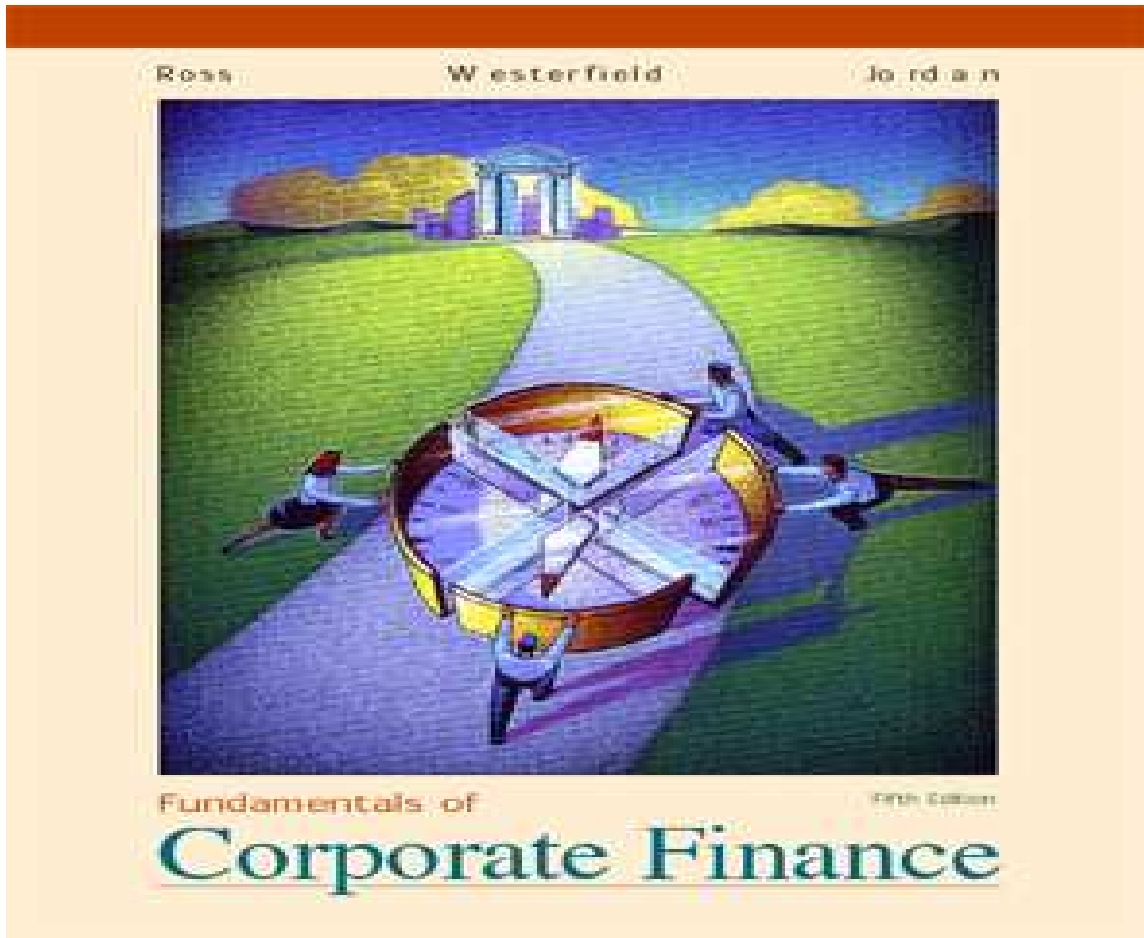




I.M.D

វិទ្យាស្ថានគ្រប់គ្រង និង អភិវឌ្ឍន៍

Institute of Management and Development
I.M.D



Self-Study CD-ROM



SYLLABUS FOR
Fundamentals of Corporate Finance

By Nut Khorn
(Course Facilitator)
For BBA students

1. Course Description:

This course aims to introduce to the students the modern fundamental theory of finance. Specifically it refers to the issues faced by the modern day company in the management of its financial function. This course is designed for both finance and non-finance major student. At the end of the course, student will be familiar the central concepts of finance which include net present value, agency theory, risk and return, financial analysis theory and international financial theory.

2. Course objectives

The objectives of the course are to enable the student to:

1. Apply the financial technique in valuation and capital budgeting
2. Analyze financial statements and planning
3. Understand issues in working capital management
4. Analyze the issues in capital structure and dividend policy decision
5. Understand various sources of long term and short term finance
6. Analyze and evaluate contemporary corporate finance issue

3. Course content

- Unit 1.** THE WORLD OF FINANC
Introduction to the corporate finance
Financial market and institution
- Unit 2.** ESSENTIAL CONCEPT IFN FINANCE
Financial statements, taxes and Cash flow
Analysis of financial statement
The time value of money
- Unit 3.** CAPITAL BUDGETING
Introduction to risk and return
Capital budgeting method
- Unit 4.** DIVIDEND POLICY AND CAPITAL STRUCTURE
Cost of Capital
Capital structure
The dividend controversy
- Unit 5** WORKING CAPITAL MANAGEMEMT
Working capital policy
Managing Cash
- Unit 6.** CONTEMPORARY ISSUE IN FINANCE
International finance

Merger and acquisition

4. Learning Resources:

Required textbook

Ross Stephen A., Westerfield Randolph W., Jordon Bradford D. (2006) FUNDAMENTALS OF COPORATE FINANCE, McGraw- Hill international edition, Seventh edition.

Stephen A. Ross, Randolph W. Westerfield, and Jeffrey F. Jaffe, (2005), Corporate Finance, McGraw- Hill international, 6th Edition

Additional Reading

JOEL LERNER and JAMES A. CASHIN, (1998), “*financial Management*” The Second Edition, McGraw- Hill, (SCHAUM’S OUTLINES).

Paul G. KEAT and PHILIP K.Y. YOUNG, (2000), “*Managerial Economics* ” The Third Edition, Prentice Hall (USA).

Douglas R. Emery, John D.Finnerty, and John D. Stowe, (2004),”*Corporate Financial Management* ”. The Second Edition, Pearson Education International, (USA).

5. Course requirement

Student should have basic knowledge of Business mathematics, financial accounting, and financial issues.

6. Evaluation of the student performance

Course assessment:

<i>Attendance and participation.....</i>	<i>10%</i>
<i>Home work.....</i>	<i>10%</i>
<i>Assignment.....</i>	<i>30%</i>
<i>Mid-term Exam.....</i>	<i>20%</i>
<i>Final Examination</i>	<i>30%</i>
<i>Total:</i>	<i>100%</i>

Knowing Our Finance Program

Four major areas:

1. ***Corporate Finance (Financial Management):*** How the corporation raises and uses its resources, short-term and long-term, capital structure, dividend policy and other related topics on the financial management of the corporation.
2. ***Money and Capital Markets (Financial Markets and Institutions):*** Environment needed for the development of our financial systems, money and capital markets, banking system (central and commercial banks), other non-bank financial institutions.
3. ***Investment Analysis and Portfolio Management:*** Fundamental analysis for fixed income securities (bonds) and equity securities (stocks), portfolio theory and management, derivative securities and other related portfolio topics.
4. ***International Finance:*** Financial management in the context of the global financial markets, foreign exchange principles and applications, international money and capital markets, international diversification, and related topics.

Work Requirement for a Finance Major under Mr. Nut Khorn

- *I will apply the international standard when I teach all finance courses I will require that you do all the assigned work before class:*

Read your textbook (slide presentation is not complete)

Read the power point materials

Do the assignments

Prepare for all examinations.

Internet research work.

- To perform well in my courses, you need to spend about a minimum of **15 hours per week for this class**. If you do not want to make this commitment, then do not take my courses.
- You should be present in all my classes. If you do not show up for my lectures, I will consider you as absent (no need to give excuses).
- If you fail any of my courses (I hope you won't), you must retake a new written examination plus an oral examination to prove that you know the subjects.

Internet Web for this Courses:

www.mhhe.com/rwj (fundamentals of corporate finance) or www.mhhe.com/bmm

When you search the web you will get power point presentation (Slide), quizzes, multiple choices, excel template, and so on.

Other webs to supporting of your course.

www.mhhe.com (General subjects)

www.mhhe.com/bh (Foundation of Financial Management)


www.mhhe.com/williams_basis14e (Financial & Managerial Accounting)

www.mhhe.com/garrison12e (Managerial Accounting)

www.wiley.com (General Subjects)

www.wiley.com/college/weygandt (Accounting Principles, Financial Accounting, Hospital Accounting, and Managerial Accounting)

General Research: www.en.wikipedia.org

 **Note:** When you research the entire web above you should enter the STUDENT CENTER OR STUDENT COMPONION.

7-HOME WORK AND ASSIGNMENT

Students **MUST COMPLY STRICTLY** with the following **instructions** in writing their Home Work, Individual Assignments, Group Case-study and Group Case-Study Presentation.

1. The student(s) **is expected** to do his/her own research in order to write up individual assignments and home work.
2. All Individual Assignments/Home work and Group Case-Study **MUST be type written on A-4 sized paper** with adequate margins. **You should include a TITLE PAGE and a LIST OF CONTENTS.**
3. Use headings and sub-headings to organize your report, including supporting material(s) as attachments.
4. All reference books/published materials you refer to should be properly referenced (arrange in this order: **name of author(s), year, and title of the book, publisher, and the country the book was published**) and this **must** be included in a bibliography at the end of the assignment.
5. Use **text referencing** when you **cite somebody else's work** from your references. **Citation may mean direct quoting, or paraphrasing, or summarizing, or simply to make a statement of that author's view of finding.** An example of text referencing: Beamer and Varner (2001), suggested that culture is not something we are born with, but rather it is learned.

6. **Number all pages** sequentially and securely staple and/or bind all sheets together.

Chapter 1:

Ch1.1) What is Corporate Finance? Explain (At least 10 Lines).

Ch1.2) Describe the advantage and disadvantage of the sole proprietorship, partnership, and corporation.

Assignment: ដំណើរទីផ្សារមូលបត្រ នៅក្នុងប្រទេសកម្ពុជា។ (ធ្វើជាក្រុម ដោយ១ក្រុម=៤ នាក់) ។

Chapter 2:

P2-11

P2-12

Chapter 3:

P3-3; P3-6; P3-9

Chapter 4

P4-10; P4-12

Chapter 5:

P5-

Chapter 1.

Introduction to Corporate Finance

Chapter Outline

1.1 What is Corporate Finance?

1.2 Corporate Securities as Contingent Claims on Total Firm Value

1.3 The Corporate Firm

1.4 Goals of the Corporate Firm

1.5 Financial Markets

Finance

Noun

- 1.[U] finance (for sth) money used to run a business, an activity or a project:
- 2.[U]the activity of managing money, especially by a government or commercial organization:
- 3.finances [pl.] the money available to a person, an organization or a country; the way this money is managed:

Corporate:

adjective

- 1.connected with a corporation:
2. (technical) forming a corporation:
3. involving or shared by all the members of a group:

Finance is the science of funds management.[1] The general areas of finance are *business finance*, *personal finance*, and *public finance*. [2] Finance includes saving money and often includes lending money. The field of finance deals with the concepts of time, money and risk and how they are interrelated. It also deals with how money is spent and budgeted.

Corporate finance is an area of finance dealing with the financial decisions corporations make and the tools and analysis used to make these decisions. The primary goal of corporate finance is to maximize corporate value [1] while managing the firm's financial risks. Although it is in principle different from managerial finance which studies the financial decisions of all firms, rather than corporations alone, the main concepts in the study of corporate finance are applicable to the financial problems of all kinds of firms.

What is Corporate Finance?

Corporate Finance addresses the following three questions:

1. What long-term investments should the firm engage in?
2. How can the firm raise the money for the required investments?
3. How much short-term cash flow does a company need to pay its bills?

The Balance-Sheet Model of the Firm

Total Value of Assets

Current Assets

Fixed Assets
 1. **Tangible Assets**
 2. **Intangible Assets**

=

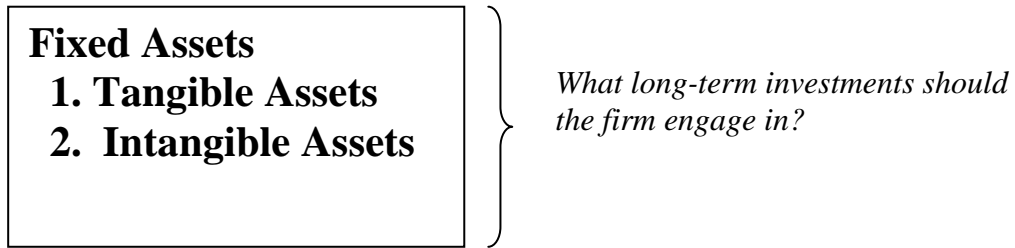
Total Firm Value to Investors:

Current Liabilities

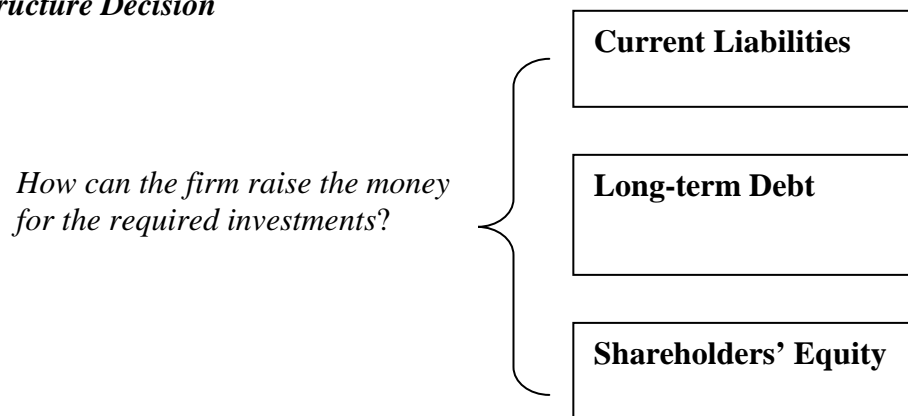
Long-term Debt

Shareholders' Equity

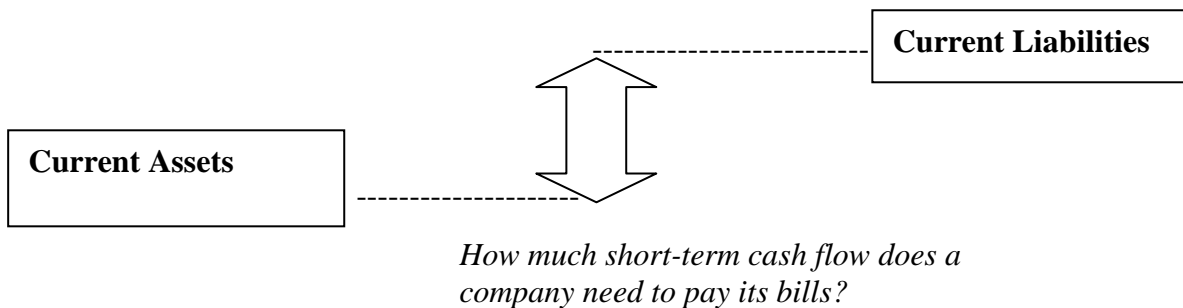
➤ **The Capital Budgeting Decision**



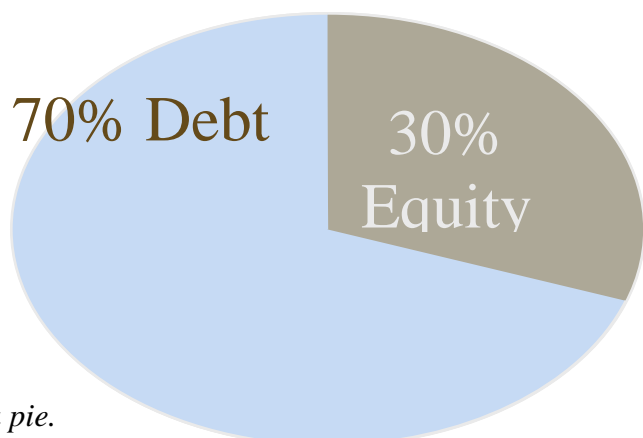
➤ **The Capital Structure Decision**



➤ **The Net Working Capital Investment Decision**



Capital Structure:



*The value of the firm can be thought of as a pie.
 The goal of the manager is to increase the size of the pie.
 The Capital Structure decision can be viewed as how best to slice up the pie.
 If how you slice the pie affects the size of the pie, then the capital structure decision matters.*

Hypothetical Organization Chart

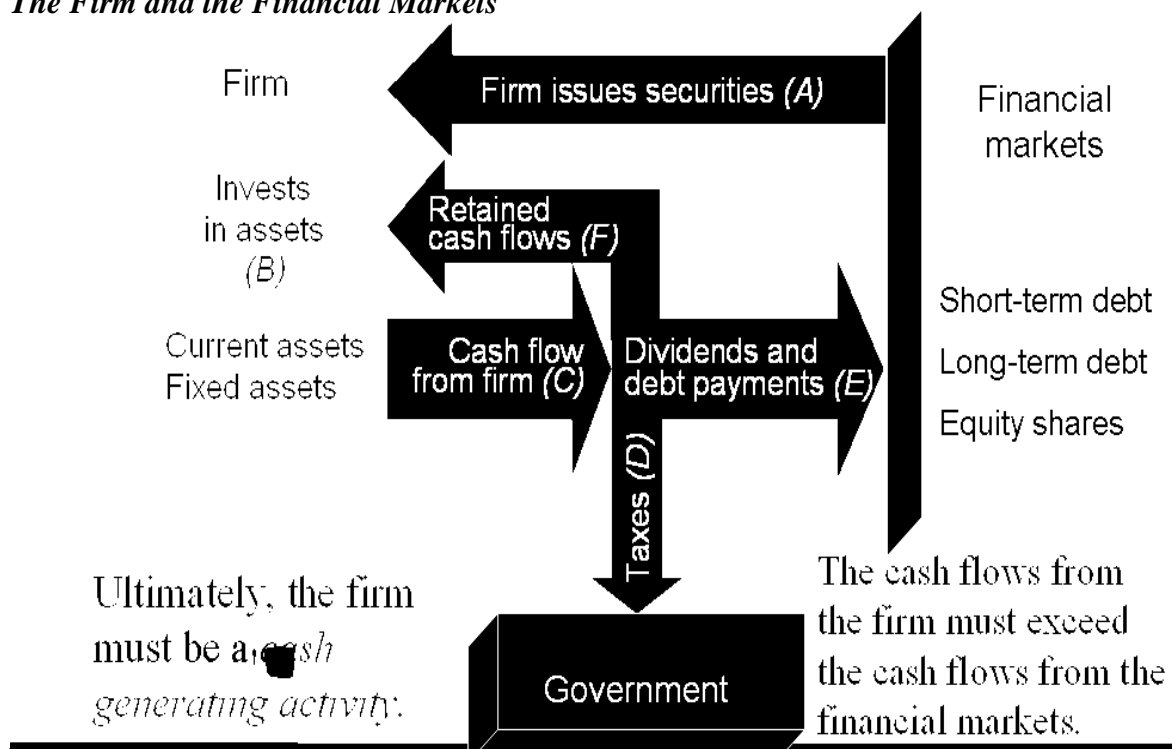


The Financial Manager

To create value, the financial manager should:

