Principels of Personal Finance

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March 10, 2025

Chapter Objectives

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 the allocation of resources over time and the handling of risk.
- *Finance* is the field that studies such decision making.

Present Value: The Time Value of Money

- To compare sums from different times, we use the concept of present value.
- The *present value* of a future sum: the amount that would be needed today to yield that future sum at prevailing interest rates
- Related concept: *The future* value of a sum: the amount the sum will be worth at a given future date, when allowed to earn interest at the prevailing rate

EXAMPLE 1: A Simple Deposit

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

- In one year, $FV = \$100(1 + 0.05) = \$105.00$
- In two years, $FV = \$100(1 + 0.05)^2 = \$110.25$
- In three years, $FV = \$100(1 + 0.05)^3 = \$115.76$
- In N years, $FV = \$100(1 + 0.05)^N$

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, $FV = PV(1 + r)^N$ where r denotes the interest rate (in decimal form).
- Solve for PV to get: $PV = \frac{FV}{(1+r)^N}$

EXAMPLE 2: Investment Decision

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

Suppose $r = 0.06$.

- Should General Motors spend $100 million to build a factory that will yield $200 million in ten years?
- Solution: Find present value of $200 million in 10 years:
  - PV = ($200 million)/(1.06)10 = $112 million
  - Since $PV >$ cost of factory, GM should build it.

EXAMPLE 2: Investment Decision

- How would your decision change if $r = 0.09$.
- Solution: Find present value of $200 million in 10 years at the new r:
  - $PV = (\$200 million)/(1.09)10 = \$84$ million
  - Since PV $<$ cost of factory, GM should not build it.
- N.B.: Present value helps explain why investment falls when the interest rate rises.

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?

Effect of Compounding

- *Compounding*: the accumulation of a sum of money where the interest earned on the sum earns additional interest
- 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

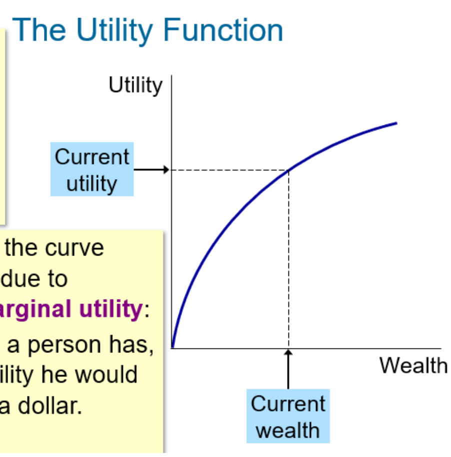
If rate of return = 0.10, FV = \$17,450

The Rule of 70

- **The Rule of 70**: If a variable grows at a rate of x percent per year, that variable will double in about $70/x$ years.
- Example:
  - If interest rate is 5%, a deposit will double in about 14 years.
  - If interest rate is 7%, a deposit will double in about 10 years.

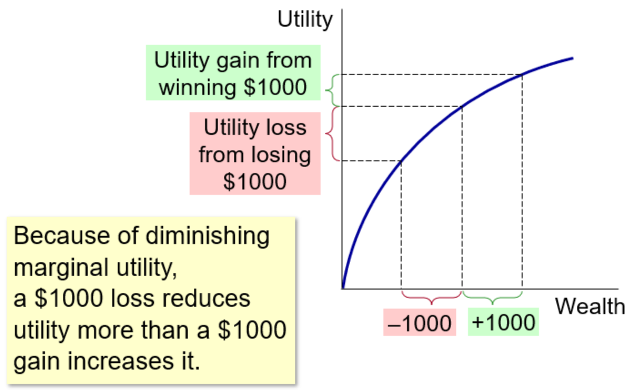
The Utility Function

Utility is a subjective measure of well-being that depends on wealth.



As wealth rises, the curve becomes flatter due to **diminishing marginal utility**: the more wealth a person has, the less extra utility he would get from an extra dollar.

The Utility Function and Risk Aversion



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.
- Insurance allows risks to be pooled, and can make risk averse people better off:

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: A high-risk person benefits more from insurance, so is more likely to purchase it.
2. Moral hazard: People with insurance have less incentive to avoid risky behavior.

- Insurance companies cannot fully guard against these problems, so they must charge higher prices.
- As a result, low-risk people sometimes forego insurance and lose the benefits of risk-pooling.

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

- Where running a business (investing) or saving your wealth in stocks is risky, that is the return you get varies from day to day. Sometimes high and sometimes low, including negative return
- We can measure risk of an asset with the **standard deviation**, a statistic that measures a variable's volatility- how likely it is to fluctuate.
- The higher the standard deviation of the asset's return, the greater the risk.

