Soochow University International Programs

2021 SCUIP Winter Session I
ECON202

Lecture 7: The Basic Tool of Finance

ECON202: Macroeconomics
Soochow University

Road Map

- In Lecture 5, we discuss how capital is among the primary determinants of output and growth.
- In Lecture 6, we addressed how saving converted into investment in capital goods.
- In this lecture, we will show some of the tools people and firms use when choosing capital projects in which to invest.

Financial System

- Financial system links the present to the future.
  - ▹ They enable savers to convert current income into future purchasing power;
  - ▹ and borrowers to acquire capital to produce goods and services in the future.

An Important Concept in Macroeconomics

- Agents (households and/or firms) are forward-looking.

- Agents have rational expectations.
  - How much will I earn in ten years?
  - Will I have enough money for retirement?
  - Will the market demand goes up next year?
  - When should we do innovation?

Often the timing is everything!

- Often we have to make a timing decision.
  - ▹ What is the best way to allocate my life-time consumption? How much to consume when I am young, and how much when I am old?
  - ▹ When is the best time to produce? When the demand is high or when it is low?

- To answer these questions, we have to compare the present with the future.

We 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 market 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 filed that studies such decision making.

Present Value: The Time Value of Money

- To compare different 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 of the sum will be worth at a given future date, when allowed to earn interest at the prevailing rate.

An important fact of economic life

- A dollar in the future is less valuable than a dollar today.
- Why?
- Because a dollar today can be deposited in an interest-bearing bank account and produce more in the future.

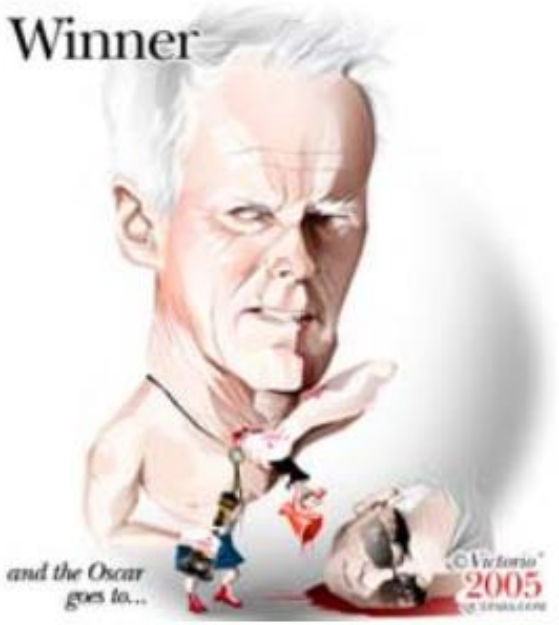
Example: A Simple Deposit

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

Example: A Simple Deposit (Cont'd)

- 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 PV to get: PV = $\frac{FV}{(1+r)^N}$

A million-dollar “baby”?



It may not be worth much!

- Suppose that you won a million-dollar lottery.
- Such prizes are usually paid out over time – say, $50,000 a year for 20 years.
- With an annual interest rate of 5%, the PV of such a prize is $623,000.
- What if the prize were paid out as a dollar a year for a million years?

Example: 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:
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.

Investment Decision (Cont'd)

- Instead, suppose $r = 0.09$.
  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)/$(1.09)^{10}$= \$84 million
Since PV < cost of factory, GM should not build it.

Present value helps explain why investment falls when the interest rate rises.

Now, question

- Will saving rise or fall if interest rate goes up?
  - ▹ Rise? Perhaps. Now saving earns higher interest, we have stronger incentives to save.
  - ▹ Falls? Perhaps. If I used to save for retirement, now higher interest rate gives me higher return so I do not have to save that much.
  - ▹ Substitution effect vs. Wealth effect
  - ▹ Theoretically, the impact of interest rate on saving is ambiguous.

Compounding

- Compounding: the accumulation of a sum of money where the interest earned on the sum of 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.

Risk and Uncertainty

- So far, there is no risk and uncertainty.
- Now, let’s introduce risk.

Risk Aversion

- Most people are risk averse – they dislike uncertainty.

