Economics

CFA一级培训项目

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10/% Contribution Breeds Professionalism

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- **讲授课程：CFA一、二、三级；AP经济学、统计学课程**
- **参与出版：曾参与出版了注册金融分析师系列丛书、金程教育CFA课堂笔记、CFA冲刺宝典、CFA中文NOTES等公开出版物及内部出版物。并参与翻译CFA协会官方参考书《企业理财》，《国际财务报告分析》等书籍。**

Topic Weightings in CFA Level I

Session NO.	Content	Weightings
Study Session 1	**Ethics & Professional Standards**	**15**
Study Session 2-3	Quantitative Analysis	12
Study Session 4-5	Economics	10
Study Session 6-9	Financial Reporting and Analysis	20
Study Session 10-11	Corporate Finance	7
Study Session 12	Portfolio Management and Wealth Planning	7
Study Session 13-14	Equity Investment	10
Study Session 15-16	Fixed Income	10
Study Session 17	Derivatives	5
Study Session 18	Alternative Investments	4

Framework

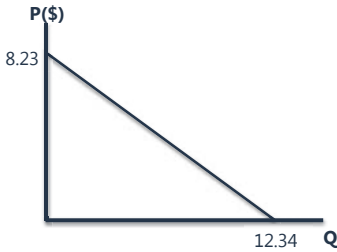
Economics

- Microeconomics and Macroeconomics
  - R14 Topics in Demand and Supply Analysis
  - R15 The Firm and Market Structures
  - R16 Aggregate Output, Prices, and Economic Growth
  - R17 Understand Business Cycles
- Monetary and Fiscal Policy, International Trade, and Currency Exchange Rates
  - R18 Monetary and Fiscal Policy
  - R19 International Trade and Capital Flows
  - R20 Currency Exchange Rates

Reading 14

Topics in Demand and Supply Analysis

Demand and Supply

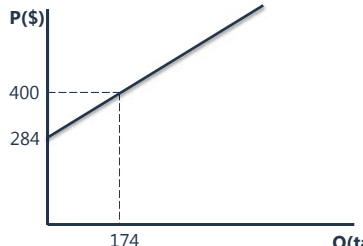


Demand function:

$Q_{gas}=12.34-15P_{gas}$

Inverse Demand function:

$P_{gas}=8.23-0.667Q_{gas}$



Supply function:

$Q_{tables}=-426+1.5P_{tables}$

Inverse supply function:

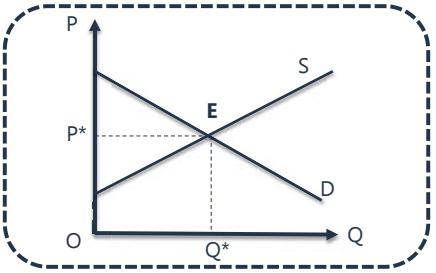
$P_{tables}=284+0.667Q_{tables}$

Demand and Supply Curves

- **Movements along demand and supply curves.**
  - Changes in quantity demanded or supplied of product X caused by changes in market price of the product X.
- **Shifts in demand and supply curves.**
  - Changes in quantity demanded or supplied of product X caused by other independent variables other than the changes in market price the product X.
    - ✓ For example: A change of the income; A change of the price for substitute goods or complementary goods.

Market Equilibrium

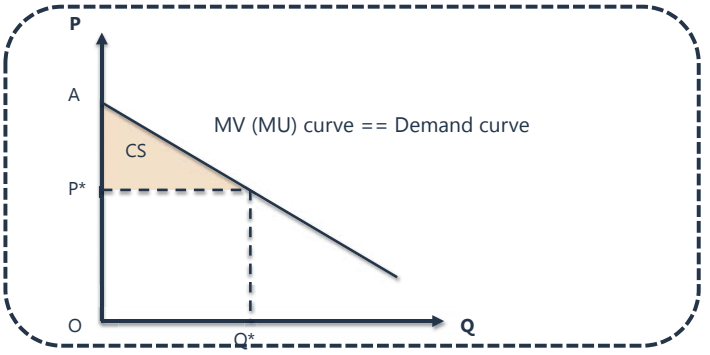
- **Equilibrium price and the equilibrium quantity**
  - When have a market supply and market demand curve for a good, we can solve for the price at which the quantity supplied equals the quantity demanded. We define this as the equilibrium price and the equilibrium quantity.