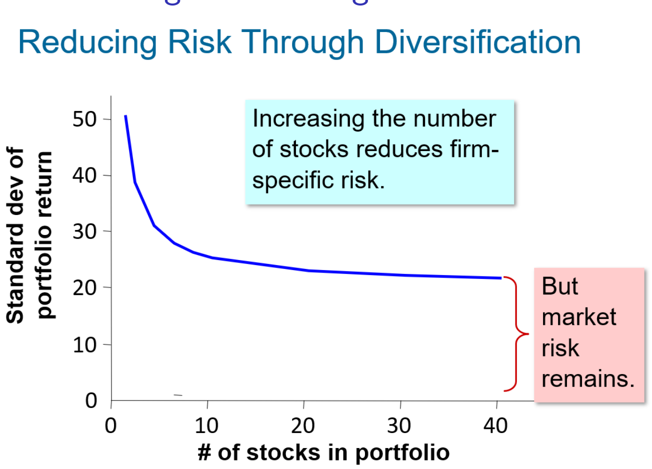
Reducing Risk Through Diversification

- **Diversification** reduces risk by replacing a single risk with a large number of smaller, unrelated risks.
- A diversified portfolio contains assets whose returns are not strongly related:
  - Some assets will realize high returns, others low returns.
  - The high and low returns average out, so the portfolio is likely to earn an intermediate return more consistently than any of the assets it contains.

Reducing Risk Through Diversification

- Diversification can reduce **firm-specific risk**, which affects only a single company.
- Diversification cannot reduce **market risk**, which affects all companies in the stock market.

Reducing Risk Through Diversification



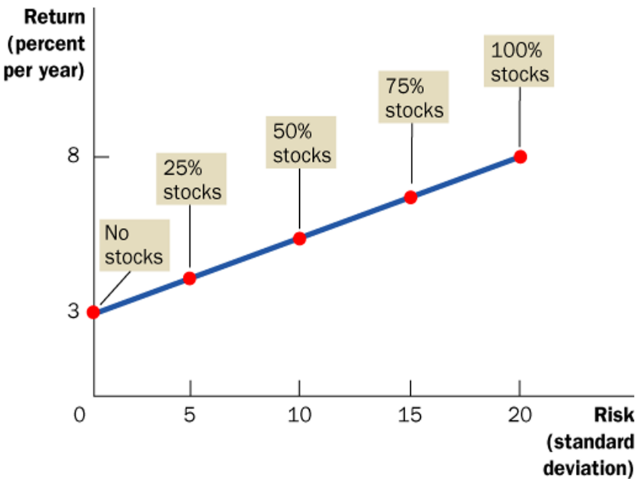
The Tradeoff Between Risk and Return

- Tradeoff: Riskier assets pay a higher return, on average, to compensate for the extra risk of holding them.
- E.g., over the past 200 years, average real return on stocks, 8%. On short-term govt bonds, 3%.

The Tradeoff Between Risk and Return

- 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 . . .

The Tradeoff Between Risk and Return



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 **overvalued**.
  - If price < value, the stock is **undervalued**.
  - If price = value, the stock is **fairly valued**.

ACTIVE LEARNING: 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?

Asset Valuation

- Value of a share
  = PV of any dividends the stock will pay + PV of the price you get when you sell the share
- Problem: When you buy the share, you don't know what future dividends or prices will be.
- One way to value a stock: **fundamental analysis**, the study of a company's accounting statements and future prospects to determine its value

ACTIVE LEARNING: 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?

The Efficient Markets Hypothesis

- Efficient Markets Hypothesis (EMH): the theory that each asset price reflects all publicly available information about the value of the asset

Implications of EMH

1. Stock market is **informationally efficient**: Each stock price reflects all available information about the value of the company.
2. Stock prices follow a **random walk**: A stock price only changes in response to new information ("news") about the company's value. News cannot be predicted, so stock price movements should be impossible to predict.
3. It is impossible to systematically beat the market.By the time the news reaches you, mutual fund managers will have already acted on it.

Index Funds vs. Managed Funds (1/2)

- An *index fund* is a mutual fund that buys all the stocks in a given stock index.
- An actively managed mutual fund aims to buy only the best stocks.
- Actively managed funds have higher expenses than index funds.
- EMH implies that returns on actively managed funds should not consistently exceed the returns on index funds.

Index Funds vs. Managed Funds (2/2)

	2001–2006 annualized return	2006 expense ratio
S&P 500 (index fund)	6.2%	.351
Managed large cap funds	5.9	1.020
S&P MidCap 400 (index fund)	10.9	.535
Managed mid cap funds	8.1	1.458
S&P SmallCap 600 (index fund)	12.5	.550
Managed mid cap funds	10.3	1.272

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** occur when speculators buy overvalued assets expecting prices to rise further.
- 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.