1. Try to make smart investment decisions.
2. Try to make smart financing decisions.

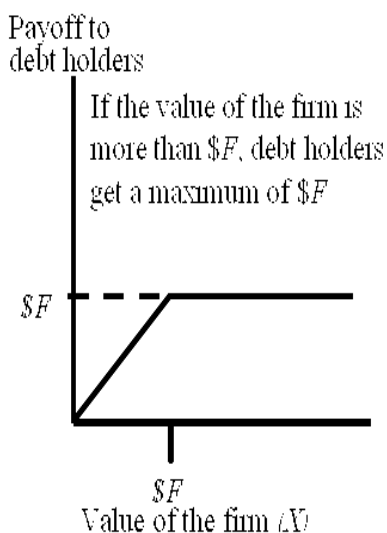
The Firm and the Financial Markets



Corporate Securities as Contingent Claims on Total Firm Value

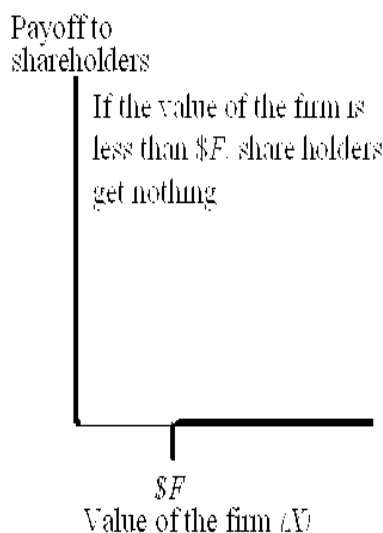
- ➔ The basic feature of a debt is that it is a promise by the borrowing firm to repay a fixed dollar amount of by a certain date.
- ➔ The shareholder's claim on firm value is the residual amount that remains after the debtholders are paid.
- ➔ If the value of the firm is less than the amount promised to the debtholders, the Shareholders get nothing

Debt and Equity as Contingent Claims



Debt holders are promised $\$F$
 If the value of the firm is less than $\$F$, they get the whatever the firm if worth

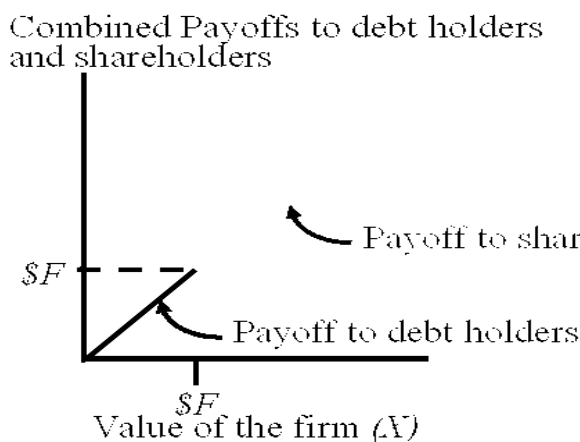
Algebraically, the bondholder's claim is:
 $\text{Min}[\$F, \$X]$



If the value of the firm is less than $\$F$, share holders get nothing
 If the value of the firm is more than $\$F$, share holders get everything above $\$F$

Algebraically, the shareholder's claim is:
 $\text{Max}[0, \$X - \$F]$

Combined Payoffs to Debt and Equity



Debt holders are promised $\$F$

The Corporate Firm

If the value of the firm is *less* than $\$F$, the shareholder's claim is:
 $\text{Max}[0, \$X - \$F] = \$0$ and the debt holder's claim is $\text{Min}[\$F, \$X] = \$X$.
 The sum of these is = $\$X$

If the value of the firm is *more* than $\$F$, the shareholder's claim is:
 $\text{Max}[0, \$X - \$F] = \$X - \F and the debt holder's claim is:

$\text{Min}[\$F, \$X] = \$F$.

The sum of these is = $\$X$

- The corporate form of business is the standard method for solving the problems encountered in raising large amounts of cash.
- However, businesses can take other forms.

Forms of Business Organization

- The Sole Proprietorship
- The Partnership
 - General Partnership
 - Limited Partnership
- The Corporation
- Advantages and Disadvantages
 - Liquidity and Marketability of Ownership
 - Control
 - Liability
 - Continuity of Existence
 - Tax Considerations

A Comparison of Partnership and Corporations

	Corporation	Partnership
Liquidity	Shares can easily be exchanged.	Subject to substantial restrictions.
Voting Rights	Usually each share gets one vote	General Partner is in charge; limited partners may have some voting
Taxation	Double	Partners pay taxes on distributions.
Reinvestment and dividend payout	Broad latitude	All net cash flow is distributed to partners.
Liability	Limited liability	General partners may have unlimited liability. Limited partners enjoy limited liability.
Continuity	Perpetual life	Limited life

Goals of the Corporate Firm

- The traditional answer is that the managers of the corporation are obliged to make efforts to maximize shareholder wealth.

The Set-of-Contracts Perspective

- The firm can be viewed as a set of contracts.
- One of these contracts is between shareholders and managers.
- The managers will usually act in the shareholders’ interests.
 - The shareholders can devise contracts that align the incentives of the managers with the goals of the shareholders.

- The shareholders can monitor the managers' behavior.
- This contracting and monitoring is costly.

Managerial Goals

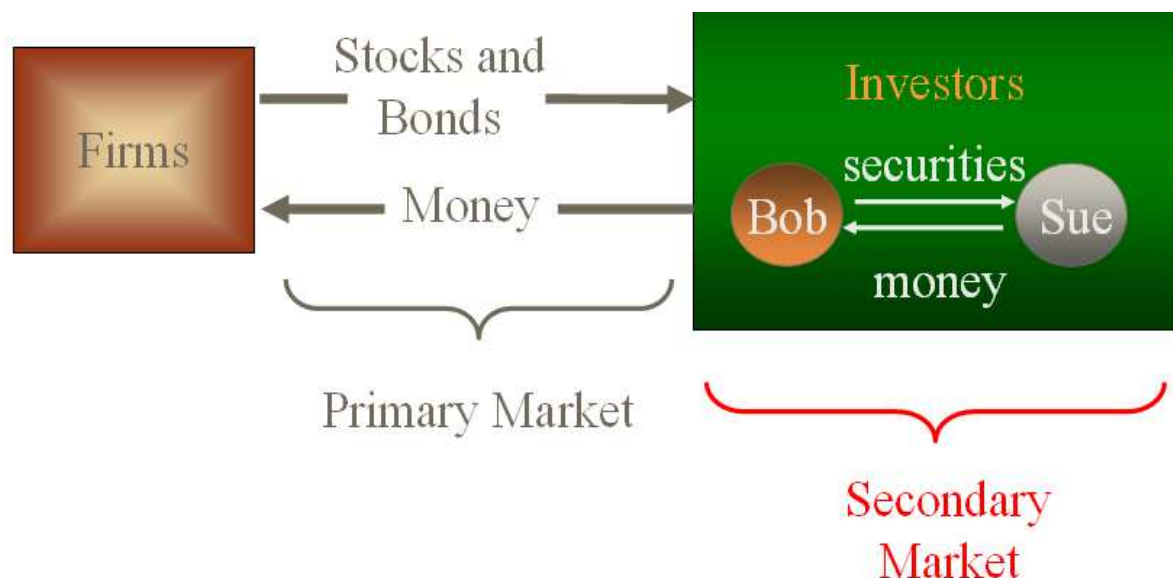
- Managerial goals may be different from shareholder goals
 - Expensive perquisites
 - Survival
 - Independence
- Increased growth and size is not necessarily the same thing as increased shareholder wealth.

Do Shareholders Control Managerial Behavior?

- Shareholders vote for the board of directors, who in turn hire the management team.
- Contracts can be carefully constructed to be *incentive compatible*.
- There is a market for managerial talent—this may provide *market discipline* to the managers—they can be replaced.
- If the managers fail to maximize share price, they may be replaced in a hostile takeover.

Financial Markets

- Primary Market
 - When a corporation issues securities, cash flows from investors to the firm.
 - Usually an underwriter is involved
- Secondary Markets
 - Involve the sale of “used” securities from one investor to another.
 - Securities may be exchange traded or trade over-the-counter in a dealer market.



Exchange Trading of Listed Stocks

- Auction markets are different from dealer markets in two ways:
 - Trading in a given auction exchange takes place at a single site on the floor of the exchange.
 - Transaction prices of shares are communicated almost immediately to the public.

Capital Budgeting

Chapter 2. Net Present Value and Other Investment Criteria

Chapter Outline

- **Net present value**
- **Payback**
- **Internal rate of return**
- **Crossover point**
- **Profitability index**
- **Mutually exclusive projects**
- **Multiple independent projects**

What is Capital Budgeting?

Capital Budgeting:

- ◆ *represents a long-term investment decision*
 - ◆ *for example, buy a new computer system or build a new plant*
- ◆ *involves the planning of expenditures for a project with a life of 1 or more years*
- ◆ *emphasizes amounts and timing of cash flows and opportunity costs and benefits*
 - ◆ *investment usually requires a large initial cash outflow with the expectation of future cash inflows*
- ◆ *considers only those cash flows that will change as a result of the investment all cash flows are calculated aftertax*

1. Net present value

Why Use Net Present Value?

- Accepting positive NPV projects benefits shareholders.
- ✓ NPV uses cash flows
- ✓ NPV uses all the cash flows of the project
- ✓ NPV discounts the cash flows properly

The Net Present Value (NPV) Rule

- Net Present Value (NPV) =
Total PV of future CF's + Initial Investment

$$\sum_{i=1}^T \frac{C_i}{(1+r)^i} + C_0 \quad \text{OR} \quad NPV = \sum_{i=1}^T \frac{C_i}{(1+r)^i} - C_0$$

➤ Estimating NPV:

- 1. Estimate future cash flows: how much? And when?
- 2. Estimate discount rate
- 3. Estimate initial costs

- Minimum Acceptance Criteria: Accept if $NPV > 0$
- Ranking Criteria: Choose the highest NPV

Good Attributes of the NPV Rule

- 1. Uses cash flows
- 2. Uses ALL cash flows of the project
- 3. Discounts ALL cash flows properly
- Reinvestment assumption: the NPV rule assumes that all cash flows can be reinvested at the discount rate.

Example:

You are considering a project which requires an initial investment of \$24,000. The project will produce cash inflows of \$8,000, \$9,800, \$7,600 and \$6,900 over the next four years, respectively.

What is the net present value of this project if the required rate of return is 12%?

Should this project be accepted?

$$\begin{aligned} NPV &= -\$24,000 + \frac{\$8,000}{(1+.12)^1} + \frac{\$9,800}{(1+.12)^2} + \frac{\$7,600}{(1+.12)^3} + \frac{\$6,900}{(1+.12)^4} \\ &= -\$24,000 + \$7,142.86 + \$7,812.50 + \$5,409.53 + \$4,385.07 \\ &= \$749.96 \end{aligned}$$

NPV = \$749.96 accept this project.

2. Payback

- How long does it take the project to “pay back” its initial investment?
- *Payback Period = number of years to recover initial costs*
- *Minimum Acceptance Criteria:*
 - *set by management*
- *Ranking Criteria:*
 - *set by management*
- *Disadvantages:*
 - *Ignores the time value of money*
 - *Ignores cash flows after the payback period*
 - *Biased against long-term projects*
 - *Requires an arbitrary acceptance criteria*
 - *A project accepted based on the payback criteria may not have a positive NPV*
- *Advantages:*
 - *Easy to understand*
 - *Biased toward liquidity*

Example: A project has an initial cost of \$199,000. The project produces cash inflows of \$46,000, \$54,000, \$57,500, \$38,900 and \$46,500 over the next five years, respectively. What is the payback period for this project?

Should the project be accepted if the required payback period is 3 years?

Year	Cash flow	Cumulative cash flow
1	\$46,000	\$ 46,000
2	\$54,000	\$100,000
3	\$57,500	\$157,500
4	\$38,900	\$196,400
5	\$46,500	\$242,900

$$\text{Payback} = 4 + \frac{\$199,000 - \$196,400}{\$46,500} = \frac{\$2,600}{\$46,500} = 4.0559 = 4.06 \text{ years}$$

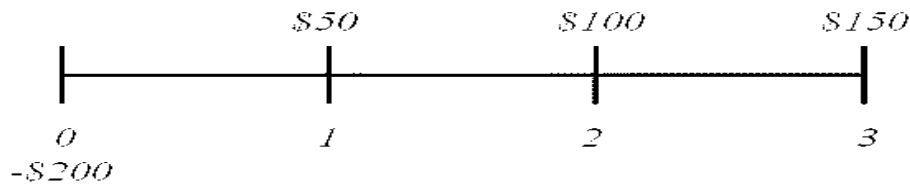
Accept the project

3. The Internal Rate of Return (IRR) Rule

- IRR: the discount that sets NPV to zero
- *Minimum Acceptance Criteria:*
 - *Accept if the IRR exceeds the required return.*
- *Ranking Criteria:*
 - *Select alternative with the highest IRR*
- *Reinvestment assumption:*
 - *All future cash flows assumed reinvested at the IRR.*
- *Disadvantages:*
 - *Does not distinguish between investing and borrowing.*
 - *IRR may not exist or there may be multiple IRR*
 - *Problems with mutually exclusive investments*
- *Advantages:*
 - *Easy to understand and communicate*

$$NPV = 0 = \sum_{i=1}^T \frac{C_i}{(1+IRR)^i} + C_0$$

Example: Consider the following project:

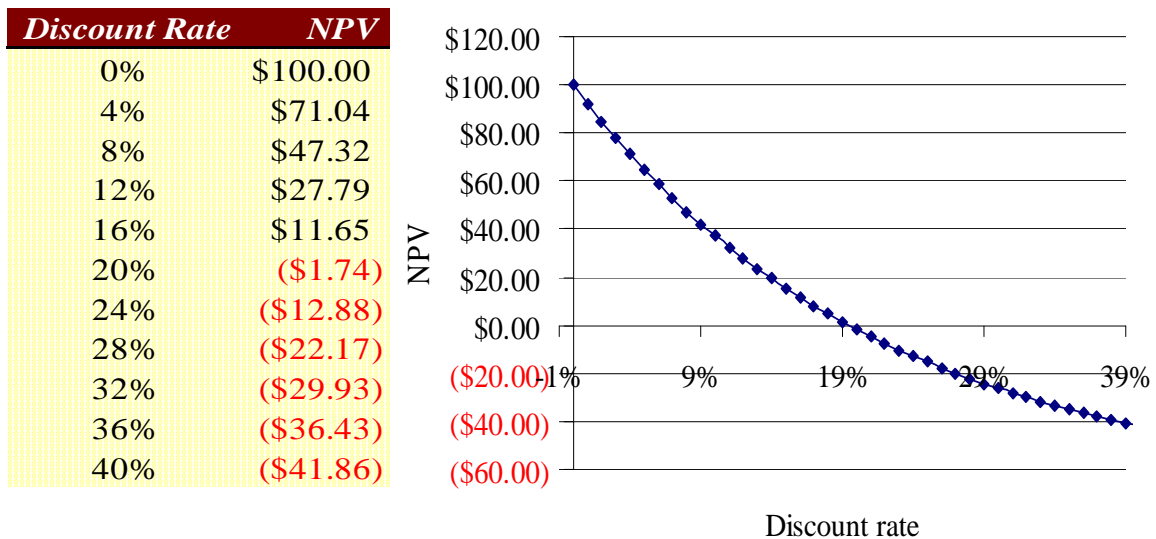


The internal rate of return for this project is **19.44%**

$$NPV = 0 = \frac{\$50}{(1+IRR)} + \frac{\$100}{(1+IRR)^2} + \frac{\$150}{(1+IRR)^3} - 200$$

The NPV Payoff Profile for This Example

If we graph NPV versus discount rate, we can see the IRR as the x-axis intercept.



- **Note:** *Mutually Exclusive Projects: only ONE of several potential projects can be chosen, e.g. acquiring an accounting system.*
 - *RANK all alternatives and select the best one.*
- *Independent Projects: accepting or rejecting one project does not affect the decision of the other projects.*
 - *Must exceed MINIMUM acceptance criteria.*

The Profitability Index (PI) Rule

$$PI = \frac{\text{Total PV of Future Cash Flows}}{\text{Initial Investent}} = 1 + \frac{NPV}{C_0}$$

- ✦ Minimum Acceptance Criteria:
 - ✦ Accept if $PI > 1$
- ✦ Ranking Criteria:
 - ✦ Select alternative with highest PI
- ✦ Disadvantages:
 - ✦ Problems with mutually exclusive investments
- ✦ Advantages:
 - ✦ May be useful when available investment funds are limited
 - ✦ Easy to understand and communicate
 - ✦ Correct decision when evaluating independent projects

The Practice of Capital Budgeting

- ✦ Varies by industry:
 - ✦ Some firms use payback, others use accounting rate of return.
- ✦ The most frequently used technique for large corporations is IRR or NPV.

Example of Investment Rules

Compute the IRR, NPV and payback period for the following two projects. Assume the required return is 10%.