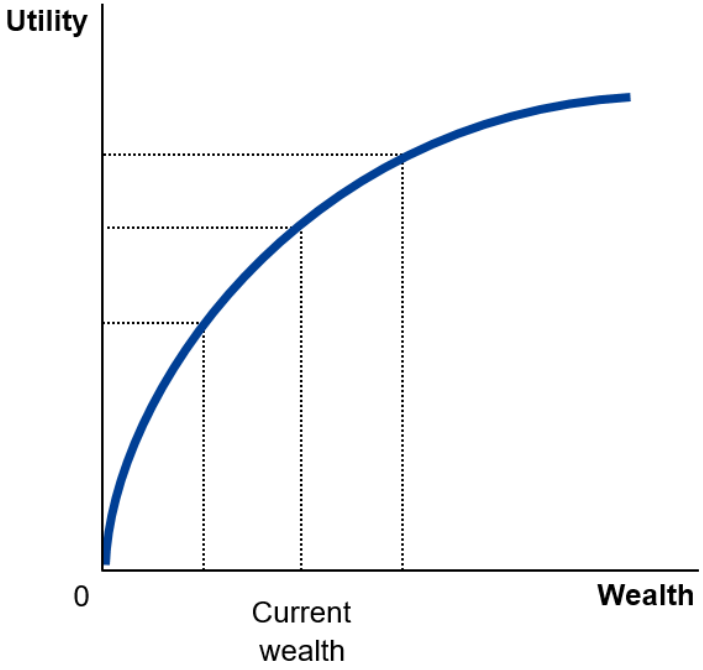
- Example: You are offered the following gamble.
  Toss a fair coin.
  i) If heads, you will $1000.
  ii) If tails, you lose $1000.
  Should you take this gamble?

- If you are risk averse, the pain of losing $1000 would exceed the pleasure of winning $1000, so you would not take this gamble.

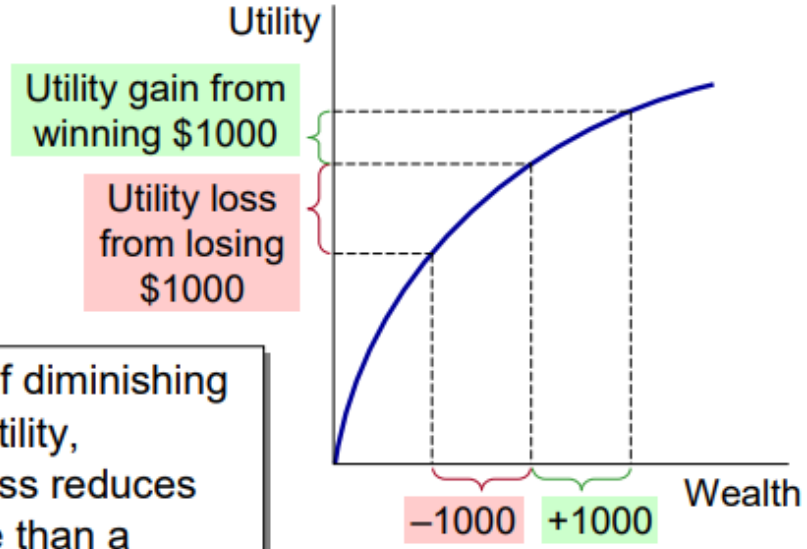
The Utility Function

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



Because of diminishing marginal utility, a $1000 loss reduces utility more than a $1000 gain increases it.

Managing Risk with Insurance

- How insurance works:
  A person facing a risk pays a fee to the insurance company, which in turn 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