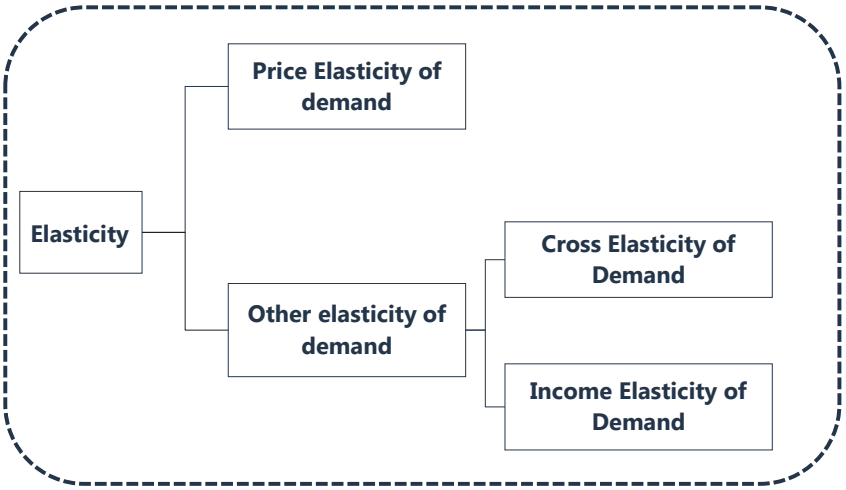
  - E: market equilibrium. At the price, the quantity of supply=the quantity of demand.

Consumer Surplus

- **Marginal value (MV or MB or MU)** is the benefit derived from consuming one additional unit of a good or service.
- The difference between the total value to consumers of the units of a good that they buy and the total amount they must pay for those units is called **consumer surplus**.



Elasticity



Price Elasticity of Demand

- **Definition**
  - A measure of how sensitive changes in quantity demanded to a change in price, and it is expressed as the ratio of percentage changes in each variable
  - The price elasticity of demand:

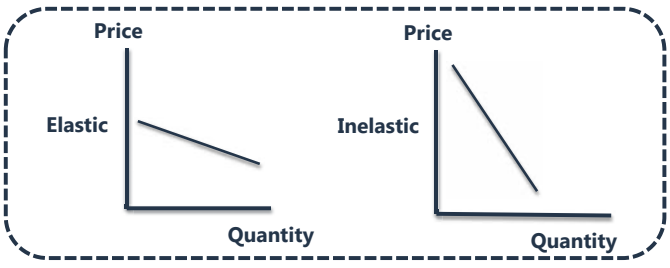
where:

$$E_{P_x}^d = \frac{\%\Delta Q_x^d}{\%\Delta P_x} = \frac{\frac{\Delta Q_x^d}{Q_x^d}}{\frac{\Delta P_x}{P_x}} = \left(\frac{\Delta Q_x^d}{\Delta P_x}\right)\left(\frac{P_x}{Q_x^d}\right)$$

$$\text{Percent change} = \frac{\text{change in value}}{\text{average value}} = \frac{\text{ending value - beginning value}}{\left(\frac{\text{ending value + beginning value}}{2}\right)}$$

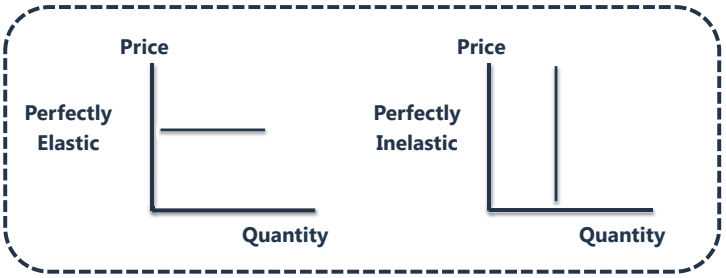
Price Elasticity of Demand

- **Price elasticity**
  - When elasticity<1, the demand is said to be inelastic;
  - When elasticity>1, the demand is said to be elastic;
  - When elasticity=1: demand is said to be unit elastic, or unitary elastic.