Year	Project A	Project B
0	-\$200	-\$150
1	\$200	\$50
2	\$800	\$100
3	-\$800	\$150

	Project A	Project B
CF0	-\$200.00	-\$150.00
PV0 of CF1-3	\$241.92	\$240.80
NPV =	\$41.92	\$90.80
IRR =	0%, 100%	36.19%
PI =	1.2096	1.6053

Net Present Value Profile

Net Present Value Profile:

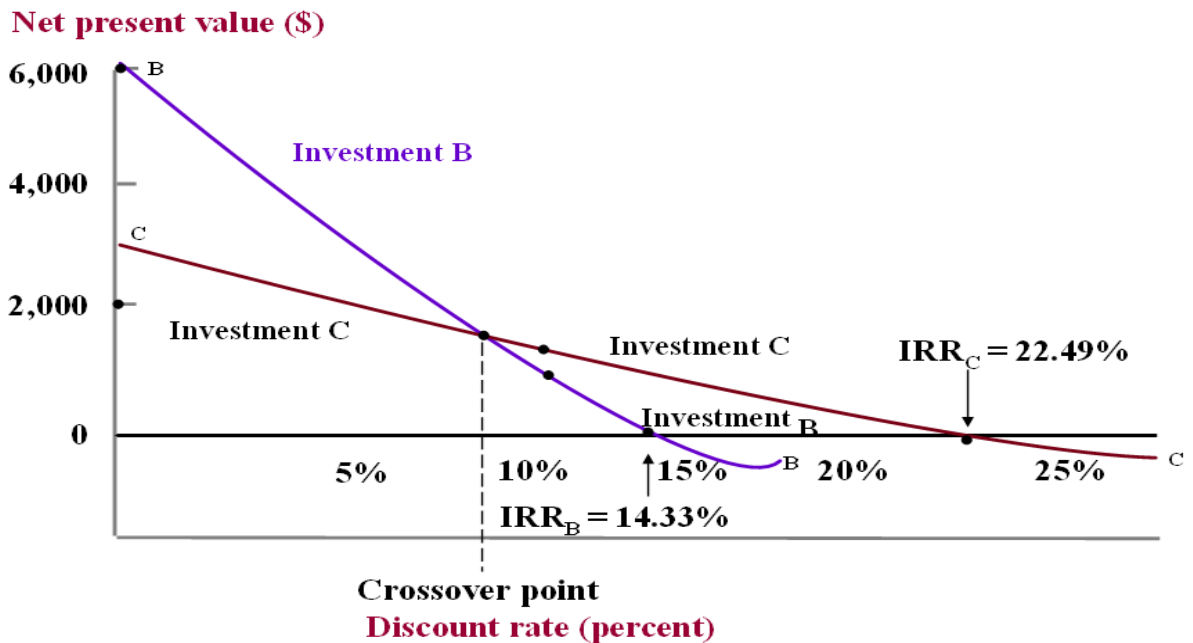
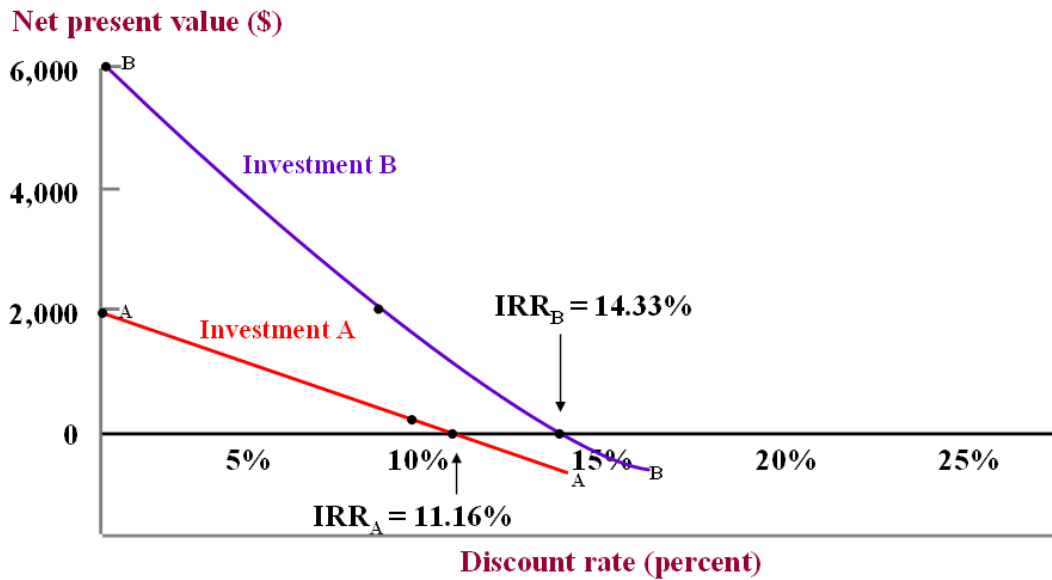
- ◆ a graph of the NPV of a project at different discount rates shows the NPV at 3 different points:
 - ◆ a zero discount rate
 - ◆ the normal discount rate (or cost of capital)
 - ◆ the IRR
- ◆ allows an easy way to visualize whether or not an investment should be undertaken

**Net Cash Inflows
(of a \$10,000 investment)**

Year	Investment A	Investment B	investment C
1.....	\$5,000	\$1,500	\$9,000
2....	5,000	2,000	3,000
3.....	2,000	2,500	1,200
4.....		5,000	
5.....		5,000	

Cost of capital $r = 10\%$

Net present value profile



Accept/Reject Decision

Payback Period (PP):

- ◆ if $PP < \text{cutoff period}$, accept the project
- ◆ if $PP > \text{cutoff period}$, reject the project

Internal Rate of Return (IRR):

- ◆ if $IRR > \text{cost of capital}$, accept the project
- ◆ if $IRR < \text{cost of capital}$, reject the project

Net Present Value (NPV):

- ◆ if $NPV > 0$, accept the project
- ◆ if $NPV < 0$, reject the project

Compute NPV and IRR in Microsoft Excel

1) Find NPV:

=npv(rate, value1,[value2],...)
 =npv(r,C1...Cn)+Co

2) Find IRR:

=irr(values,[guess])
 =irr(Co...Cn)

Addition:

Use The MS Excel: FV and PV

- FV(rate, nper, pmt,[pv],[type]) where:

-rate: ជាអត្រាការប្រាក់ក្នុងគ្រា

Nper: ចំនួនគ្រា

Pmt: ជាចំនួនទឹកប្រាក់ដែលបង់តាមកាលនីមួយៗ

PV: ជាតំលៃបច្ចុប្បន្ន

Type: សំរាប់កំណត់រយៈពេលជាក់ស្តែងដែលយើងត្រូវបង់ដែលមានជំរើសពី 0 និង 1

ដែល 0 ប្រើសំរាប់ករណីបង់ចុងគ្រា

1 ប្រើសំរាប់ករណីបង់ដើមគ្រា

Single Amount of FV and PV

You should type the formula:

$$=fv(\text{rate}, nper, 0, -pv, 0)$$
$$=pv(\text{rate}, nper, 0, -fv, 0)$$

Annuity

a) Ordinary of FVA

$$=fv(\text{rate}, nper, -pv, 0, 0)$$

b) FVA of Annuity Due:

$$=fv(\text{rate}, nper, -pv, 0, 1)$$

a) Ordinary of PVA

$$=pv(\text{rate}, nper, -pv, 0, 0)$$

b) PVA of Annuity Due:

$$=pv(\text{rate}, nper, -pv, 0, 1)$$

Web Resources

www.nacubo.org/website/members/bomag/cbg396.html A good article showing how capital budgeting is used in decision making

asbdc.ualr.edu/fod/1518.htm

How NPV analysis helps answer business questions

www.eastcentral.ab.ca/Courses/budgeting.html

Putting project cost analysis in perspective

End of Chapter 2

Problems on Chapter 2

P2-1: This problem will give you some practice calculating NPVs and paybacks. A proposed overseas expansion has the following cash flows:

Year	Cash Flow
0	-\$200
1	\$50
2	\$60
3	\$70
4	\$200

Calculate the payback period IRR, PI, and the NPV at a required return of 10 percent.

P2-2: Fuji Software, Inc. has the following projects.

Year	Project A	Project B
0	-\$7,500	-\$5,000
1	\$4,000	\$2,500
2	\$3,500	\$1,200
3	\$1,500	\$3,000

- a. Suppose Fuji's cutoff payback period is two years. Which of these two projects should be chosen?
- b. Suppose Fuji's uses the [NPV](#) rule to rank these two projects. If the approximate discount rate is 15 percent, which the project should be chosen?
- c. Compute PIA, and PIB

P2-3: CPC, Inc. has a project with the following cash flows.

Year	Cash Flows (\$)
0	-8,000
1	4,000
2	3,000
3	2,000

- a) Compute the internal rate of return ([IRR](#)) on the project.
- b) Suppose the approximate discount rate is 8 percent. Should the project be adopted by CPC?

P2-4: Assume a \$40,000 investment and the following cash flows for two alternatives:

Years	Investment X	Investment Y
1	\$6,000	\$15,000
2	8,000	20,000
3	9,000	10,000
4	17,000	_____
5	20,000	_____

Which of the alternative would you select under the payback method? If the inflow in the fifth year for Investment X were \$20,000,000 in stead of \$20,000, would your answer change under the payback method?

P2-5: Elgin Restaurant Supplies is analyzing the purchase of manufacturing equipment that will cost \$20,000. The annual cash inflows for the next three years will be:

Year	Cash Flow
1	\$ 10,000
2	9,000
3	6,500

Determine the internal rate of return (IRR) using interpolation. With a cost of capital of 20 percent, should the machine be purchased?

P2-6) Project M has a cost of \$35,000, and its expected net cash inflows are \$9,000 per year for 6 years.

- What is the project’s payback (to the closest year)?
- The cost of capital is 12 percent. What is the project’ net present value (NPV) ?
- What is the project’s internal rate of return (IRR)? (Hint: Recognize that the project is an annuity.)

P2-7 : The Danforth Tire Company is considering the purchase of a new machine that would increase the speed of manufacturing and save money. The net cost of this machine is \$66, 000. The annual cash flows have the following projections.

<i>Year</i>	<i>Cash Flows</i>
1	\$21,000
2	29,000
3	36,000
4	16,000
5	8,000

- If the cost of capital is 10 percent, what is the net present value (NPV)?
- What is the internal rate of return (IRR)
- Should the project be accepted? Why?

P2-8. What is the payback period for the following set of cash flows?

Year	Cash Flow
0	-\$2,500
1	\$400
2	\$1,600
3	\$700
4	\$300

P2-9. A firm evaluate all of its projects by applying the IRR rule. If the required return is 18 percent, should the firm accept the following project?

Year	Cash Flow
0	-\$30,000
1	\$25,000
2	\$0
3	\$15,000

P2-10. For cash flows in problem P2-9, suppose the firm uses the NPV decision rule. At a required return is 9 percent, should the firm accept this project? What if the required return was 19 percent?

P2-11. *Generation X, Inc., has identified the following two mutually exclusive projects:*

Year	Cash Flow (A)	Cash Flow (B)
0	-\$11,000	-\$11,000
1	\$4,000	\$1,000
2	\$5,000	\$6,000
3	\$6,000	\$5,000
4	\$1,000	\$5,000

a.) *What is the IRR for each of these projects? If you apply the IRR decision rule, which project should the company accept? Is this decision necessarily correct?*

b.) *If the required is 11 percent, what is the NPV for each of these projects? Which project will you choose if you apply the NPV decision rule?*

P2-12. *Consider the following two mutually exclusive projects:*

Year	Cash Flow (A)	Cash Flow (B)
0	-\$180,000	-\$18,000
1	\$10,000	\$10,000
2	\$25,000	\$5,000
3	\$25,000	\$3,000
4	\$380,000	\$2,000

Whichever project you choose, if any, you required a 15 percent return on your investment.

a) If you apply the payback criterion, which investment will you choose? Why?

b) If you apply the NPV criterion, which investment will you choose? Why?

c) If you apply the IRR criterion, which investment will you choose? Why?

P2-13.

Consider an investment which has the following cash flows:

Year	Cash Flow (\$)
0	(31,000)
1	10,000
2	20,000
3	10,000
4	10,000
5	5,000

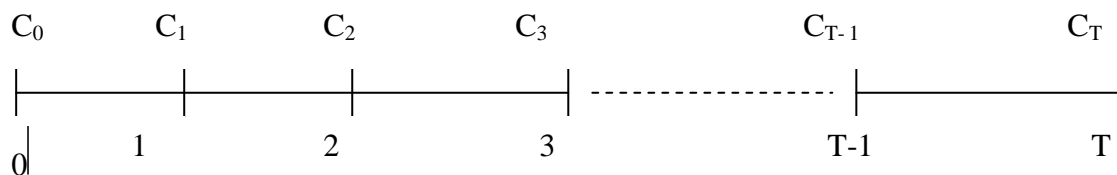
a) Compute the: (1) payback period ;(2) net present value (NPV); at 14 percent cost of capital; and (3) internal rate of return (IRR).

b) Based on (2) and (3) in part (a), make a decision about the investment. Should it be accepted or not?

Chapter 3 *Making Capital Investment Decisions*

Chapter Outline:

Incremental Cash Flows
Relevant costs
Relevant cash flows
Net working capital
MACRS depreciation
After-tax salvage value
Pro forma income statement
Project operating cash flow
Project net present value
Bottom-up OCF
Top-down OCF
Tax-shield OCF
Cost-cutting projects
Bid price
Equivalent annual cost



$NPV = f(C_T, r)$ we must find CT and r where
 $T = 0, 1, 2, 3, \dots, n$ but this chapter we know r

Fundamental Principles of Project Evaluation

The Basic Formula: The Project Cash Flow

Project Cash flow = project from operating cash flow - project change in net working capital - project capital spending

$$\begin{aligned} \text{Total Cash flow} = C_T &= OCF - \text{Change in NWC} - \text{Capital Spending} \\ &= OCF_T - \text{Changes in NWC}_T - CS_T \end{aligned}$$

Where:

➤ **Cash Flows from Operations(OCF)**

➤ Recall that:

$$\begin{aligned} \text{Operating Cash Flow} = OCF_T &= EBIT_T - \text{Taxes}_T + Dep_T \\ EBIT &= \text{Earnings Before Interest and Taxes} \end{aligned}$$

1. **Bottom-up approach to operating cash flow (OCF):**
 $OCF = \text{Net income} + \text{Depreciation}$
2. **Top-down approach to operating cash flow (OCF):**
 $OCF = \text{Sales} - \text{Costs} - \text{Taxes}$
3. **Tax shield approach to operating cash flow (OCF):**
 $OCF = (\text{Sales} - \text{Costs})(1 - T) - \text{Depreciation} \times T$

➤ **Net Capital Spending(CS)**

$$CS_T = NFA_T - NFA_{T-1} - Dep_T$$

where $NFA = \text{Net Fixed Assets}$

- Don't forget salvage value (after tax, of course).

$$\begin{aligned} \text{After-Tax Salvage Value} &= \text{Salvage Value} - \text{Taxes}(\text{Salvage Value} - \text{Book Value}) \\ &= SV_T - T(SV_T - BV_T) = MV_T - T(MV_T - BV_T) \\ &= SV_T(1 - T) \\ &= MV_T(1 - T) \text{ where } MV = \text{Market Value} \end{aligned}$$

➤ **Changes in Net Working Capital(NWC)**

$$\begin{aligned} NWC_T &= NWC_T - NWC_{T-1} \\ \text{Where } NWC_T &= CA_T - CL_T \end{aligned}$$

- Recall that when the project winds down, we enjoy a return of net working capital.

I. The cash flow identity
Cash flow from assets = Cash flow to creditors (bondholders) + Cash flow to stockholders (owners)
II. Cash flow from assets
Cash flow from assets = Operating cash flow – Net capital spending – Change in net working capital (NWC)
where:
Operating cash flow = Earnings before interest and taxes (EBIT) + Depreciation – Taxes
Net capital spending = Ending net fixed assets – Beginning net fixed assets + Depreciation
Change in NWC = Ending NWC – Beginning NWC
III. Cash flow to creditors (bondholders)
Cash flow to creditors = Interest paid – Net new borrowing
IV. Cash flow to stockholders (owners)
Cash flow to stockholders = Dividends paid – Net new equity raised

Example:

Cash Flow for Mara Corporation This problem will give you some practice working with financial statements and figuring cash flow. Based on the following information for Mara Corporation, prepare an income statement for 2007 and balance sheets for 2006 and 2007. Next, following our U.S. Corporation examples in the chapter, calculate cash flow from asset (=project cash flow). Use a 35 percent tax rate throughout. You can check your answers against ours, found in the following section.

	2006	2007
Sales	\$4,203	\$4,507
Cost of goods sold	2,422	2,633
Depreciation	785	952
Interest	180	196
Dividends	225	250
Current assets	2,205	2,429
Net fixed assets	7,344	7,650
Current liabilities	1,003	1,255
Long-term debt	3,106	2,085

Solution:

In preparing the balance sheets, remember that shareholders' equity is the residual. With this in mind, Mara's balance sheets are as follows:

MARA CORPORATION 2006 and 2007 Balance Sheets					
	2006	2007		2006	2007
Current assets	\$2,205	\$ 2,429	Current liabilities	\$1,003	\$ 1,255
Net fixed assets	<u>7,344</u>	<u>7,650</u>	Long-term debt	3,106	2,085
			Equity	<u>5,440</u>	<u>6,739</u>
			Total liabilities and		
Total assets	<u>\$9,549</u>	<u>\$10,079</u>	shareholders' equity	<u>\$9,549</u>	<u>\$10,079</u>

The income statement is straightforward:

MARA CORPORATION 2007 Income Statement	
Sales	\$4,507
Cost of goods sold	2,633
Depreciation	<u>952</u>
Earnings before interest and taxes	\$ 922
Interest paid	<u>196</u>
Taxable income	\$ 726
Taxes (35%)	<u>254</u>
Net income	<u>\$ 472</u>
Dividends	\$250
Addition to retained earnings	222

MARA CORPORATION 2007 Operating Cash Flow	
Earnings before interest and taxes	\$ 922
+ Depreciation	952
– Taxes	<u>254</u>
Operating cash flow	<u><u>\$1,620</u></u>

Ending net fixed assets	\$7,650
– Beginning net fixed assets	7,344
+ Depreciation	<u>952</u>
Net capital spending	<u><u>\$1,258</u></u>

Ending NWC	\$1,174
– Beginning NWC	<u>1,202</u>
Change in NWC	<u><u>–\$ 28</u></u>

MARA CORPORATION 2007 Cash Flow from Assets	
Operating cash flow	\$1,620
– Net capital spending	1,258
– Change in NWC	<u>–28</u>
Cash flow from assets	<u><u>\$ 390</u></u>

AN EXAMPLE: CASH FLOWS FOR DOLE COLA

This extended example covers the various cash flow calculations discussed in the chapter. It also illustrates a few variations that may arise.

Operating Cash Flow During the year, Dole Cola, Inc., had sales and cost of goods sold of \$600 and \$300, respectively? Depreciation was \$150 and interest paid was \$30. Taxes were calculated at a straight 34 percent. Dividends were \$30. (All figures are in millions of dollars.) What was operating cash flow for Dole? Why is this different from net income?

The easiest thing to do here is to create an income statement. We can then pick up the number we need. Dole Cola’s income statement is given here:

DOLE COLA 2007 Income Statement		
Net sales		\$600
Cost of goods sold		300
Depreciation		150
Earnings before interest and taxes		\$150
Interest paid		30
Taxable income		\$120
Taxes		41
Net income		<u>\$ 79</u>
Dividends	\$30	
Addition to retained earnings	49	

DOLE COLA 2007 Operating Cash Flow	
Earnings before interest and taxes	\$150
+ Depreciation	150
– Taxes	41
Operating cash flow	<u>\$259</u>

-Your firm has sales of \$231,800, costs of goods sold of \$187,000, interest expense of \$3,600, depreciation expense of \$11,300 and a tax rate of 34%.

What is your operating cash flow?

-Net capital spending

Your firm has ending net fixed assets of \$467,803 and beginning net fixed assets of \$503,498. The depreciation expense for the year is \$59,200.

What is the amount of your net capital spending for the year?

-Change in net working capital

Given the following information what is the change in net working capital (NWC)?

	<u>Beginning</u>	<u>Ending</u>
Cash	\$ 903	\$ 789
Accounts receivable	3,298	3,672
Inventory	6,129	5,032
Net fixed assets	11,973	12,530
Accounts payable	1,542	1,303
Long-term debt	10,200	9,300

Cash flow from assets

A firm has operating cash flow of \$18,500, change in net working capital of \$300 and additions to net capital spending of -\$1,200. What is the amount of the cash flow from assets?

■ Fundamental Principles of Project Evaluation:

Project evaluation - the application of one or more capital budgeting decision rules to estimated relevant project cash flows in order to make the investment decision.

Relevant cash flows - the incremental cash flows associated with the decision to invest in a project.

The incremental cash flows for project evaluation consist of *any and all* changes in the firm's future cash flows that are a direct consequence of taking the project.

Stand-alone principle - evaluation of a project based on the project's incremental cash flows.

Incremental Cash Flows

Incremental Cash Flows

■ Key issues:

- ◆ When is a cash flow incremental?
- ◆ Terminology

- A. Sunk costs
 - B. Opportunity costs
 - C. Side effects
 - D. Net working capital
 - E. Financing costs
 - F. Other issues
-

The Rule of Depreciation:

Through recent tax legislation, assets are classified according to nine categories that determine the allowance rate of depreciation write-off. Each class is referred to as a "**MACRS**"; MACRS stands for modified accelerated cost recovery system. Some references are also made to ADR, which stands for asset depreciation range, or the expected physical life of the assets or class of assets.