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

Measuring Risk

- 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

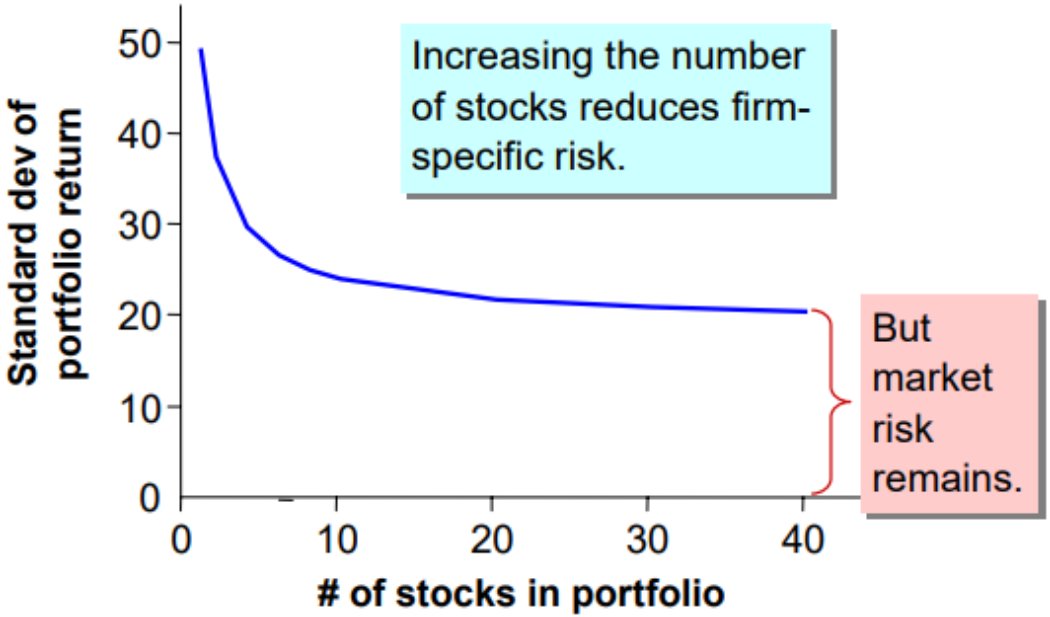
- Diversification reduces risk by replacing a single risk with a large number of smaller, unrelated risks.

- 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 (Cont'd)

- 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 (Cont'd)



The Tradeoff Between Risk and Return

- A tradeoff between risk and return: Riskier assets pay a higher return, on average, the compensate for the extra risk of holding them.

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

The Tradeoff Between Risk and Return (Cont'd)

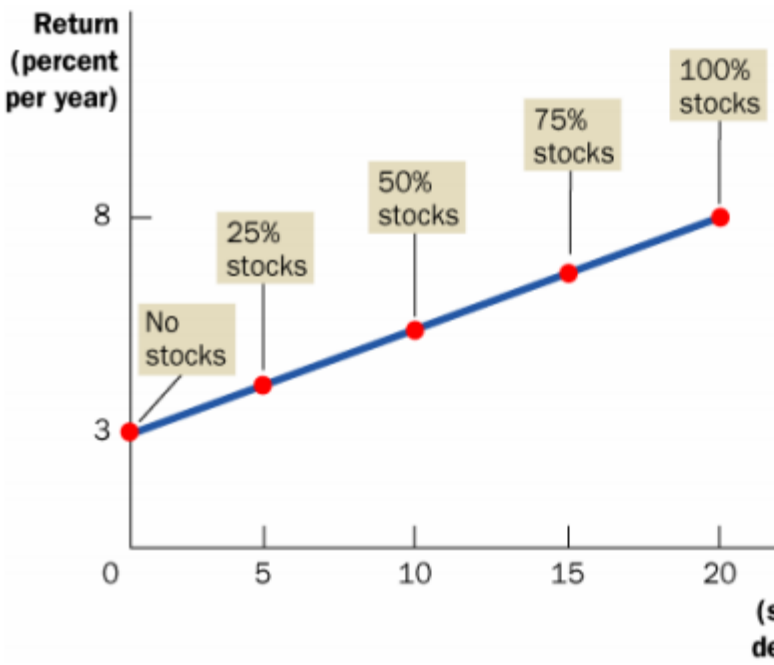
- Example:
  Suppose you are dividing your portfolio between two asset classes.

  (1) A diversified group of risky stocks: average return = 8%, std.dev. = 20%

  (2) A safe asset: return = 3%, std.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 (Cont'd)



Increasing the share of stocks in the portfolio increases the average return but also the risk.

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 share price < value, the stock is undervalued.
  - ▹ If share price = value, the stock is fairly valued.