Price Elasticity of Demand

- **Perfectly elastic**
  - Demand curve is horizontal at some given price. It implies that even a minute price increase will reduce demand to zero.
- **Perfectly inelastic**
  - Demand curve is vertical, quantity demanded is not sensitive to price at all.



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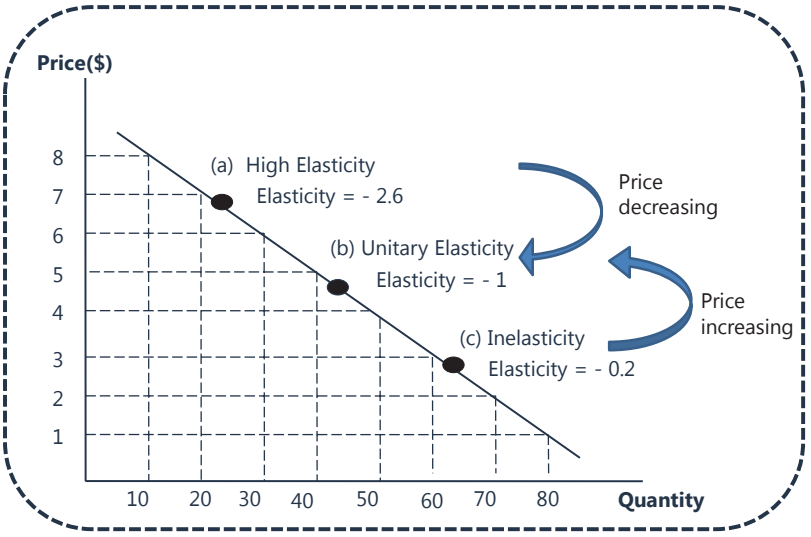
Price Elasticity of Demand

- **The relation between price elasticity of demand and total revenue.**
  - When demand is elastic
    - ✓ Price and total expenditure move in opposite directions.
    - ✓ The price decrease, but the sales volume increase in a higher percentage, total expenditure increase, the total revenue will decrease.
  - When demand is inelastic
    - ✓ Price and total expenditure move in the same direction.
    - ✓ The price decrease, and the sales volume increase in a lower percentage, total expenditure decrease with total revenue decrease.
  - When demand is unit elastic
    - ✓ The total revenue of the company is maximized.

Price Elasticity of Demand



Factors that Influence the Elasticity of Demand

- **Availability of substitutes**
  - If there are close substitutes for the good, then if its price rises even slightly, a consumer would tend switch to the less costly substitute.
- **The relative amount of income spent on the good**
  - If consumers tend to spend a very small portion of their budget on a good, their demand tends to be less elastic than if they spend a very large part of their income.
- **Time period since the price change**
  - For most goods and services, the long-run demand is much more elastic than the short-run demand.
  - Durable goods tend to behave in the opposite way.

Cross-Price Elasticity of Demand

- **Cross-price elasticity:** It measures how sensitive the demand for good X is to changes in the price of some other good, Y, holding all other things constant.

$$E_{P_y}^{d} = \frac{\%\Delta Q_x^{d}}{\%\Delta P_y}$$

  - If two goods, X and Y, has **positive** cross-price elasticity, the goods X and Y are referred to as **substitutes**.
    - ✓ Example: pen and pencil.
  - If two goods, X and Y, has negative cross-price elasticity, the goods X and Y are referred to as **complements**.
    - ✓ Example: pencil and eraser.