We now discuss some specifics of the depreciation system enacted by the Tax Reform Act of 1986. This system is a modification of the accelerated cost recovery system (**ACRS**) instituted in 1981.

Accelerated cost recovery system (ACRS):

A depreciation method under U.S. tax law allowing for the accelerated write-off of property under various classifications.

Example:

Class	Example
3-year	Equipment used in research
5-year	Autos, computers
7-year	Most industrial equipment

To illustrate how depreciation is calculated, we consider an automobile costing \$12,000. Autos are normally classified as five-year asset.

Table:

Year	MACRS	Cost	Depreciation
1	0.200	\$ 12,000	\$ 2,400.00
2	0.320	\$ 12,000	\$ 3,840.00
3	0.192	\$ 12,000	\$ 2,304.00
4	0.115	\$ 12,000	\$ 1,380.00
5	0.115	\$ 12,000	\$ 1,380.00
6	0.058	\$ 12,000	\$ 696.00
	<u>1.000</u>		<u>\$ 12,000.00</u>

Year	Beginning Book Value	Depreciation	Ending Book Value
1	\$ 12,000.00	\$ 2,400.00	\$ 9,600.00
2	\$ 9,600.00	\$ 3,840.00	\$ 5,760.00
3	\$ 5,760.00	\$ 2,304.00	\$ 3,456.00
4	\$ 3,456.00	\$ 1,380.00	\$ 2,076.00
5	\$ 2,076.00	\$ 1,380.00	\$ 696.00
6	\$ 696.00	\$ 696.00	\$ -

Example: A piece of newly purchased industrial equipment costs \$784,000 and is classified as seven-year property under MACRS. Calculate the annual depreciation allowances and end-of-the-year book value for this equipment.

CASE 1: Find NPV using the OCF

Assume you purchase a \$50,000 asset that falls in the five-year MACRS category. It will produce income of \$18,500 for the first three years before deductions for depreciation and taxes. In the last three years, the income before depreciation and taxes will be \$12,000. Furthermore, we will assume a corporate tax rate of 35 percent and a cost of capital of 10 percent for the analysis. Should the investment be undertaken?

Year	MACRS	Cost	Depreciation
1	0.200	\$ 50,000	\$ 10,000.00
2	0.320	\$ 50,000	\$ 16,000.00
3	0.192	\$ 50,000	\$ 9,600.00
4	0.115	\$ 50,000	\$ 5,750.00
5	0.115	\$ 50,000	\$ 5,750.00
6	0.058	\$ 50,000	\$ 2,900.00
	<u>1.000</u>		<u>\$ 50,000.00</u>

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Earnings before depreciation and Taxes (EBDT).....	\$ 18,500	\$ 18,500	\$ 18,500	\$ 12,000	\$ 12,000	\$ 12,000
Depreciation	\$ 10,000	\$ 16,000	\$ 9,600	\$ 5,750	\$ 5,750	\$ 2,900
Earnings before taxes	\$ 8,500	\$ 2,500	\$ 8,900	\$ 6,250	\$ 6,250	\$ 9,100
Taxes 35%	\$ 2,975	\$ 875	\$ 3,115	\$ 2,188	\$ 2,188	\$ 3,185
Earnings after taxes	\$ 5,525	\$ 1,625	\$ 5,785	\$ 4,063	\$ 4,063	\$ 5,915
Depreciation	\$ 10,000	\$ 16,000	\$ 9,600	\$ 5,750	\$ 5,750	\$ 2,900
Cash flow	\$ 15,525	\$ 17,625	\$ 15,385	\$ 9,813	\$ 9,813	\$ 8,815

$$NPV = \frac{\$15,525}{(1.01)^1} + \frac{\$17,625}{(1.01)^2} + \frac{\$15,385}{(1.01)^3} + \frac{\$9,813}{(1.01)^4} + \frac{\$9,813}{(1.01)^5} + \frac{\$8,815}{(1.01)^6} - \$50,000 = \$7,991$$

NPV = \$7,991 > 0; ⇒ Accepted the project.

CASE 2: Find NPV

Bendog’s Franks is looking at a new sausage system with an installed cost of \$305,000. This cost will be depreciated straight-line to zero over the project’s five-year life, at the end of which the sausage system can be scrapped for \$60,000. The sausage system will save the firm \$90,000 per year in pretax operating costs, and the system requires an initial investment in net working capital of \$27,000. If the tax rate is 34 percent and the discount rate is 10 percent, what is the NPV of this project?

Solution

Years	0	1	2	3	4	5
Savings		\$90,000	\$90,000	\$90,000	\$90,000	\$90,000
Depreciation		61,000	61,000	61,000	61,000	61,000
Taxable Income		29,000	29,000	29,000	29,000	29,000
Taxes		9,860	9,860	9,860	9,860	9,860
Net Income		19,140	19,140	19,140	19,140	19,140
Add: Depreciation		61,000	61,000	61,000	61,000	61,000
Operating Cash Flow		80,140	80,140	80,140	80,140	80,140
Initial Investment	(\$305,000)					
NWC	(27,000)					
Salvage Value						39,600
Project Cash Flow	(\$332,000)	\$80,140	\$80,140	\$80,140	\$80,140	\$119,740
NPV		\$13,147				

Web Resources

www-ec.njit.edu/~mathis/interactive/FCCalcBase4.html

www.doubleclick.net

www.4pm.com/articles/palette.html

www.irs.ustreas.gov/prod/bus_info/index.html

End of Chapter 3.

Problems of Chapter 3.

P3-1. Consider the following income statement:

Sales	\$956,750
Costs	\$574,050
Depreciation	\$109,000
EBIT	?
Taxes(34%)	?
Net income	?

Fill in the missing numbers and then calculate the OCF. What is the depreciation tax shield?

P3-2. A proposed new project has projected sales of \$75,000, costs of \$40,000, and depreciation of \$2,500. The tax rate is 34 percent. Calculate operating cash flow using the four approaches described in the chapter and verify that the answer is the same in each case.

P3-3. A piece of newly purchased industrial equipment costs \$736, 000 and is classified as seven-year property under MACRS. Calculate the annual depreciation allowances and end-of – the-year book value for this equipment.

P3-4*. *Based on the following information for project X, should we undertake venture? To answer, first prepare a pro forma income statement for each year. Next, calculate operating cash flow. Finish the problem by determining total cash flow and the calculating NPV assuming a 28 percent required return. Use a 34 percent tax rate throughout. For help, look back at our shark attractant and power mulcher examples.*

Project X involves a new type of graphite composite in –line skate wheel. We think we sell 6,000 units per year at a price of \$1,000 each. Variable costs will run about \$400 per unit, and the product should have a four- year life. Fixed costs for the project will run \$450,000 per year. Further, we will need to invest a total of \$1,250,000 in manufacturing equipment. The equipment is seven-year MACRS property for tax purposes. If four years, the equipment will be worth about half of what we paid of it. We will have to invest \$1,150,000 in net working capital at the start. After that, net working capital requirement will be 25 percent of sales.

P3-5. Mont Blanc Livestock Pens, Inc., has projected a sales volume of \$1,650 for the second year of a proposed expansion project. Costs normally run 60 percent of sale, or about \$990 in this case. The depreciation expense will be \$100, and the tax rate is 35 percent. What is the operating cash flow? Calculate your answer using all of the approaches(including the top-down, bottom- up, and tax shield approaches) described in the chapter.

P3-6: A project is expected to generate \$48,400 in sales, \$31,500 in costs and \$7,500 in depreciation expense.

What is the projected net income for this project if the applicable tax rate is 34%?

P3-7: Betty’s Boutique is considering a project with projected sales of \$46,000. Costs are estimated at \$29,500. The project will require \$20,000 initially for the purchase of new equipment. This equipment will be depreciated using straight line depreciation to a zero book value over the four year life of the project. The equipment will be worthless at the end of the four years. The tax rate is 35%.

What is the amount of the projected annual operating cash flow for this project?

P3-8: Assume a corporation has earnings before depreciation and taxes of \$100,000, and depreciation of \$50,000 and that it has a 30 percent tax bracket. Compute its cash flow using the format below.

Earnings before depreciation and taxes	_____
Depreciation	_____
Earnings before taxes	_____
Taxes @ 30%	_____
Earnings after taxes	_____
Depreciation	_____
Cash flow	_____

P3-9: The Summit Petroleum Corporation will purchase an asset that qualifies for three-year MACRS depreciation. The cost is \$80,000 and the asset will provide the following stream of earnings before depreciation and taxes for the next four years:

Year1.....	\$36,000
Year2.....	40,000
Year 3.....	31,000
Year 4.....	19,000

The firm is in a 35 percent tax bracket and has an 11 percent cost of capital. Should it purchase the asset? Use the net present value method.

P3-10: Propulsion Labs will acquire new equipment that falls under the five-year MACRS category. The cost is \$200,000. If the equipment is purchased, the following earnings before depreciation and taxes will be generated for the next six years.

Year 1.....	\$75,000
Year 2.....	70,000
Year 3	55,000
Year 4.....	35,000
Year 5.....	25,000
Year 6.....	21,000

The firm is in a 30 percent tax bracket and has a 14 percent cost of capital. Should Propulsion Labs purchase the equipment? Use the net present value method.

P3-11:

Clinton Carbide, Inc. is considering a new three-year expansion project that requires an initial fixed asset investment of \$1.8 million. The fixed asset will be depreciated straight-line to zero over its three-year tax life, after which time it will be worthless. The project is estimated to generate \$1,850,000 in annual sales, with costs of \$650,000. If the tax rate is 35%, what is the OCF for this project?

P3-12: Your firm is contemplating the purchase of a new \$925,000 computer- based order entry system. The system will be depreciated straight –line to zero over its five-year life. It will be worth \$90,000 at the end of that time. You will save \$360,000 before tax per year in order

processing costs and will be able to reduce working capital by \$125,000 (this is a one-time reduction). If the tax rate is 40 percent, what are NPV and IRR for this project?

P3-13: Bendog's Franks is looking at a new sausage system with an installed cost of \$420,000. This cost will be depreciated straight-line to zero over the project's five-year life, at the end of which the sausage system can be scrapped for \$60,000. The sausage system will save the firm \$130,000 per year in pretax operating costs, and the system requires an initial investment in net working capital of \$28,000. If the tax rate is 34 percent and the discount rate is 10 percent, what are the NPV and IRR of this project?

P3-14: Consider an asset that costs Au\$380,000 and is depreciated straight-line to zero over its eight-year tax life. The asset is to be used in a five-year project; at the end of the project, the asset can be sold for Au\$42,000. The relevant tax rate is 35 percent, what is the after-tax cash flow from the sale of this asset?

Depreciations Year	3-Year MACRS	5-Year MACRS	7-Year MACRS	10-Year MACRS	15-Year MACRS	20-Year MACRS
1.....	0.333	0.200.....	0.143.....	0.100.....	0.050.....	0.038
2.....	0.445.....	0.320.....	0.245.....	0.180.....	0.095.....	0.072
3.....	0.148.....	0.192.....	0.175.....	0.144.....	0.086.....	0.067
4.....	0.074.....	0.115.....	0.125.....	0.115.....	0.077.....	0.062
5.....		0.115.....	0.089.....	0.092.....	0.069.....	0.057
6.....		0.058	0.089	0.074	0.062	0.053
7.....			0.089	0.066	0.059	0.045
8.....			0.045	0.066	0.059	0.045
9.....				0.065	0.059	0.045
10.....				0.065	0.059	0.045
11.....				0.033	0.059	0.045
12.....					0.059	0.045
13.....					0.059	0.045
14.....					0.059	0.045
15.....					0.059	0.045
16.....					0.030	0.045
17.....						0.045
18.....						0.045
19.....						0.045
20.....						0.045
21.....						0.017

MACRS=Modified Accelerated Cost Recovery System.

Chapter 4. Capital Budgeting Under Risk.

What is Risk?

- ◆ Investment proposals are judged on the basis of **return** and **risk**
- ◆ Risk means **uncertainty** about a future outcome OR probability loss in the future.
- ◆ Investments are risky because future cash flows will likely **vary** from forecasts
- ◆ Risk varies greatly, depending on the investment:
 - ◆ A T-Bill has zero or no risk
 - ◆ Nortel at \$120 had high risk
- ◆ Most investors and managers don't like risk
- ◆ The maximum risk acceptable depends on the investor's **aversion to risk**
- ◆ The higher the risk, the higher the required **return**

INTRODUCTION

Risk analysis is important in making capital investment decisions because of the large amount of capital involved and the long-term nature of the investments being considered. The higher the risk associated with a proposed project, the greater the rate of return that must be earned on the project to compensate for that risk.

MEASURE OF RISK

- ◆ Compute the Expected Value, Standard Deviation, and Coefficient of Variation
- ◆ Compare the risk of the investment to the company's Beta
- ◆ Increase the discount rate for riskier projects
- ◆ Certainty equivalents - adjust cash flows estimates for risk
- ◆ Use computer simulations to generate a range of possible outcomes with standard deviations
- ◆ Sensitivity analysis - How much does NPV change when one item in forecast changes?
- ◆ Use decision tree to compare the return and risk of alternate investments
- ◆ Coefficient of Correlation - How will an investment change the overall risk of the firm?

Statistical Measurement of Risk

Expected Value:

- ◆ equals the weighted average of possible outcomes (forecasts) times their probabilities
- ◆ Gives you the most likely forecast / your best estimate

Standard Deviation:

- ◆ measure of dispersion or variability around the expected value
- ◆ gives you a measure of the spread of possible outcomes
- ◆ **larger the standard deviation → greater the risk**

Coefficient of Variation:

- ◆ equal to standard deviation / expected value
- ◆ allows you to compare different investments
- ◆ **larger the coefficient of variation → greater the risk**

Risk, a measure of the dispersion around a probability distribution, is defined as the variation of cash flow around the expected value. Risk can be measured in either *absolute or relative terms*. First, the expected value \bar{R} is:

$$\bar{R} = \sum_{i=1}^n R_i P_i$$

Where R_i = the value of the i th possible outcome

P_i = the probability that the i th outcome will occur

n = the number of possible outcomes

Then, the absolute risk is measured by the *variance and standard deviation*:

$$\sigma^2 = (R_i - \bar{R})^2 P_i$$

$$\sigma = \sqrt{\sigma^2}$$

The relative risk is measured by the *Coefficient of Variation (CV)*.

$$CV = \frac{\sigma}{\bar{R}}$$

Note: -the higher of CV, the higher of the Risk of the Project.

-The lower of CV, the lower of the risk of the project.

Example: The ABC Corporation is considering investment in one of two mutually exclusive projects. Depending on the state of the economy, the projects would provide the following cash inflows in each of the next 5 years.

State	Probability	Proposal A	Proposal B
Recession	0.3	\$1,000.00	\$ 500.00
Normal	0.4	\$2,000.00	\$2,000.00
Boom	0.3	\$3,000.00	\$5,000.00

To compute the expected value (\bar{R}), the standard deviation (σ), and the coefficient of variation (CV).

Proposal A :

R_i	P_i	$R_i P_i$	\bar{R}	$R_i - \bar{R}$	$(R_i - \bar{R})^2$	$(R_i - \bar{R})^2 P_i$
\$ 1,000	0.3	\$ 300	\$ 2,000	\$ (1,000)	\$ 1,000,000	\$ 300,000
\$ 2,000	0.4	\$ 800	\$ 2,000	\$ -	\$ -	\$ -
\$ 3,000	0.3	\$ 900	\$ 2,000	\$ 1,000	\$ 1,000,000	\$ 300,000
		<u>\$ 2,000</u>			σ^2	<u>\$ 600,000</u>
					σ	<u>775</u>
				CV		<u>39</u>

For Proposal B

R_i	P_i	$R_i P_i$	\bar{R}	$R_i - \bar{R}$	$(R_i - \bar{R})^2$	$(R_i - \bar{R})^2 P_i$
\$ 500	0.3	\$ 150	\$ 2,450	\$ (1,950)	\$ 3,802,500	\$ 1,140,750
\$ 2,000	0.4	\$ 800	\$ 2,450	\$ (450)	\$ 202,500	\$ 81,000
\$ 5,000	0.3	\$ 1,500	\$ 2,450	\$ 2,550	\$ 6,502,500	\$ 1,950,750
		<u>\$ 2,450</u>			σ^2	<u>\$ 3,172,500</u>
					σ	<u>1781</u>
				CV		<u>73</u>

Beta

$$\beta_i = \frac{Cov(R_i, R_M)}{Var(R_M)} = \frac{\sigma_{i, M}}{\sigma_M^2}$$

$$\beta_i = \text{Expected value of } [(R_i - \bar{R}_i)(R_M - \bar{R}_M)]$$

$$\beta_i = \frac{\sum (R_i - \bar{R}_i)(R_M - \bar{R}_M)}{\sum (R_M - \bar{R}_M)^2}$$

- ◆ *Beta is a statistical measure of volatility*
- ◆ *It measures how responsive or sensitive a company's stock is to market movements in general*
- ◆ *An individual stock's beta shows how it compares to the market as a whole:*
- ◆ *beta = 1 means equal risk with the market*
- ◆ *beta > 1 means more risky than the market*
- ◆ *beta < 1 means less risky than the market*
- ◆
- ◆ *Company risk may provide guideline to risk of a new investment in that company*

RISK ANALYSIS IN CAPITAL BUDGETING

Since different investment projects involve different risks, it is important to incorporate risk into the analysis of capital budgeting. There several methods for incorporating risk, including:

- c) *Probability distributions*
- d) *Risk –adjusted discount rate*
- e) *Certainty equivalent*
- f) *Simulation*
- g) *Sensitivity analysis*
- h) *Decision trees (or probability trees)*

A) Probability Distributions

Expected values of a probability distribution may be computed. Before any capital budgeting method is applied, compute the expected cash inflows or, in some cases, the expected life of the asset.

Example: The Connors Company is considering a \$60,000 investment in a machine that will reduce operating costs. The following estimates regarding cash savings, along with their probabilities of occurrence, have been made:

Annual Cash Savings		Useful Life	
Event	Probability	Event	Probability
\$20,000	0.3	9 year	0.4
\$14,000	0.3	8 year	0.4
\$12,000	0.4	6 year	0.2

Compute the expected annual cash savings and useful life. Determine whether the machine should be purchased, using the NPV method and cost of capital is 16 %.