- It's easy to look up the price. But how does one determine the stock's value?

Asset Valuation (Cont'd)

- 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.

The Efficient Markets Hypothesis

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

- Mutual fund managers
  - ▹ use fundamental analysis to assess value of all publicly traded companies
  - ▹ buy shares when price < value,
    sell shares when price > value
  - ▹ continuously monitor and act on any news that affects the valuation of any stock

The Efficient Markets Hypothesis (Cont'd)

- Stock prices determined by supply and demand.
  In equilibrium,
  ▹ the number of people who believe a stock is overvalued exactly balances the number who believe it to be undervalued
  ▹ the typical person perceives all stocks fairly valued

Informational Efficiency

- According to the Efficient Markets Hypothesis, the stock market is informational efficient: each stock price reflects all available information about the value of the company.

▹ When good news about a company's prospects becomes public, the value of company rises, so money managers buy lots of shares until the price rises to the new, higher value.

▹ When bad news become public, the value of the company falls, so money managers sell the shares until their prices fall by the same amount.

When buying becomes intensified

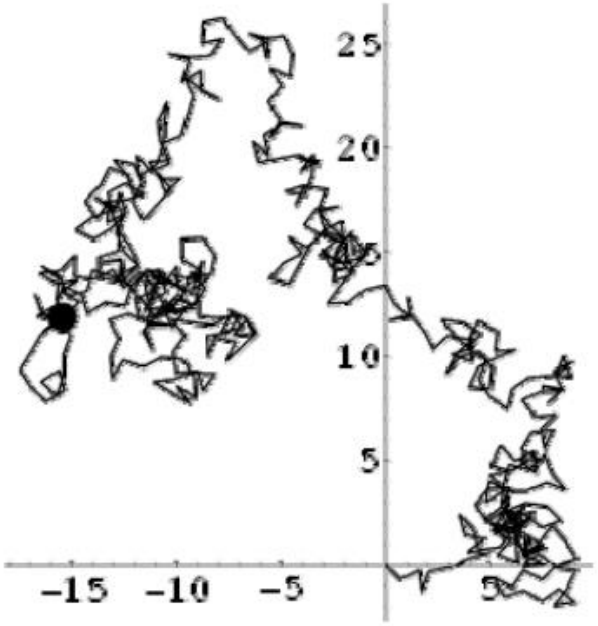
Informational Efficiency (Cont'd)

- At any moment, a stock price is the market's best guess of the company's value based on all available information.

Random Walk

- Random walk: the path of a variable whose changes are impossible to predict.
- The efficient markets hypothesis implies that stock prices should follow a random walk.

Random Walk (Cont'd)



The Efficient Markets Hypothesis (Cont'd)

- According to this theory, the only thing that can move stock prices is news that can change the market's perception of the company's value.
- In other words, something that the entire market does not know but you do.
- Such news is impossible to predict. (Otherwise it wouldn't really be news, and would already be reflected in the stock price.)

Trying to beat the Market?

- Evidence: Index Funds vs. Managed Funds
- An index fund is a mutual fund that buys all the stocks in a given stock index.
- An actively managed fund aims to buy only the best stock.
- The efficient markets hypothesis implies that it is impossible to consistently “beat the market”.
- If true, the returns on actively managed funds should not consistently exceed the returns on index funds.
- In fact, most actively managed funds perform worse than index funds (and have higher fees).

Market Irrationality

- Economists have argued that stock price movements are partly psychological.
- 1930s: John Maynard Keynes said stock prices are driven by investors' "animal spirits" – irrational waves of pessimism and optimism.

Market Irrationality (Cont'd)

- 1990s: Fed Chair Alan Greenspan said the stock boom reflected "irrational exuberance".
- The bubble burst around early 2000.

Market Irrationality vs. Market Rationality

- Do you believe in market irrationality or market rationality?
- It’s true that stock prices often move in ways that are hard to explain rationally.
- Yet, it’s impossible to know what price movements are “rational”.
- And if many investors behaved irrationally, there would be profit opportunities for rational investors. Yet, beating the market is nearly impossible.

2021 SCUIP Winter Session I