Income Elasticity of Demand

- Income elasticity of demand is defined as the percentage change in quantity demanded ($\%\Delta Q_x^{d}$) divided by the percentage change in income ($\%\Delta I$), holding all other things constant, as shown:

$$E_I^{d} = \frac{\%\Delta Q_x^{d}}{\%\Delta I}$$

  - If a good's income elasticity of demand is 0.6, it means that whenever the income rises by 1%, the quantity demand at each price would rise by 0.6%.
- **Positive income elasticity** means that as income rises, the demand for the good also rises.
  - Goods with positive income elasticity are called **"normal goods".**
    - ✓ **Luxuries:** high positive elasticity (>1).
    - ✓ **Necessities:** normal but have lower elasticity (between 0 and 1).
- **Negative income elasticity** means that as income rises, the demand for the good decreases.
  - Goods with negative income elasticity are called **"inferior" goods.**
    - ✓ Rice, potatoes, or less expensive cuts of meat.

Substitution and Income Effects

- **Substitution effect**
  - When the price of Good X decreases, the relative price of Good X against other goods will decrease. Consumer equilibrium moves along the indifference curve, which leads to an increase in the demand of Good X.
- **Income effect**
  - When the price of Good X decreases, consumer's real purchasing power will change. Real income increases, and budget constraint moves, which lead to a change in the demand of Good X.
- **Income effect & Substitution effect共同作用决定需求量变化**
- **When decrease in the price of Good X:**
  - The substitution effect is positive, and the income effect is also positive—consumption of Good X will increase.
  - The substitution effect is positive, and the income effect is negative but smaller than the substitution effect—consumption of Good X will increase.
  - The substitution effect is positive, and the income effect is negative and larger than the substitution effect—consumption of Good X will decrease

Normal Goods and Inferior Goods

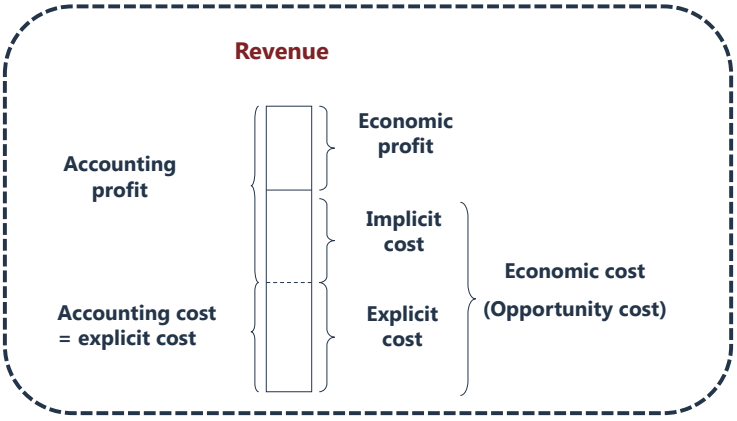
- **Normal good** is one for which the income effect is positive**.**
- **Inferior good** is one for which the income effect is negative**.**
- **Giffen goods (吉芬商品):**
  - Income effect （inferior goods） > Substitution effect
  - demand curve has positive slope
- **Veblen goods (韦伯伦商品, Conspicuous goods):**
  - Consumer can not truly value a good until the price is known.
  - Price is used by the consumer to signal the status in the society.
  - High price→ high value → high demand quantity (extremely)
    - ✓ Have a positively sloped demand curve (eg: luxury automobile or very expensive piece of jewelry) firstly.
    - ✓ But when price increases, the slope may be negative.
- **Two important distinctions between Giffen goods and Veblen goods.**
  - **First**, Giffen goods are inferior goods (negative income effect), while Veblen goods certainly are not.
  - **Second**, the existence of Giffen goods is theoretically supported by our rules of consumer choice, while the existence of Veblen goods is not.