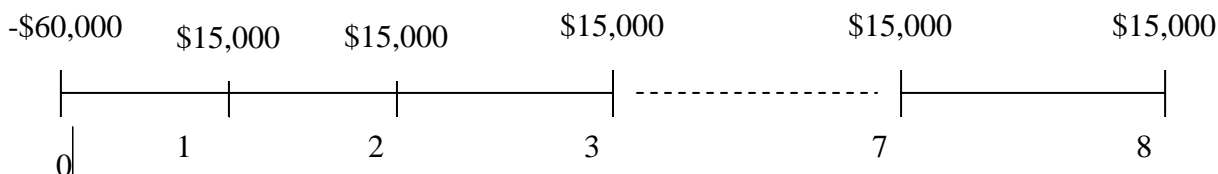
Solution:

Compute the expected annual cash savings and useful life

Event (R _i)	Probability P _i	Expected Value	\bar{R}
\$ 20,000	0.30	\$6,000	
\$ 14,000	0.30	\$4,200	
\$ 12,000	0.40	\$4,800	
	1.00	\$15,000	

Useful life

Event (R _i)	Probability P _i	Expected Value	\bar{R}
9 Years	0.30		3 Years
8 Years	0.30		2 Years
6 Years	0.40		2 Years
	1.00		8



\$ (60,000) \$ 15,000 \$ 15,000 \$ 15,000 \$ 15,000 \$ 15,000 \$ 15,000 ##### \$ 15,000
r 16%

NPV 5,153.86

B) Risk-adjusted Discount Rate (RADR):

A value equal to the riskless (risk-free) interest rate plus a risk premium. The risk-free rate ideally is the pure time value of money, and the risk premium represents a judgment as to the additional return necessary to compensate for additional risk.

$$k = R_f + RP; \text{ Required Return} = \text{Base Rate} + \text{Risk Premium}$$

$$\text{RADR} = \text{WACC} + \text{Risk Premium}$$

Example: A firm is considering an investment project with an expected life of 3 years. It requires an initial investment of \$35,000. The firm estimates the following data in each of the next 3 years:

After-Tax Cash Inflow	Probability
-\$5,000	0.2
\$10,000	0.3
\$30,000	0.3
\$50,000	0.2

Assuming a risk-adjusted required rate of return (after taxes) of 20 percent is approximate for the investment projects of this level of risk, compute the risk-adjusted NPV.

Solution:

$$C = \text{Annuity} = \bar{R} = -\$5,000(0.2) + \$10,000(0.3) + \$30,000(0.3) + \$50,000(0.2) = \$21,000$$

$$\text{NPV} = \$21,000(\text{PVA}_{20\%,3}) - \$35,000 = \underline{\underline{\$9,237}}$$

C) Certainty equivalent:

A certain (risk-free) cash flow that would be acceptable as opposed to the expected value of a risky cash flow. The ratio of these cash flows determines the CE coefficient (α).

$$\alpha = \frac{\text{Riskless cash flow}}{\text{Risky Cash Flow}}$$

Once certainty equivalent coefficients are obtained, they are multiplied by the original cash flow to obtain the equivalent certain cash flow. Then, the accept-or-reject decision is made, using the normal capital budgeting criteria. The risk-free rate of return is used as the discount rate under the NPV method and as the cutoff rate under the IRR method.

Example: XYZ inc, with a 14 percent cost of capital after taxes is considering a project with an expected life of 4 years. The project requires an initial certain cash outlay of \$50,000. The expected cash inflows and certainty equivalent coefficients are as follows:

Year	After-Tax Cash Flow(\$)	Certainty Equivalent Coefficient
1	10,000	0.95
2	15,000	0.80
3	20,000	0.70
4	25,000	0.60

The risk-free rate of return is 5 percent; compute the NPV.

Solution:

Year	After-Tax Cash Flow(\$)	Certainty Equivalent Coefficient	Equivalent Certain Cash flow(\$)	PV at 5%	PV(\$)
1	10,000	0.95	9,500	0.9524	9,048
2	15,000	0.80	12,000	0.9070	10,884
3	20,000	0.70	14,000	0.8638	12,093
4	25,000	0.60	15,000	0.8227	12,341
					<u>44,366</u>

$\Rightarrow NPV = \$44,366 - \$50,000 = \underline{\underline{-\$5,634}}$

D) Simulation:

This risk analysis method is frequently called the Monte Carlo simulation. It requires that a probability distribution be constructed for each of the important variables affecting the project’s cash flows. Since a computer is used to generate many results using random numbers, project simulation is expensive.

E) Sensitivity Analysis

Forecasts of many calculated NPVs under various alternative functions are compared to see how sensitive NPV is to changing conditions. It may be found that a certain variable or group of variables, once their assumptions are changed or relaxed, drastically alters the NPV. This results in a much riskier asset that was originally forecast.

F) Decision Trees:

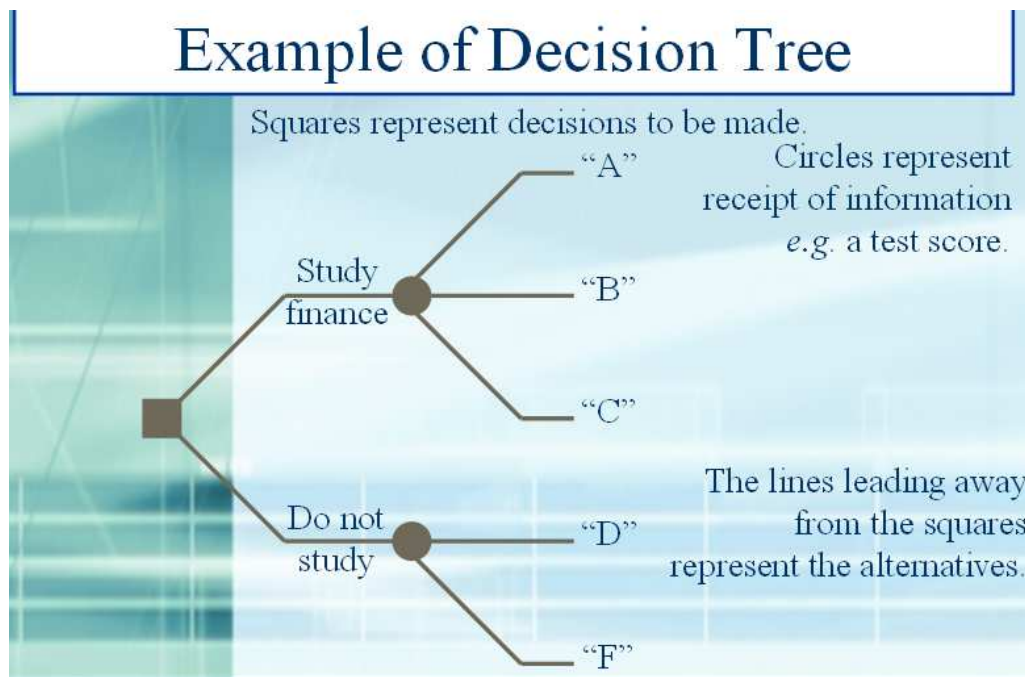
- Allow us to graphically represent the alternatives available to us in each period and the likely consequences of our actions.
- This graphical representation helps to identify the best course of action.

Some firms use decision trees (probability trees) to evaluate the risk of capital budgeting proposals. A decision tree is a graphical method of showing the sequence of possible outcomes. A capital budgeting tree would show the cash flows and **NPV** of the project under different possible circumstances. The decision tree method has the following advantage: *(1) It visually lays out all the possible outcomes of the proposed project and makes management aware of the adverse possibilities, and(2) the conditional nature of successive years’ cash flows can be expressly depicted. The primary disadvantage is that most problems are too complex to permit a year-by-year depiction.* For example, for a 3-year project with three possible outcomes following each year, there are 27 paths. For a 10-year project (again with three possible outcomes following each year) there will be about 60,000 paths.

Example: A firm has an opportunity to invest in a machine which will last 2 years, initially cost \$125,000 and has the following estimated possible after-tax cash flow pattern: In year 1, there is a 40 percent chance that the after-tax cash inflow will be \$45,000, a 25 percent chance that it will be \$65,000, and a 35 percent chance that it will be \$90,000. In year 2, the after-tax cash inflow possibilities depend on the cash inflow that occurs in year 1; that is, the year 2 after-tax cash inflows are *conditional probabilities*. Assume that the firm's after-tax cost of capital is 12 percent. The estimated conditional after-tax cash inflows (ATCI) and probabilities are given below.

If ATCI ₁ = \$45,000		If ATCI ₁ = \$65,000		If ATCI ₁ = \$90,000	
ATCI ₂ (\$)	Probability	ATCI ₂ (\$)	Probability	ATCI ₂ (\$)	Probability
30,000	0.3	80,000	0.2	90,000	0.1
60,000	0.4	90,000	0.6	100,000	0.8
90,000	0.3	100,000	0.2	110,000	0.1

.....



Stewart Pharmaceuticals

- The Stewart Pharmaceuticals Corporation is considering investing in developing a drug that cures the common cold.
- A corporate planning group, including representatives from production, marketing, and engineering, has recommended that the firm go ahead with the test and development phase.
- This preliminary phase will last one year and cost \$1 billion. Furthermore, the group believes that there is a 60% chance that tests will prove successful.
- If the initial tests are *successful*, Stewart Pharmaceuticals can go ahead with full-scale production. This investment phase will cost \$1.6 billion. Production will occur over the next 4 years.

Stewart Pharmaceuticals NPV of Full-Scale Production following Successful Test

Investment	Year 1	Years 2-5
Revenues		\$4,050
Variable Costs		(1,735)
Fixed Costs		(1,800)
Depreciation		(400)
Pretax profit		\$115
Tax (34%)		(39.10)
Net Profit		\$75.90
Cash Flow	-\$1,600	\$475

$$NPV = -\$1,600 + \sum_{f=1}^4 \frac{\$475.90}{(1.10)^f} = -\$91.461$$

Note that the NPV is calculated as of date 1, the date at which the investment of \$1,600 million is made. Later we bring this number back to date 0.

Investment	Year 1	Years 2-5
Revenues		\$7,000
Variable Costs		(3,000)
Fixed Costs		(1,800)
Depreciation		(400)
Pretax profit		\$1,800
Tax (34%)		(612)
Net Profit		\$1,188
Cash Flow	-\$1,600	\$1,588

$$NPV = -\$1,600 + \sum_{f=1}^4 \frac{\$1,588}{(1.10)^f} = \$3,433.75$$

Note that the NPV is calculated as of date 1, the date at which the investment of \$1,600 million is made. Later we bring this number back to date 0.

Decision Tree for Stewart Pharmaceutical



Stewart Pharmaceutical: Decision to Test

- Let's move back to the first stage, where the decision boils down to the simple question: should we invest?
- The expected payoff evaluated at date 1 is:

$$\text{Expected payoff} = \left(\text{Prob.}_{\text{success}} \times \text{Payoff}_{\text{given success}} \right) + \left(\text{Prob.}_{\text{failure}} \times \text{Payoff}_{\text{given failure}} \right)$$

$$\text{Expected payoff} = (60 \times \$3,433.75) + (40 \times \$0) = \$2,060.25$$

The NPV evaluated at date 0 is:

$$NPV = -\$1,000 + \frac{\$2,060.25}{1.10} = \$872.95$$

So we should test.

Solved Problems

P4-1. Expected Value and Standard Deviation. The Lendel Company is considering investment in one of two mutually exclusive projects. They have the following cash inflowing for each of the next 3 years:

Probability	Cash Inflows (\$)	
	Project A	Project B
0.1	3,000	3,000
0.25	3,500	4,000
0.3	4,000	5,000
0.25	4,500	6,000
0.1	5,000	7,000

Calculate (a) the expected value (expected cash inflow) of each project ; (b) the standard deviation of each project; and (c) the coefficient of variation. (d) Which project has the greater degree of risk? Why?

P4.2. Coefficient of variation. McEnro wishes to decide between two projects, X and Y. By using probability estimates, he has determined the following statistics:

	Project X	Project Y
Expected NPV	\$35,000	\$20,000
σ	\$22,000	\$20,000

(a) Compute the coefficient of variation for each project, and (b) explain why σ and the coefficient of variation give different rankings of risk. Which method is better?

P4.3. NPV Analysis Under Risk. The Connors Company is considering a \$60,000 investment in a machine that will reduce operating costs. The following estimates regarding cash savings, along with their probabilities of occurrence, have been made:

Annual Cash Savings		Useful Life	
Event	Probability	Event	Probability
\$20,000	0.3	9 year	0.4
\$14,000	0.3	8 year	0.4
\$12,000	0.4	6 year	0.2

- (a) Compute the expected annual cash savings and useful life. Determine whether the machine should be purchased, using the NPV method.
- (b) The company wishes to see whether the machine would be a good investment if each of its most pessimistic estimates, but not both at the same time, came true. Determine whether the investment would be desirable if: (1) the useful life is the expected value computed in part (a), and annual cash flows are only \$12,000; (2) the annual cash flows are equal to the expected value computed in part (a) and the useful life is only 6 years.

P4.4. Expected NPV and Risk. The administrator of ABC Hospital is considering the purchase of new operating room equipment at a cost of \$7,500. The surgical staff has furnished the following estimates of useful life and cost savings. Each useful life estimate is independent of each cost savings.

Years of Estimated Useful Life	Probability of Occurrence	Estimated Cost Savings	Probability of Occurrence
4	0.25	\$1,900	0.30
5	0.50	\$2,000	0.40
6	<u>0.25</u>	\$2,100	<u>0.30</u>
	<u>1.00</u>		<u>1.00</u>

Calculate (a) the expected net present value, allowing for risk and uncertainty and using a 10 percent discount rate, and (b) the standard deviation and coefficient of variation for the present value calculation of estimated cost saving before deducting the investment.

P4.5. Risk-Adjusted NPV and Decision. Vilas Corporation is considering two mutually exclusive Project, both of which require an initial investment of \$4,500 and an expected life of 10 years. The probability distribution for the cash inflows are as follows (for years 1 through 10):

Project A		Project B	
Cash inflow	Probability	Cash Inflow	Probability
\$700	0.1	\$550	0.2
900	0.8	800	0.3
1,000	0.1	1,000	0.3
		1,400	0.2

The company has decided that the project with higher relative risk should have a required rate of return of 16 percent, whereas the less risky project’s required rate of return should be 14 percent.

Compute (a) the coefficient of variation as a measure of relative risk, and (b) the risk-adjusted NPV of each project. Which project should be chosen? (c) What factors other than NPV should be considered when deciding between these two projects?

P4.6. Risk-Adjusted NPV. Kyoto Laboratories, Inc, is contemplating a capital investment project with an expected useful life of 10 years that requires an initial cash outlay of \$225,000. The company estimates the following data:

Annual Cash Inflows (\$)	Probabilities
0	0.1
50,000	0.2
65,000	0.4
70,000	0.2
90,000	0.1

(a) Assuming a risk-adjusted required rate of return of 25 percent is appropriate for projects of this level of risk, calculate the risk-adjusted NPV of the project. (b) Should the project be accepted?

P4.7. Certainty Equivalent NPV. Rush Corporation is considering the purchase of a new machine that will last 5 years and require a cash outlay of \$300,000. The firm has a 12 percent cost of capital rate and its after-tax risk-free rate is 9 percent. The Company has expected cash inflows and certainty equivalents for these cash inflows, as follows:

Year	After-Tax Cash Inflows (\$)	Certainty Equivalent
1	100,000	1
2	100,000	0.95
3	100,000	0.9
4	100,000	0.8
5	100,000	0.7

Calculate (a) the unadjusted NPV, and (b) the certainty equivalent NPV. (c) Determine if the machine should be purchased.

P4.8. Decision Tree. The Sunimerall Corporation wishes to introduce one of two products to the market this year. The probabilities and present values of projected cash inflows are given below.

Products	Initial Investment (\$)	PV of Cash Inflows (\$)	Probabilities
A	225,000		1
		450,000	0.4
		200,000	0.5
		-100,000	0.1
B	80,000		1
		320,000	0.2
		100,000	0.6
		-150,000	0.2

(a) Construct a decision tree to analyze the two products. (b) Which product would you introduce? Comment on your decision.

P4.9. Dependent Cash Inflows and Expected NPV. The Newcome Corporation has determined that its after-tax cash inflows (ATCI) distributions are not independent. Further, the company has estimated that the year 1 results (ATCI₁) will affect the year 2 flows (ATCI₂) as follows:

If ATCI = \$40,000 with a 30 percent chance, the distribution for ATCI is:

0.2	\$20,000
0.6	\$50,000
0.2	\$80,000

If ATCI = \$60,000 with a 40 percent chance, the distribution for ATCI is:

0.3	\$70,000
0.4	\$80,000
0.3	\$90,000

If ATCI = \$80,000 with a 30 percent chance, the distribution for ATCI is:

0.1	\$80,000
0.8	\$100,000
0.1	\$120,000

Assume that the project's initial investment is \$100,000. (a) Set up a decision tree to depict the above cash flow possibilities, and calculate an expected NPV for each 2-year possibility using a risk-free rate if 15 percent. (b) Determine if the project should be accepted.

P4-10: Janday Corporation’s after-tax cash inflows (ATCI) are time- independent, so that year 1 results (ATCI₁) will affect the year 2 flows (ATCI₂) as follows:

If ATCI₁ = \$8,000 with a 40 percent chance, the distribution for ATCI₂ is:

0.3	\$5,000
0.5	\$10,000
0.2	\$15,000

If ATCI₁ = \$60,000 with a 50 percent chance, the distribution for ATCI₂ is:

0.3	\$10,000
0.6	\$20,000
0.1	\$30,000

If ATCI = \$20,000 with a 10 percent chance, the distribution for ATCI₂ is:

0.1	\$15,000
0.8	\$40,000
0.1	\$50,000

Assume that the project’s initial investment is \$20,000. (a) Set up a decision tree to depict the above cash flow possibilities, and calculate an expected NPV for each 2-year possibility using a risk-free rate if 10 percent. (b) Determine if the project should be accepted.

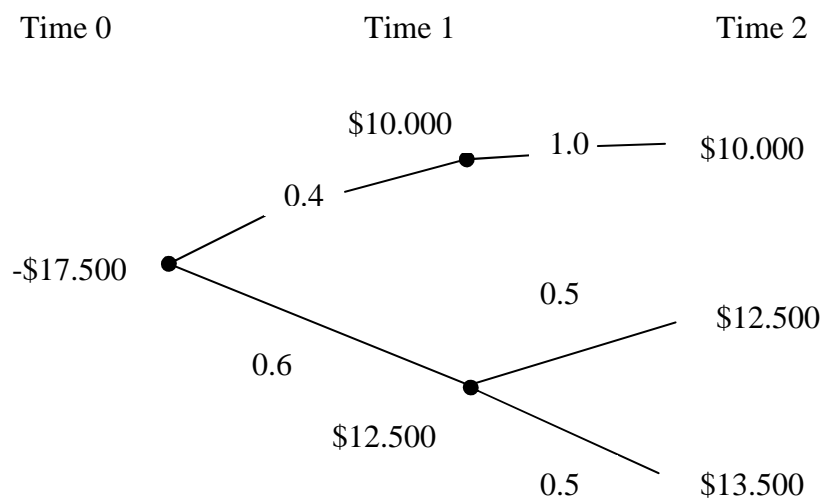
P4.11. . Decision Tree Analysis. The Dry dale Corporation is contemplating the development of a new product. The initial investment required to purchase the necessary equipment is

\$200,000. There is a 60 percent chance that demand will be high in year 1. If it is high, there is an 80 percent chance that it will continue high indefinitely. If demand is low in year 1, there is a 60 percent chance that it will continue high indefinitely. If demand is high, forecasted cash inflow (before taxes) is \$90,000 a year; if demand is low, forecasted cash inflow is \$30,000 a year.

The corporate Income tax rate is 40 percent. The company uses straight-line depreciation and will depreciate the equipment over 10 years with no salvage value.

(a). Determine the after-tax cash inflows. (b) Set up a decision tree representing all possible outcomes, and compute the expected NPV using a 10 percent risk-free rate of return.

P4.12. Decision Tree Analysis and Expected IRR. The NFL Systems,Inc, is considering the purchase of a minicomputer using the following decision tree:



(a) Complete the decision tree by computing IRR, joint probability, and the expected IRR

(round to the nearest whole percent of IRR). (b) Should this computer be purchased?
 (Assume the company’s cost of capital is 16 percent.)

