In this chapter, look for the answers to these questions:

- What is “present value”? How can we use it to compare sums of money from different times?
- Why are people risk averse? How can risk-averse people use insurance and diversification to manage risk?
- What determines the value of an asset? What is the “efficient markets hypothesis”? Why is beating the market nearly impossible?

Introduction

- The financial system coordinates saving and investment.
- Participants in the financial system make decisions regarding
- Finance is the field that studies such decision making.
Present Value: The Time Value of Money

To compare a sums from different times, we use the concept of present value.

The present value of a future sum:

The future value of a sum:

Example 1: A Simple Deposit

Deposit $100 in the bank at 5% interest. What is the future value (FV) of this amount?

In $N$ years, $FV = \$100(1 + 0.05)^N$

In this example, $\$100$ is the present value (PV).

In general, where $r$ denotes the interest rate (in decimal form).

Solve for PV to get:
EXAMPLE 2: Investment Decision

Suppose $r = 0.06$. Should General Motors spend $100 million to build a factory that will yield $200 million in ten years?

Solution:

Present value formula: $PV = \frac{FV}{(1 + r)^N}$

EXAMPLE 2: Investment Decision

Instead, suppose $r = 0.09$. Should General Motors spend $100 million to build a factory that will yield $200 million in ten years?

Solution:

Present value helps explain why

ACTIVE LEARNING 1

Present value

You are thinking of buying a six-acre lot for $70,000. The lot will be worth $100,000 in five years.

A. Should you buy the lot if $r = 0.05$?
B. Should you buy it if $r = 0.10$?
Compounding

Because of compounding, small differences in interest rates lead to big differences over time.

Example: Buy $1000 worth of Microsoft stock, hold for 30 years.
If rate of return = 0.08, FV = $10,063
If rate of return = 0.10, FV = $17,450

The Rule of 70

The Rule of 70:

Example:
If interest rate is 5%, a deposit will double in
If interest rate is 7%, a deposit will double in

Risk Aversion

Most people are risk averse – they dislike uncertainty.

Example: You are offered the following gamble. Toss a fair coin.
If heads, you win $1000.
If tails, you lose $1000.
Should you take this gamble?
If you are risk averse,
**The Utility Function**

- Utility
- Wealth

**The Utility Function and Risk Aversion**

- Utility
- Wealth

**Managing Risk With Insurance**

- How insurance works: A person facing a risk pays a fee to the insurance company, which in return accepts part or all of the risk.

- E.g., it is easier for 10,000 people to each bear 1/10,000 of the risk of a house burning down than for one person to bear the entire risk alone.
Two Problems in Insurance Markets

1. **Adverse selection:**

2. **Moral hazard:**

   Insurance companies cannot fully guard against these problems, so they must charge higher prices. As a result,

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**ACTIVE LEARNING 2**

**Adverse selection or moral hazard?**

Identify whether each of the following is an example of adverse selection or moral hazard.

A. Joe begins smoking in bed after buying fire insurance.

B. Both of Susan’s parents lost their teeth to gum disease, so Susan buys dental insurance.

C. When Gertrude parks her Corvette convertible, she doesn’t bother putting the top up, because her insurance covers theft of any items left in the car.

---

**Measuring Risk**

- We can measure risk of an asset with the **standard deviation**, a statistic that measures

- The higher the standard deviation of the asset’s return,
Reducing Risk Through Diversification

- Diversification

- A diversified portfolio contains assets whose returns are not strongly related:
  - Some assets will realize high returns,
  - others low returns.

Reducing Risk Through Diversification

- Diversification can reduce

- Diversification cannot reduce

Reducing Risk Through Diversification

![Graph showing the relationship between the number of stocks in a portfolio and the standard deviation of portfolio return.](image)
The Tradeoff Between Risk and Return

Tradeoff:

- E.g., over past 200 years, average real return on stocks, 8%. On short-term govt bonds, 3%.

Example:
Suppose you are dividing your portfolio between two asset classes.
- A diversified group of risky stocks:
  - average return = 8%, standard dev. = 20%
- A safe asset:
  - return = 3%, standard dev. = 0%

The risk and return on the portfolio depends on the percentage of each asset class in the portfolio...
**Asset Valuation**

When deciding whether to buy a company’s stock, you compare the price of the shares to the value of the company.

- If share price > value, the stock is
- If price < value, the stock is
- If price = value, the stock is

**ACTIVE LEARNING 3**

**Valuing a share of stock**

If you buy a share of AT&T stock today,
- you will be able to sell it in 3 years for $30.
- you will receive a $1 dividend at the end of each of those 3 years.

If the prevailing interest rate is 10%, what is the value of a share of AT&T stock today?

**ACTIVE LEARNING 3**

**Answers**
Asset Valuation

- Value of a share =

- Problem: When you buy the share, you don’t know what future dividends or prices will be.

- One way to value a stock:

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Show-of-hands survey

You have a brokerage account with Merrill Lynch. Your broker calls you with a hot tip about a stock: new information suggests that the company will be highly profitable.

Should you buy stock in the company?

A. Yes
B. No
C. Not until you read the prospectus.
D. What’s a prospectus?

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The Efficient Markets Hypothesis

- Efficient Markets Hypothesis (EMH):
Implications of EMH
1. Stock market is informationally efficient:

2. Stock prices follow a random walk:

Index Funds vs. Managed Funds
- An index fund is
- An actively managed mutual fund aims to buy only the best stocks.
- Actively managed funds have higher expenses than index funds.
- EMH implies that

<table>
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<th>Index or Fund</th>
<th>2001-2006 Annualized Return</th>
<th>2006 Expense Ratio</th>
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<tr>
<td>S&amp;P 500 (index fund)</td>
<td>6.2%</td>
<td>.351</td>
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<tr>
<td>Managed large cap funds</td>
<td>5.9</td>
<td>1.020</td>
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<tr>
<td>S&amp;P MidCap 400 (index fund)</td>
<td>10.9</td>
<td>.535</td>
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<tr>
<td>Managed mid cap funds</td>
<td>8.1</td>
<td>1.458</td>
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<tr>
<td>S&amp;P SmallCap 600 (index fund)</td>
<td>12.5</td>
<td>.550</td>
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<tr>
<td>Managed mid cap funds</td>
<td>10.3</td>
<td>1.272</td>
</tr>
</tbody>
</table>
Market Irrationality

Many believe that stock price movements are partly psychological:

- J.M. Keynes: stock prices driven by “animal spirits,” “waves of pessimism and optimism”
- Alan Greenspan: 1990s stock market boom due to “irrational exuberance”

Bubbles

The importance of departures from rational pricing is not known.

CONCLUSION

- This chapter has introduced some of the basic tools people use when they make financial decisions.
- The efficient markets hypothesis teaches that a stock price should reflect the company’s expected future profitability.
- Fluctuations in the stock market have important macroeconomic implications, which we will study later in this course.