P4.13. Normal Distribution and NPV Analysis. The probability distribution of possible NPVs for project A has an expected cash inflow of \$30,000 and a standard deviation of \$15,000. Assuming a normal distribution, compute the probability that: (a) the NPV will be zero or less; (b) the NPV will be greater than \$45,000; and (c) the NPV will be less than \$7,500.

P4.14. Normal Distribution and NPV Analysis. The Halo Shipping Company is considering an investment in a project that requires an initial investment of \$6,000, with a projected after-tax cash inflow generated over next 3 years as follows

Period 1		Period 2		Period 3	
Probability	Cash Flow (\$)	Probability	Cash Flow (\$)	Probability	Cash Flow (\$)
0.1	1,000	0.2	1,000	0.3	1,000
0.3	2,000	0.4	2,000	0.4	2,000
0.2	3,000	0.3	3,000	0.1	3,000
0.4	4,000	0.1	4,000	0.2	4,000

Assume that probability distributions are independent and the after-tax risk-free rate of return is 6 percent. Calculate: (a) the expected NPV of the project; (b) the standard deviation of the expected NPV; (c) the probability that the NPV will be zero or less (assume that the probability distribution is normal and continuous); (d) the probability that the NPV will be greater than zero; and (e) the probability that the NPV will be greater than the expected value.

P4.15. Portfolio Effects. The projected cash inflows of three projects-X, Y, and Z- for the period 19X1 to 19X5 are given below.

Year	Project X	Project Y	Project Z
19X1	\$2,000	\$6,000	\$1,000
19X2	\$3,000	\$4,000	\$2,000
19X3	\$4,000	\$3,000	\$3,000
19X4	\$5,000	\$2,000	\$3,000
19X5	\$7,000	\$1,000	\$6,000
	Project X	Project Y	Project Z
	\$4,200	\$3,200	\$3,000

(a) Calculate the expected cash inflows and standard deviation of cash inflows for project combination XY and XZ, and (b) determine the portfolio effects of the above combinations of projects upon the portfolio risk.

P4.16. CAPM and Capital Budgeting Decision. The Taylor Corporation is evaluating some new capital budgeting projects. Their evaluation method involves comparing each project’s risk-adjusted return obtained from the capital asset pricing model (CAPM) with the project’s average rate of return. The following data are provided.

	Projects	Beta	
	A	-0.5	
	B	0.8	
	C	1.2	
	D	2	

Possible rates of return and associated probability are:

	Rates of return(%)		
	(0,4)	(0,5)	(0,1)
A	4	2	5
B	2	6	12
C	10	15	20
D	-8	25	50

Assume that the risk-free rate of return is 6 percent and the market rate of return is 12 percent. Which project should be selected?

P4.17. Beta and NPV Analysis. The risk-free rate is 5 percent and the expected return on the market portfolio is 13 percent. On the basis of the CAPM, answer the following questions: (a) What is the risk premium on the market? (b) What is the required rate of return on an investment with a beta equal to 1.2? (c) If an investment with a beta of 0.6 offers an expected return of 8.5 percent, does it have a positive NPV? (d) If the market expects a return of 12.5 percent from stock A, what is its beta?



Chapter 5 Risk, Cost of Capital, and Capital Budgeting

Chapter Outline

5.1 The Cost of Equity Capital

5.2 Estimation of Beta

5.3 Determinants of Beta

5.4 Extensions of the Basic Model

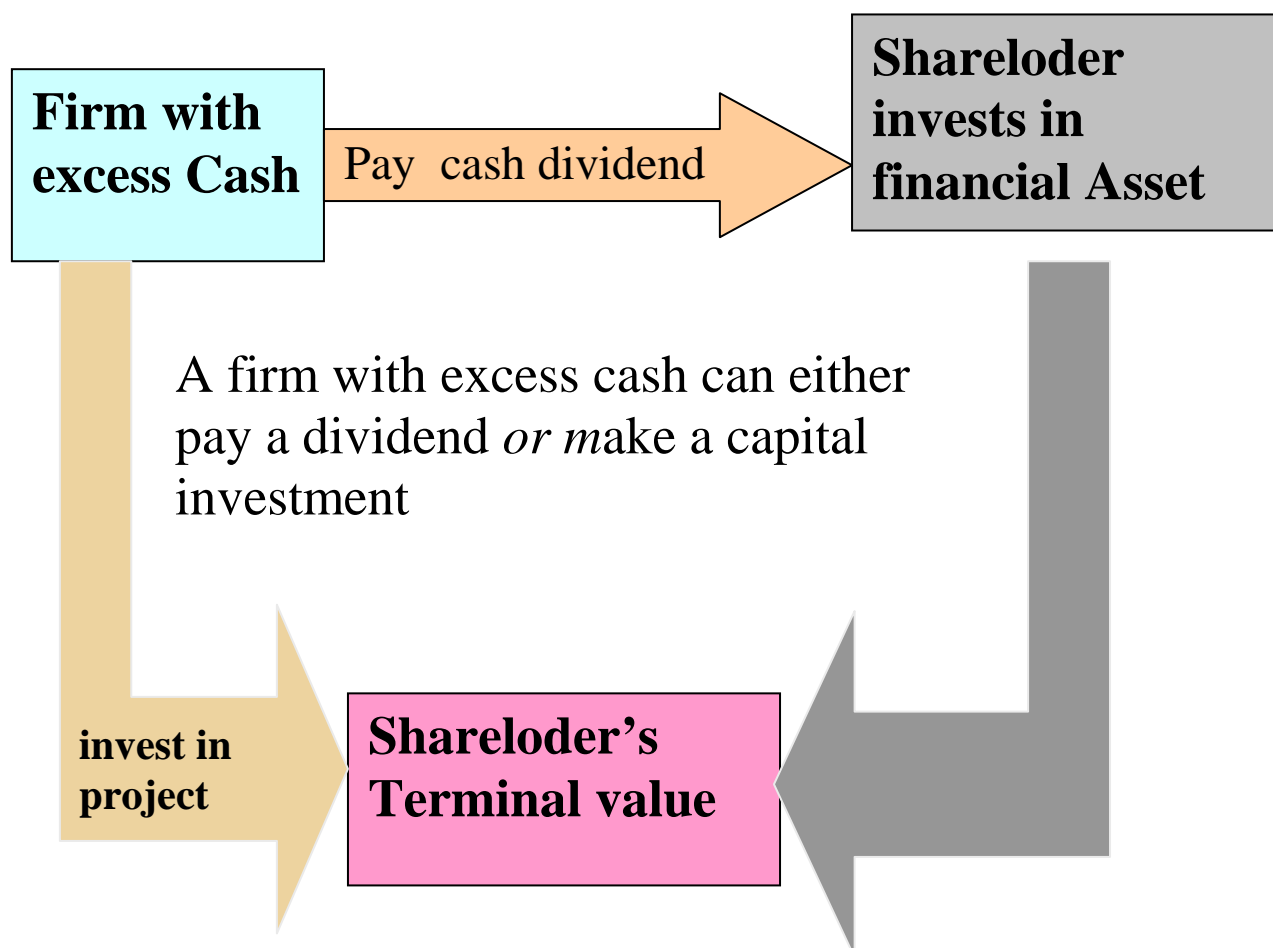
5.5 Estimating International Paper's Cost of Capital

5.6 Summary and Conclusions

What's the Big Idea?

- Earlier chapters on capital budgeting focused on the appropriate size and timing of cash flows.
- This chapter discusses the appropriate discount rate when cash flows are risky.

5.1 The Cost of Equity Capital



Because stockholders can reinvest the dividend in risky financial assets, the expected return on a capital-budgeting project should be at least as great as the expected return on a financial asset of comparable risk.

The Cost of Equity

- From the firm's perspective, the expected return is the Cost of Equity Capital:

$$\bar{R}_i = R_F + \beta_i (\bar{R}_M - R_F)$$

➤ To estimate a firm’s cost of equity capital, we need to know three things:

1. The risk-free rate, R_F
2. The market risk premium, $\bar{R}_M - R_F$
3. The company beta, $\beta_i = \frac{Cov(R_i, R_M)}{Var(R_M)} = \frac{\sigma_{i,M}}{\sigma_M^2}$

Example

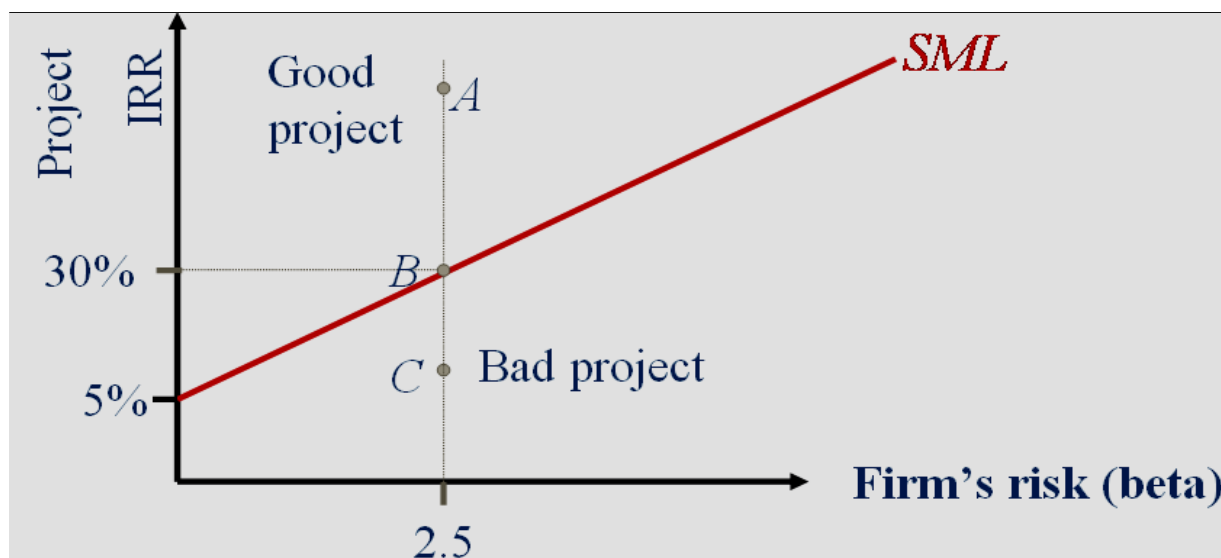
- Suppose the stock of Stansfield Enterprises, a publisher of PowerPoint presentations, has a beta of 2.5. The firm is 100-percent equity financed.
- Assume a risk-free rate of 5-percent and a market risk premium of 10-percent.
- What is the appropriate discount rate for an expansion of this firm?

$$\begin{aligned} \bar{R} &= R_F + \beta_i(\bar{R}_M - R_F) \\ \bar{R} &= 5\% + 2.5 \times 10\% \\ \bar{R} &= 30\% \end{aligned}$$

Suppose Stansfield Enterprises is evaluating the following non-mutually exclusive projects. Each costs \$100 and lasts one year.

Project	Project β	Project’s Estimated Cash Flows Next Year	IRR	NPV at 30%
A	2.5	\$150	50%	\$15.38
B	2.5	\$130	30%	\$0
C	2.5	\$110	10%	-\$15.38

Using the SML to Estimate the Risk-Adjusted Discount Rate for Projects



An all-equity firm should accept a project whose IRR exceeds the cost of equity capital and reject projects whose IRRs fall short of the cost of capital.

5.2 Estimation of Beta: Measuring Market Risk

Market Portfolio - Portfolio of all assets in the economy. In practice a broad stock market index, such as the S&P Composite, is used to *represent* the market.

Beta - Sensitivity of a stock's return to the return on the market portfolio.

Estimation of Beta

Theoretically, the calculation of beta is straightforward:

$$\beta = \frac{\text{Cov}(R_i, R_M)}{\text{Var}(R_M)} = \frac{\sigma_i^2}{\sigma_M^2}$$

✦ Problems

1. Betas may vary over time.
2. The sample size may be inadequate.
3. Betas are influenced by changing financial leverage and business risk.

✦ Solutions

1. Problems 1 and 2 (above) can be moderated by more sophisticated statistical techniques.
2. Problem 3 can be lessened by adjusting for changes in business and financial risk.
3. Look at average beta estimates of comparable firms in the industry.

Stability of Beta

- ✦ Most analysts argue that betas are generally stable for firms remaining in the same industry.
- ✦ That's not to say that a firm's beta can't change.
 - ✦ Changes in product line

- ✦ Changes in technology
- ✦ Deregulation
- ✦ Changes in financial leverage

Using an Industry Beta

- ✦ It is frequently argued that one can better estimate a firm's beta by involving the whole industry.
- ✦ If you believe that the operations of the firm are similar to the operations of the rest of the industry, you should use the industry beta.
- ✦ If you believe that the operations of the firm are fundamentally different from the operations of the rest of the industry, you should use the firm's beta.
- ✦ Don't forget about adjustments for financial leverage.

5.3 Determinants of Beta

- ✦ Business Risk
 - ✦ Cyclicity of Revenues
 - ✦ Operating Leverage
- ✦ Financial Risk
 - ✦ Financial Leverage

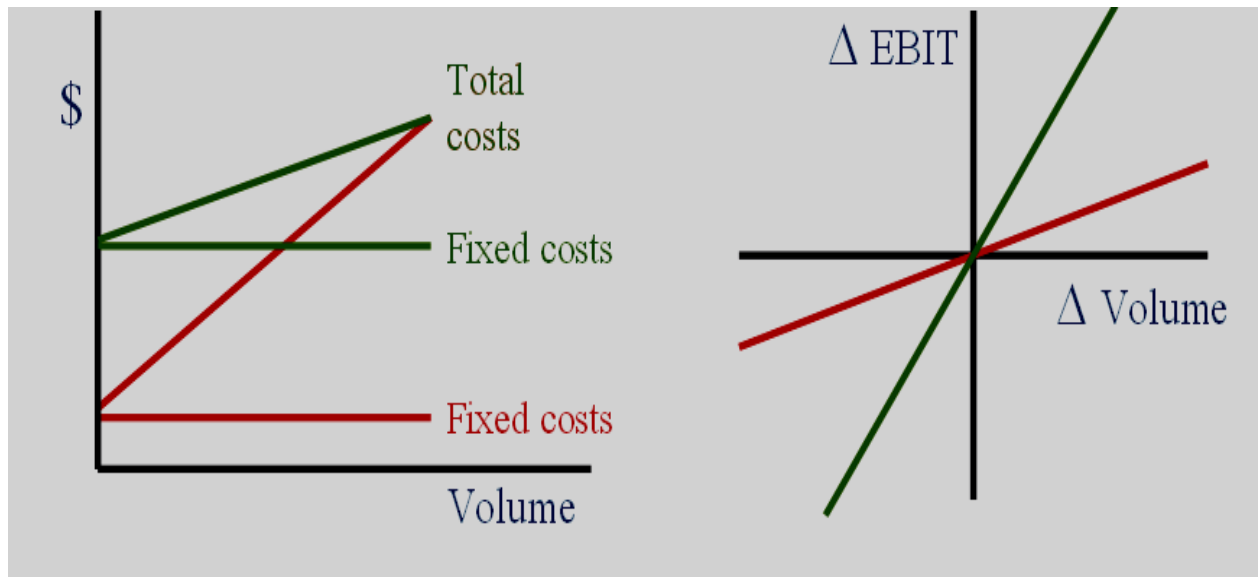
Cyclicity of Revenues

- ✦ Highly cyclical stocks have high betas.
 - ✦ Empirical evidence suggests that retailers and automotive firms fluctuate with the business cycle.
 - ✦ Transportation firms and utilities are less dependent upon the business cycle.
- ✦ Note that cyclicity is not the same as variability—stocks with high standard deviations need not have high betas.
 - ✦ Movie studios have revenues that are variable, depending upon whether they produce “hits” or “flops”, but their revenues are not especially dependent upon the business cycle.

Operating Leverage

- ✦ The degree of operating leverage measures how sensitive a firm (or project) is to its fixed costs.
- ✦ Operating leverage increases as fixed costs rise and variable costs fall.
- ✦ Operating leverage magnifies the effect of cyclicity on beta.
- ✦ The degree of operating leverage is given by:

$$DOL = \frac{\Delta EBIT}{EBIT} \times \frac{Sales}{\Delta Sales}$$



Operating leverage increases as fixed costs rise and variable costs fall.

Financial Leverage and Beta

- ✦ Operating leverage refers to the sensitivity to the firm's fixed costs of *production*.
- ✦ Financial leverage is the sensitivity of a firm's fixed costs of *financing*.
- ✦ The relationship between the betas of the firm's debt, equity, and assets is given by:

$$\beta_{Asset} = \frac{Debt}{Debt + Equity} \times \beta_{Debt} + \frac{Equity}{Debt + Equity} \times \beta_{Equity}$$

- ✦ Financial leverage always increases the equity beta relative to the asset beta.

Financial Leverage and Beta: Example

Consider Grand Sport, Inc., which is currently all-equity and has a beta of 0.90.

The firm has decided to lever up to a capital structure of 1 part debt to 1 part equity.

Since the firm will remain in the same industry, its asset beta should remain 0.90.

However, assuming a zero beta for its debt, its equity beta would become twice as large:

$$\beta_{Asset} = 0.90 = \frac{1}{1 + 1} \times \beta_{Equity}$$

$$\beta_{Equity} = 2 \times 0.90 = 1.80$$

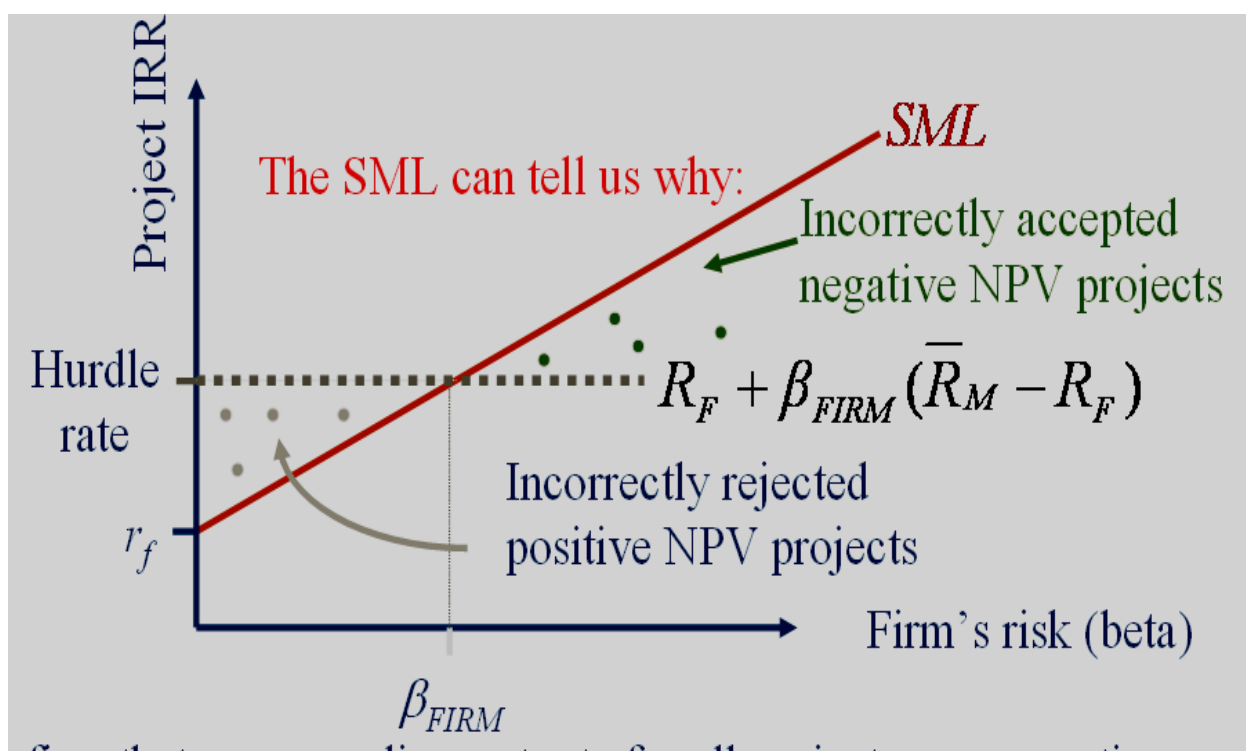
5.4 Extensions of the Basic Model

- The Firm versus the Project
- The Cost of Capital with Debt

The Firm versus the Project

- Any project's cost of capital depends on the use to which the capital is being put—not the source.
- Therefore, it depends on the *risk of the project* and not the risk of the *company*.

Capital Budgeting & Project Risk



Suppose the Conglomerate Company has a cost of capital, based on the CAPM, of 17%. The risk-free rate is 4%; the market risk premium is 10% and the firm's beta is 1.3.

$$17\% = 4\% + 1.3 \times [14\% - 4\%]$$

This is a breakdown of the company's investment projects:

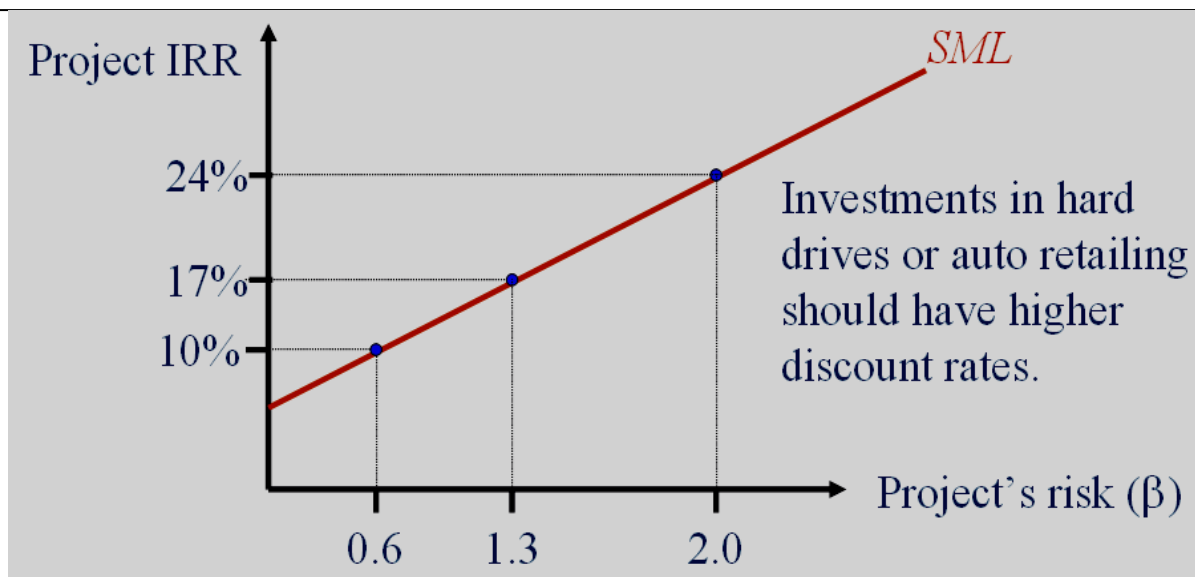
1/3 Automotive retailer $\beta = 2.0$

1/3 Computer Hard Drive Mfr. $\beta = 1.3$

1/3 Electric Utility $\beta = 0.6$

average β of assets = 1.3

When evaluating a new electrical generation investment, which cost of capital should be used?



$$r = 4\% + 0.6 \times (14\% - 4\%) = 10\%$$

10% reflects the opportunity cost of capital on an investment in electrical generation, given the unique risk of the project.

The Cost of Capital with Debt

- The Weighted Average Cost of Capital is given by:

$$r_{WACC} = \frac{\text{Equity}}{\text{Equity} + \text{Debt}} \times r_{Equity} + \frac{\text{Debt}}{\text{Equity} + \text{Debt}} \times r_{Debt} \times (1 - T_C)$$

$$r_{WACC} = \frac{S}{S + B} \times r_S + \frac{B}{S + B} \times r_B \times (1 - T_C)$$

- It is because interest expense is tax-deductible that we multiply the last term by $(1 - T_C)$

5.5 Estimating International Paper's Cost of Capital

- First, we estimate the cost of equity and the cost of debt.
 - We estimate an equity beta to estimate the cost of equity.
 - We can often estimate the cost of debt by observing the YTM of the firm's debt.
- Second, we determine the WACC by weighting these two costs appropriately.

Estimating IP's Cost of Capital

The industry average beta is 0.82; the risk free rate is 8% and the market risk premium is 8.4%.

$$r_S = R_F + \beta_i \times (R_M - R_F)$$

- Thus the cost of equity capital is
 - = 3% + 0.82 × 8.4%
 - = 9.89%

- The yield on the company's debt is 8% and the firm is in the 37% marginal tax rate.
- The debt to value ratio is 32%

$$\begin{aligned}
 r_{WACC} &= \frac{S}{S+B} \times r_S + \frac{B}{S+B} \times r_B \times (1 - T_C) \\
 &= 0.68 \times 9.89\% + 0.32 \times 8\% \times (1 - 0.37) \\
 &= 8.34\%
 \end{aligned}$$

8.34 percent is International's cost of capital. It should be used to discount any project where one believes that the project's risk is equal to the risk of the firm as a whole, and the project has the same leverage as the firm as a whole.

5.6 Summary and Conclusions

- The expected return on any capital budgeting project should be at least as great as the expected return on a financial asset of comparable risk. Otherwise the shareholders would prefer the firm to pay a dividend.
- The expected return on any asset is dependent upon b.
- A project's required return depends on the *project's* b.
- A project's b can be estimated by considering comparable industries or the cyclicity of project revenues and the project's operating leverage.
- If the firm uses debt, the discount rate to use is the rWACC.
- In order to calculate rWACC, the cost of equity and the cost of debt applicable to a project must be estimated.

មតិសង្ខេប β

- ១- បើ $\beta < ១$ គេថាភាគហ៊ុននេះមាន Defensive គឺមានការប្រែប្រួលយឺតជាងទីផ្សារ ក្នុងករណីមានការប្រែប្រួលសន្ទស្សន៍នៅលើទីផ្សារ ។ ឧទាហរណ៍ ភាគហ៊ុន A មានបែតាស្មើនឹង 0.75 ($\beta = 0.75$) ។ ប្រសិនបើធនលាភភាពលើទីផ្សារកើនឡើង 10% នោះធនលាភ ភាពរបស់ភាគហ៊ុន A កើនឡើងចំនួន $0.75 * 10\% = 7.5\%$ តាមទីផ្សារ ។
- ២- $\beta = ១$ គេថាភាគហ៊ុនប្រែប្រួលដូចគ្នានឹងទីផ្សារ ឬជាបែតារបស់ទីផ្សារ ។
- ៣- $\beta > ១$ គេថាភាគហ៊ុននេះមាន Aggressive មានន័យថាបើទីផ្សារមានការកើនឡើង ឬថយចុះ នោះភាគហ៊ុនដែលមានបែតាធំជាង ១ នេះកើនឡើង ឬថយចុះជាខ្លាំងប្រៀប

បញ្ចប់នឹងទីផ្សារ ។ ឧទាហរណ៍ ភាគហ៊ុន B មានបែតាស្មើនឹង 1.65 ($\beta = ១.៦៥$) ប្រសិនបើធនលាភភាពរបស់ទីផ្សារមានការថយចុះ 10% នោះ ធនលាភភាពរបស់ភាគហ៊ុន B ថយចុះ $1.65 * 10\% = 16.5\%$ តាមទីផ្សារ ។

Problems on Chapter 05

- P5-1** Furniture Depot, Inc. is an all-equity firm with a beta of 0.95. The market risk premium is 9 percent and the risk free-rate is 5 percent. The company is considering a project that will generate annual after-tax cash flows of \$340,000 at year-end for five years. The project requires an immediate investment of \$1.2 million. If the project has the same risk as the firm as a whole, should Furniture Depot undertake the project?
- P5-2** Lizzapaz Inc. is a levered firm with a debt-to- equity ratio of 0.25. The beta of the common stock is 1.15, while the beta of debt is 0.3. The market- risk premium is 10 percent and the risk-free rate is 6 percent. The corporate tax rate is 35 percent.
- What is the firm's cost of equity capital?
 - If a new company project has the same risk as the overall firm, what is the weighted average cost of capital for the project?
- P5-3** Adobe Online Inc. has an equity beta of 1.29 and a debt-to-equity ratio of 1.0. The expected return on the market is 13 percent and the risk-free rate is 7 percent. The before-tax cost of debt capital is 7 percent. The corporate tax is 35 percent.
- What is Adobe Online's cost of equity?
 - What is Adobe Online's weighted average cost of capital?
- P5-4** Lavan Industries, Inc. is considering a new project with a \$25 million initial outlay. The project will generate after-tax (year-end) cash flows of \$ 7 million for five years. The firm has a debt-to-equity ratio of 0.75. The cost of equity is 15 percent and the before-tax cost of debt is 9 percent. The corporate tax rate is 35 percent. The project has the same risk as the overall firm. Should Lavan accept the project?
- P5-5** Suppose Garageband.com has a 28 percent cost of equity capital and a 10 percent before-tax cost of debt capital. The firm's debt-to-equity ratio is 1.0. Garageband.com is interested in investing in a guitar factory that will cost \$1,000,000 and will provide \$600,000 pretax annual cash flows for five years. The project risk is similar to the overall risk of the firm. What is the net present value of this project if Garageband.com's tax rate is 35 percent?

[Ross/ Westerfield/ Jaffe, (Corporate Finance),(2005), page 339-341]

Glossary

(See related pages)

absolute priority rule (APR) The rule establishing priority of claims in liquidation.

accelerated cost recovery system (ACRS) A depreciation method under U.S. tax law allowing for the accelerated write-off of property under various classifications.

accounting break-even The sales level that results in zero project net income.

accounts payable period The time between receipt of inventory and payment for it.

accounts receivable financing A secured short-term loan that involves either the assignment or the factoring of receivables.

accounts receivable period The time between sale of inventory and collection of the receivable.

agency problem The possibility of conflict of interest between the stockholders and management of a firm.

aggregation The process by which smaller investment proposals of each of a firm's operational units are added up and treated as one big project.

aging schedule A compilation of accounts receivable by the age of each account.

American Depositary Receipt (ADR) A security issued in the United States representing shares of a foreign stock and allowing that stock to be traded in the United States.

American option An option that may be exercised at any time until its expiration date.

annual percentage rate (APR) The interest rate charged per period multiplied by the number of periods per year.

annuity due An annuity for which the cash flows occur at the beginning of the period.

annuity	A level stream of cash flows for a fixed period of time.
arithmetic average return	The return earned in an average year over a multiyear period.
asked price	The price a dealer is willing to take for a security.
average accounting return (AAR)	An investment's average net income divided by its average book value.
average tax rate	Total taxes paid divided by total taxable income.
balance sheet	Financial statement showing a firm's accounting value on a particular date.
bankruptcy	A legal proceeding for liquidating or reorganizing a business.
bearer form	The form of bond issue in which the bond is issued without record of the owner's name; payment is made to whoever holds the bond.
best efforts underwriting	The type of underwriting in which the underwriter sells as much of the issue as possible, but can return any unsold shares to the issuer without financial responsibility.
beta coefficient	The amount of systematic risk present in a particular risky asset relative to that in an average risky asset.
bid price	The price a dealer is willing to pay for a security.
bid-ask spread	The difference between the bid price and the asked price.
broker	An agent who arranges security transactions among investors.
business risk	The equity risk that comes from the nature of the firm's operating activities.

call option	(1) An option that gives the owner the right, but not the obligation, to buy an asset. (2) The right to buy an asset at a fixed price during a particular period of time.
call premium	The amount by which the call price exceeds the par value of the bond.
call protected bond	A bond that, during a certain period, cannot be redeemed by the issuer.
call provision	An agreement giving the corporation the option to repurchase the bond at a specified price prior to maturity.
capital asset pricing model (CAPM)	The equation of the SML showing the relationship between expected return and beta.
capital budgeting	The process of planning and managing a firm's long-term investments.
capital gains yield	The dividend growth rate, or the rate at which the value of an investment grows.
capital intensity ratio	A firm's total assets divided by its sales, or the amount of assets needed to generate \$1 in sales.
capital rationing	The situation that exists if a firm has positive NPV projects but cannot find the necessary financing.
capital structure	The mixture of debt and equity maintained by a firm.
captive finance company	A wholly owned subsidiary that handles the credit function for the parent company.
carrying costs	Costs that rise with increases in the level of investment in current assets.
cash break-even	The sales level that results in a zero operating cash flow.
cash budget	A forecast of cash receipts and disbursements for the next planning

period.

cash concentration The practice of and procedures for moving cash from multiple banks into the firm's main accounts.

cash cycle The time between cash disbursement and cash collection.

cash discount A discount given to induce prompt payment. Also, sales discount.

cash flow from assets The total of cash flow to creditors and cash flow to stockholders, consisting of the following: operating cash flow, capital spending, and change in net working capital.

cash flow time line A graphical representation of the operating cycle and the cash cycle.

cash flow to creditors A firm's interest payments to creditors less net new borrowings.

cash flow to stockholders Dividends paid out by a firm less net new equity raised.

clean price The price of a bond net of accrued interest; this is the price that is typically quoted.

clientele effect The observable fact that stocks attract particular groups based on dividend yield and the resulting tax effects.

collection policy The procedures followed by a firm in collecting accounts receivable.

commission brokers NYSE members who execute customer orders to buy and sell stock transmitted to the exchange floor.

common stock Equity without priority for dividends or in bankruptcy.

common-size statement A standardized financial statement presenting all items in percentage terms. Balance sheet items are shown as a percentage of assets and income statement items as a percentage of sales.

common-base year statement A standardized financial statement presenting all items relative to a certain base-year amount.

compensating balance Money kept by the firm with a bank in low-interest or non-interest-bearing accounts as part of a loan agreement.

compound interest Interest earned on both the initial principal and the interest reinvested from prior periods.

compounding The process of accumulating interest on an investment over time to earn more interest.

consol A type of perpetuity.

consolidation A merger in which an entirely new firm is created and both the acquired and acquiring firms cease to exist.

contingency planning Taking into account the managerial options implicit in a project.

controlled disbursement account A disbursement account to which the firm transfers an amount that is sufficient to cover demands for payment.

conversion premium The difference between the conversion price and the current stock price, divided by the current stock price.

conversion price The dollar amount of a bond's par value that is exchangeable for one share of stock.

conversion ratio The number of shares per bond received for conversion into stock.

conversion value The value a convertible bond would have if it were to be immediately converted into common stock.

convertible bond A bond that can be exchanged for a fixed number of shares of stock for a specified amount of time.

corporation A business created as a distinct legal entity composed of one or more individuals or entities.

cost of capital The minimum required return on a new investment.

cost of debt	The return that lenders require on the firm's debt.
cost of equity	The return that equity investors require on their investment in the firm.
coupon rate	The annual coupon divided by the face value of a bond.
coupon	The stated interest payment made on a bond.
credit analysis	The process of determining the probability that customers will not pay.
credit cost curve	A graphical representation of the sum of the carrying costs and the opportunity costs of a credit policy.
credit instrument	The evidence of indebtedness.
credit period	The length of time for which credit is granted.
credit scoring	The process of quantifying the probability of default when granting consumer credit.
cross-hedging	Hedging an asset with contracts written on a closely related, but not identical, asset.
cross-rate	The implicit exchange rate between two currencies (usually non-U.S.) quoted in some third currency (usually the U.S. dollar).
cumulative voting	A procedure in which a shareholder may cast all votes for one member of the board of directors.
current yield	A bond's annual coupon divided by its price.
date of payment	The date the dividend checks are mailed.

date of record	The date by which a holder must be on record in order to be designated to receive a dividend.
<hr/>	
dealer	An agent who buys and sells securities from inventory.
<hr/>	
debenture	An unsecured debt, usually with a maturity of 10 years or more.
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declaration date	The date on which the board of directors passes a resolution to pay a dividend.
<hr/>	
default risk premium	The portion of a nominal interest rate or bond yield that represents compensation for the possibility of default.
<hr/>	
deferred call provision	A call provision prohibiting the company from redeeming the bond prior to a certain date.
<hr/>	
degree of operating leverage (DOL)	The percentage change in operating cash flow relative to the percentage change in quantity sold.
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delta	Measures the effect on an option's value of a small change in the value of the underlying stock.
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depreciation tax shield	The tax saving that results from the depreciation deduction, calculated as depreciation multiplied by the corporate tax rate.
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derivative security	A financial asset that represents a claim to another financial asset.
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dilution	Loss in existing shareholders' value, in terms of either ownership, market value, book value, or EPS.
<hr/>	
direct bankruptcy costs	The costs that are directly associated with bankruptcy, such as legal and administrative expenses.
<hr/>	
dirty price	The price of a bond including accrued interest, also known as the full or invoice price. This is the price the buyer actually pays.
<hr/>	
discount rate	The rate used to calculate the present value of future cash flows.
<hr/>	

discount	Calculate the present value of some future amount.
<hr/>	
discounted cash flow (DCF) valuation	(1) Calculating the present value of a future cash flow to determine its value today. (2) The process of valuing an investment by discounting its future cash flows.
<hr/>	
discounted payback period	The length of time required for an investment's discounted cash flows to equal its initial cost.
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distribution	A payment made by a firm to its owners from sources other than current or accumulated retained earnings.
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divestiture	The sale of assets, operations, divisions, and/or segments of a business to a third party.
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dividend growth model	A model that determines the current price of a stock as its dividend next period divided by the discount rate less the dividend growth rate.
<hr/>	
dividend payout ratio	The amount of cash paid out to shareholders divided by net income.
<hr/>	
dividend yield	A stock's expected cash dividend divided by its current price.
<hr/>	
dividend	A payment made out of a firm's earnings to its owners, in the form of either cash or stock.
<hr/>	
dividends	Payments by a corporation to shareholders, made in either cash or stock.
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Du Pont identity	Popular expression breaking ROE into three parts: operating efficiency, asset use efficiency, and financial leverage.
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Dutch auction underwriting	The type of underwriting in which the offer price is set based on competitive bidding by investors. Also known as a uniform price auction.
<hr/>	
economic exposure	Long-term financial risk arising from permanent changes in prices or other economic fundamentals.
<hr/>	
economic order quantity	The restocking quantity that minimizes the total inventory costs.

(EOQ)

effective annual rate (EAR) The interest rate expressed as if it were compounded once per year.

efficient capital market A market in which security prices reflect available information.

efficient markets hypothesis (EMH) The hypothesis that actual capital markets, such as the NYSE, are efficient.

electronic communications network (ECN) A Web site that allows investors to trade directly with each other.

employee stock option (ESO) An option granted to an employee by a company giving the employee the right to buy shares of stock in the company at a fixed price for a fixed time.

equity carve-out The sale of stock in a wholly owned subsidiary via an IPO.

equivalent annual cost (EAC) The present value of a project's costs calculated on an annual basis.

erosion The cash flows of a new project that come at the expense of a firm's existing projects.

Eurobonds International bonds issued in multiple countries but denominated in a single currency (usually the issuer's currency).

Eurocurrency Money deposited in a financial center outside of the country whose currency is involved.

European option An option that may only be exercised on the expiration date.

ex-dividend date The date two business days before the date of record, establishing those individuals entitled to a dividend.

ex-rights date The beginning of the period when stock is sold without a recently declared right, normally two trading days before the holder-of-record date.

exchange rate risk	The risk related to having international operations in a world where relative currency values vary.
exchange rate	The price of one country's currency expressed in terms of another country's currency.
exercising the option	The act of buying or selling the underlying asset via the option contract.
expected return	The return on a risky asset expected in the future.
expiration date	The last day on which an option may be exercised.
face value	The principal amount of a bond that is repaid at the end of the term. Also, par value.
financial break-even	The sales level that results in a zero NPV.
financial distress costs	The direct and indirect costs associated with going bankrupt or experiencing financial distress.
financial lease	Typically a longer-term, fully amortized lease under which the lessee is responsible for maintenance, taxes, and insurance. Usually not cancelable by the lessee without penalty.
financial ratios	Relationships determined from a firm's financial information and used for comparison purposes.
financial risk	The equity risk that comes from the financial policy (i.e., capital structure) of the firm.
firm commitment underwriting	The type of underwriting in which the underwriter buys the entire issue, assuming full financial responsibility for any unsold shares.
Fisher effect	The relationship between nominal returns, real returns, and inflation.
five C's of credit	The five basic credit factors to be evaluated: character, capacity, capital, collateral, and conditions.

fixed costs	Costs that do not change when the quantity of output changes during a particular time period.
float	The difference between book cash and bank cash, representing the net effect of checks in the process of clearing.
floor brokers	NYSE members who execute orders for commission brokers on a fee basis; sometimes called \$2 brokers.
floor traders	NYSE members who trade for their own accounts, trying to anticipate temporary price fluctuations.
forecasting risk	The possibility that errors in projected cash flows will lead to incorrect decisions. Also, estimation risk.
foreign bonds	International bonds issued in a single country, usually denominated in that country's currency.
foreign exchange market	The market in which one country's currency is traded for another's.
forward contract	A legally binding agreement between two parties calling for the sale of an asset or product in the future at a price agreed upon today.
forward exchange rate	The agreed-upon exchange rate to be used in a forward trade.
forward trade	An agreement to exchange currency at some time in the future.
free cash flow	Another name for cash flow from assets.
future value (FV)	The amount an investment is worth after one or more periods.
futures contract	A forward contract with the feature that gains and losses are realized each day rather than only on the settlement date.
general cash offer	An issue of securities offered for sale to the general public on a cash basis.

Generally Accepted Accounting Principles (GAAP)

The common set of standards and procedures by which audited financial statements are prepared.

geometric average return

The average compound return earned per year over a multiyear period.

gilts

British and Irish government securities.

going-private transactions

Transactions in which all publicly owned stock in a firm is replaced with complete equity ownership by a private group.

Green Shoe provision

A contract provision giving the underwriter the option to purchase additional shares from the issuer at the offering price. Also called the overallotment option.

greenmail

In a targeted stock repurchase, payments made to potential bidders to eliminate unfriendly takeover attempts.

gross spread

Compensation to the underwriter, determined by the difference between the underwriter's buying price and offering price.

hard rationing

The situation that occurs when a business cannot raise financing for a project under any circumstances.

hedging

Reducing a firm's exposure to price or rate fluctuations. Also, immunization.

holder-of-record date

The date on which existing shareholders on company records are designated as the recipients of stock rights. Also, the date of record.

homemade dividend policy

The tailored dividend policy created by individual investors who undo corporate dividend policy by reinvesting dividends or selling shares of stock.

homemade leverage

The use of personal borrowing to change the overall amount of financial leverage to which the individual is exposed.

implied standard deviation

An estimate of the future standard deviation of the return on an asset obtained from the Black-Scholes OPM.

income statement Financial statement summarizing a firm's performance over a period of time.

incremental cash flows The difference between a firm's future cash flows with a project and those without the project.

indenture The written agreement between the corporation and the lender detailing the terms of the debt issue.

indirect bankruptcy costs The costs of avoiding a bankruptcy filing incurred by a financially distressed firm.

inflation premium The portion of a nominal interest rate that represents compensation for expected future inflation.

information content effect The market's reaction to a change in corporate dividend payout.

initial public offering A company's first equity issue made available to the public. Also called an unseasoned new issue or an IPO.

inside quotes Highest bid quotes and lowest ask quotes offered by dealers for a security.

interest on interest Interest earned on the reinvestment of previous interest payments.

interest rate parity (IRP) The condition stating that the interest rate differential between two countries is equal to the percentage difference between the forward exchange rate and the spot exchange rate.

interest rate risk premium The compensation investors demand for bearing interest rate risk.

interest tax shield The tax saving attained by a firm from interest expense.

internal growth rate The maximum growth rate a firm can achieve without external financing of any kind.

internal rate of return (IRR)	The discount rate that makes the NPV of an investment zero.
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international Fisher effect (IFE)	The theory that real interest rates are equal across countries.
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intrinsic value	The lower bound of an option's value, or what the option would be worth if it were about to expire.
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inventory loan	A secured short-term loan to purchase inventory.
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inventory period	The time it takes to acquire and sell inventory.
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investment timing decision	The evaluation of the optimal time to begin a project.
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invoice	A bill for goods or services provided by the seller to the purchaser.
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joint venture	Typically an agreement between firms to create a separate, co-owned entity established to pursue a joint goal.
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just-in-time (JIT) inventory	A system for managing demand-dependent inventories that minimizes inventory holdings.
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lessee	The user of an asset in a leasing agreement. The lessee makes payments to the lessor.
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lessor	The owner of an asset in a leasing agreement. The lessor receives payments from the lessee.
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leveraged buyouts (LBOs)	Going-private transactions in which a large percentage of the money used to buy the stock is borrowed. Oftentimes, incumbent management is involved.
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leveraged lease	A financial lease in which the lessor borrows a substantial fraction of the cost of the leased asset on a nonrecourse basis.
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line of credit	A formal (committed) or informal (noncommitted) prearranged, short-term bank loan.

liquidation	Termination of the firm as a going concern.
liquidity premium	The portion of a nominal interest rate or bond yield that represents compensation for lack of liquidity.
lockboxes	Special post office boxes set up to intercept and speed up accounts receivable payments.
lockup agreement	The part of the underwriting contract that specifies how long insiders must wait after an IPO before they can sell stock.
London Interbank Offer Rate (LIBOR)	The rate most international banks charge one another for overnight Eurodollar loans.
M&M Proposition I	The proposition that the value of the firm is independent of the firm's capital structure.
M&M Proposition II	The proposition that a firm's cost of equity capital is a positive linear function of the firm's capital structure.
managerial options	Opportunities that managers can exploit if certain things happen in the future.
marginal tax rate	Amount of tax payable on the next dollar earned.
marginal, or incremental, cost	the change in costs that occurs when there is a small change in output.
marginal, or incremental, revenue	The change in revenue that occurs when there is a small change in output.
market risk premium	The slope of the SML, the difference between the expected return on a market portfolio and the risk-free rate.
materials requirements planning (MRP)	A set of procedures used to determine inventory levels for demand-dependent inventory types such as work-in-progress and raw materials.

maturity	Specified date on which the principal amount of a bond is paid.
member	The owner of a seat on the NYSE.
merger	The complete absorption of one company by another, wherein the acquiring firm retains its identity and the acquired firm ceases to exist as a separate entity.
multiple rates of return	The possibility that more than one discount rate will make the NPV of an investment zero.
mutually exclusive investment decisions	A situation in which taking one investment prevents the taking of another.
net advantage to leasing (NAL)	The NPV that is calculated when deciding whether to lease an asset or to buy it.
net present value (NPV)	The difference between an investment's market value and its cost.
net present value profile	A graphical representation of the relationship between an investment's NPVs and various discount rates.
net working capital	Current assets less current liabilities.
nominal rates	Interest rates or rates of return that have not been adjusted for inflation.
noncash items	Expenses charged against revenues that do not directly affect cash flow, such as depreciation.
normal distribution	A symmetric, bell-shaped frequency distribution that is completely defined by its mean and standard deviation.
note	An unsecured debt, usually with a maturity under 10 years.
operating cash flow	Cash generated from a firm's normal business activities.

operating cycle	The time period between the acquisition of inventory and the collection of cash from receivables.
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operating lease	Usually a shorter-term lease under which the lessor is responsible for insurance, taxes, and upkeep. May be cancelable by the lessee on short notice.
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opportunity cost	The most valuable alternative that is given up if a particular investment is undertaken.
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option contract	An agreement that gives the owner the right, but not the obligation, to buy or sell a specific asset at a specific price for a set period of time.
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order flow	The flow of customer orders to buy and sell securities.
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over-the-counter (OTC) market	Securities market in which trading is almost exclusively done through dealers who buy and sell for their own inventories.
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oversubscription privilege	A privilege that allows shareholders to purchase unsubscribed shares in a rights offering at the subscription price.
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partnership	A business formed by two or more individuals or entities.
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payback period	The amount of time required for an investment to generate cash flows sufficient to recover its initial cost.
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payoff profile	A plot showing the gains and losses that will occur on a contract as the result of unexpected price changes.
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percentage of sales approach	A financial planning method in which accounts are varied depending on a firm's predicted sales level.
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perpetuity	An annuity in which the cash flows continue forever.
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planning horizon	The long-range time period on which the financial planning process focuses, usually the next two to five years.
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poison pill	A financial device designed to make unfriendly takeover attempts unappealing, if not impossible.

political risk	Risk related to changes in value that arise because of political actions.
portfolio weight	A percentage of a portfolio's total value that is in a particular asset.
portfolio	A group of assets such as stocks and bonds held by an investor.
precautionary motive	The need to hold cash as a safety margin to act as a financial reserve.
preferred stock	Stock with dividend priority over common stock, normally with a fixed dividend rate, sometimes without voting rights.
present value (PV)	The current value of future cash flows discounted at the appropriate discount rate.
primary market	The market in which new securities are originally sold to investors.
principle of diversification	Spreading an investment across a number of assets will eliminate some, but not all, of the risk.
private placements	Loans, usually long-term in nature, provided directly by a limited number of investors.
pro forma financial statements	Financial statements projecting future years' operations.
profitability index (PI)	The present value of an investment's future cash flows divided by its initial cost. Also, benefit-cost ratio
prospectus	A legal document describing details of the issuing corporation and the proposed offering to potential investors.
protective covenant	A part of the indenture limiting certain actions that might be taken during the term of the loan, usually to protect the lender's interest.
protective put	The purchase of stock and a put option on the stock to limit the

downside risk associated with the stock.

proxy contest An attempt to gain control of a firm by soliciting a sufficient number of stockholder votes to replace existing management.

proxy A grant of authority by a shareholder allowing another individual to vote his/her shares.

purchasing power parity (PPP) The idea that the exchange rate adjusts to keep purchasing power constant among currencies.

pure play approach The use of a WACC that is unique to a particular project, based on companies in similar lines of business.

put option (1) An option that gives the owner the right, but not the obligation, to sell an asset. (2) The right to sell an asset at a fixed price during a particular period of time. The opposite of a call option.

put-call parity (PCP) The relationship between the prices of the underlying stock, a call option, a put option, and a riskless asset.

real option An option that involves real assets as opposed to financial assets such as shares of stock.

real rates Interest rates or rates of return that have been adjusted for inflation.

red herring A preliminary prospectus distributed to prospective investors in a new issue of securities.

registered form The form of bond issue in which the registrar of the company records ownership of each bond; payment is made directly to the owner of record.

registration statement A statement filed with the SEC that discloses all material information concerning the corporation making a public offering.

regular cash dividend A cash payment made by a firm to its owners in the normal course of business, usually made four times a year.

Regulation A	An SEC regulation that exempts public issues of less than \$5 million from most registration requirements.
reorganization	Financial restructuring of a failing firm to attempt to continue operations as a going concern.
repurchase	Another method used to pay out a firm's earnings to its owners, which provides more preferable tax treatment than dividends.
residual dividend approach	A policy under which a firm pays dividends only after meeting its investment needs while maintaining a desired debt-equity ratio.
retention ratio	The addition to retained earnings divided by net income. Also called the plowback ratio.
reverse split	A stock split in which a firm's number of shares outstanding is reduced.
rho	Measures the sensitivity of an option's value to a change in the risk-free rate.
rights offer	A public issue of securities in which securities are first offered to existing shareholders. Also called a rights offering.
risk premium	The excess return required from an investment in a risky asset over that required from a risk-free investment.
risk profile	A plot showing how the value of the firm is affected by changes in prices or rates.
sale and leaseback	A financial lease in which the lessee sells an asset to the lessor and then leases it back.
scenario analysis	The determination of what happens to NPV estimates when we ask what-if questions.
seasoned equity offering (SEO)	A new equity issue of securities by a company that has previously issued securities to the public.
secondary market	The market in which previously issued securities are traded among

	investors.
security market line (SML)	A positively sloped straight line displaying the relationship between expected return and beta.
share rights plans	Provisions allowing existing stockholders to purchase stock at some fixed price should an outside takeover bid come up, discouraging hostile takeover attempts.
shelf registration	Registration permitted by SEC Rule 415, which allows a company to register all issues it expects to sell within two years at one time, with subsequent sales at any time within those two years.
shortage costs	Costs that fall with increases in the level of investment in current assets.
simple interest	Interest earned only on the original principal amount invested.
simulation analysis	A combination of scenario and sensitivity analysis.
sinking fund	An account managed by the bond trustee for early bond redemption.
soft rationing	The situation that occurs when units in a business are allocated a certain amount of financing for capital budgeting.
sole proprietorship	A business owned by a single individual.
sources of cash	A firm's activities that generate cash.
specialist's post	A fixed place on the exchange floor where the specialist operates.
specialist	A NYSE member acting as a dealer in a small number of securities on the exchange floor; often called a market maker.
speculative motive	The need to hold cash to take advantage of additional investment opportunities, such as bargain purchases.
spin-off	The distribution of shares in a subsidiary to existing parent company

stockholders.

split-up The splitting up of a company into two or more companies.

spot exchange rate The exchange rate on a spot trade.

spot trade An agreement to trade currencies based on the exchange rate today for settlement within two business days.

stakeholder Someone other than a stockholder or creditor who potentially has a claim on the cash flows of the firm.

stand-alone principle The assumption that evaluation of a project may be based on the project's incremental cash flows.

standard deviation The positive square root of the variance.

Standard Industrial Classification (SIC) code A U.S. government code used to classify a firm by its type of business operations.

standby fee An amount paid to an underwriter participating in a standby underwriting agreement.

standby underwriting The type of underwriting in which the underwriter agrees to purchase the unsubscribed portion of the issue.

stated interest rate The interest rate expressed in terms of the interest payment made each period. Also, quoted interest rate.

statement of cash flows A firm's financial statement that summarizes its sources and uses of cash over a specified period.

static theory of capital structure The theory that a firm borrows up to the point where the tax benefit from an extra dollar in debt is exactly equal to the cost that comes from the increased probability of financial distress.

stock dividend A payment made by a firm to its owners in the form of stock, diluting the value of each share outstanding.

stock split	An increase in a firm's shares outstanding without any change in owners' equity.
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straight bond value	The value a convertible bond would have if it could not be converted into common stock.
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straight voting	A procedure in which a shareholder may cast all votes for each member of the board of directors.
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strategic alliance	Agreement between firms to cooperate in pursuit of a joint goal.
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strategic options	Options for future, related business products or strategies.
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strike price	The fixed price in the option contract at which the holder can buy or sell the underlying asset. Also, the exercise price or striking price.
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sunk cost	A cost that has already been incurred and cannot be removed and therefore should not be considered in an investment decision.
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SuperDOT system	An electronic NYSE system allowing orders to be transmitted directly to the specialist.
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sustainable growth rate	The maximum growth rate a firm can achieve without external equity financing while maintaining a constant debt-equity ratio.
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swap contract	An agreement by two parties to exchange, or swap, specified cash flows at specified intervals in the future.
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swaps	Agreements to exchange two securities or currencies.
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syndicate	A group of underwriters formed to share the risk and to help sell an issue.
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synergy	The positive incremental net gain associated with the combination of two firms through a merger or acquisition.
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systematic risk principle	The expected return on a risky asset depends only on that asset's systematic risk.

systematic risk	A risk that influences a large number of assets. Also, market risk.
target payout ratio	A firm's long-term desired dividend-to-earnings ratio.
tax-oriented lease	A financial lease in which the lessor is the owner for tax purposes. Also called a true lease or a tax lease.
taxability premium	The portion of a nominal interest rate or bond yield that represents compensation for unfavorable tax status.
tender offer	A public offer by one firm to directly buy the shares of another firm.
term loans	Direct business loans of, typically, one to five years.
term structure of interest rates	The relationship between nominal interest rates on default-free, pure discount securities and time to maturity; that is, the pure time value of money.
terms of sale	The conditions under which a firm sells its goods and services for cash or credit.
theta	Measures the sensitivity of an option's value to a change in the time to expiration.
tombstone	An advertisement announcing a public offering.
trading range	The price range between the highest and lowest prices at which a stock is traded.
transaction motive	The need to hold cash to satisfy normal disbursement and collection activities associated with a firm's ongoing operations.
transactions exposure	Short-run financial risk arising from the need to buy or sell at uncertain prices or rates in the near future.
Treasury yield curve	A plot of the yields on Treasury notes and bonds relative to maturity.

unbiased forward rates (UFR)	The condition stating that the current forward rate is an unbiased predictor of the future spot exchange rate.
uncovered interest parity (UIP)	The condition stating that the expected percentage change in the exchange rate is equal to the difference in interest rates.
underwriters	Investment firms that act as intermediaries between a company selling securities and the investing public.
unlevered cost of capital	The cost of capital of a firm that has no debt.
unsystematic risk	A risk that affects at most a small number of assets. Also, unique or asset-specific risk.
uses of cash	A firm's activities in which cash is spent. Also called applications of cash.
variable costs	Costs that change when the quantity of output changes.
variance	The average squared difference between the actual return and the average return.
vega	Measures the sensitivity of an option's value to a change in the standard deviation of the return on the underlying asset.
venture capital (VC)	Financing for new, often high-risk ventures.
warrant	A security that gives the holder the right to purchase shares of stock at a fixed price over a given period of time.
weighted average cost of capital (WACC)	The weighted average of the cost of equity and the aftertax cost of debt.
working capital	A firm's short-term assets and liabilities.
yield to maturity (YTM)	The rate required in the market on a bond.

zero coupon bond A bond that makes no coupon payments, thus initially priced at a deep discount.

zero-balance account A disbursement account in which the firm maintains a zero balance, transferring funds in from a master account only as needed to cover checks presented for payment.