Accounting Profit and Economic Profit

- **Accounting profit is the difference between total revenue and total accounting cost.**
  - Accounting profit = total revenue – total accounting (explicit) cost
- **Economic profit** is also referred to as abnormal profit. It is equal to accounting profit less implicit opportunity costs.
  - **Economic profit= accounting profit - implicit opportunity costs**
  - **Implicit costs** are the opportunity costs of resources supplied to the firm by its owners.
    - ✓ For private firms, the implicit costs include
      - ◆ The opportunity cost of owner-supplied capital;
      - ◆ The opportunity cost of the time;
      - ◆ Entrepreneurial ability of the firm's owners.
    - ✓ For publicly firms, implicit costs are only the opportunity cost of equity owners' investment.
  - **Economic profit = total revenue – total economic costs**

Normal Profit

- **Normal profit** is the accounting profit that makes economic profit zero.
  - Accounting profit = economic profit + normal profit

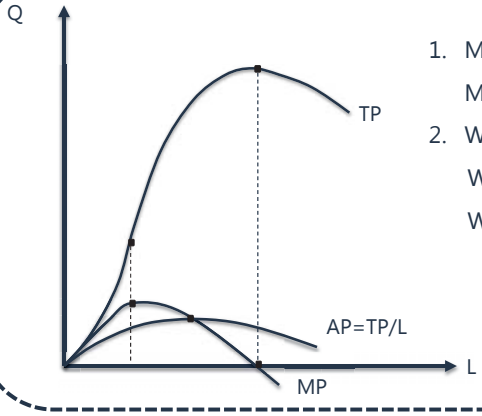


Total, Average, Marginal Products

- **Total product(TP)**: sum of the output from all inputs during a time period; usually illustrated as the total output (Q) using labor quantity (L)
- **Average product(AP)**: total product divided by the quantity of a given input; measured as total product divided by the number of worker hours used at that output level (Q/L)
- **Marginal product(MP):** the amount of additional output resulting from using one more unit of input assuming other inputs are fixed; measured by taking the difference in total product and dividing by the change in the quantity of labor (ΔQ/ΔL).

Law of Diminishing Returns

- **The law of diminishing marginal returns** states that as more and more resources (such as labor) are devoted to a production process, they increase output but at an ever decreasing rate.



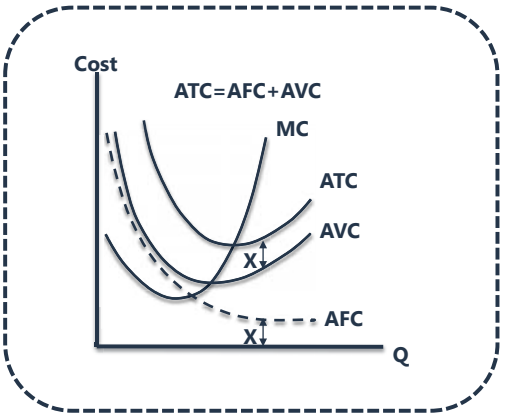
1. MP is the slope of TP, when MP=0, TP is maximized.
2. When MP > AP, AP increase;
   When MP< AP, AP decrease;
   When MP= AP, AP is maximized.

Total, Average, and Marginal Revenue

- **Total revenue (TR)** for any firm that charges a single price to all customers is calculated as price multiplied by quantity sold, or TR=∑P*Q.
- **Average revenue (AR)** is equal to total revenue divided by the quantity sold, AR=TR/Q.
- **Marginal revenue (MR)** is the increase in total revenue from selling one more unit of a good or service.
- **Under perfect competition**
  - The individual firm is a **price taker**.
  - It must take the market price of its output as given, so it faces a perfectly elastic, horizontal demand curve.
  - The firm's average revenue (AR), or revenue per unit, is also equal to price per unit. MR=Price=AR
- **Under imperfect competition**
  - Firm that faces a negatively sloped demand curve is **price searchers**.
  - Total revenue (TR) is maximized when MR=0.
  - The relationship between MR, P, and price elasticity of demand: **$MR=P[1-1/E_p]$**

Total, Average, Marginal, Fixed, Variable costs

Average and Marginal Costs



- AFC slopes downward.
- MC declines initially, then increases.
- MC intersects AVC and ATC at their minimum points.

Profit Maximization

- **Profit maximization** occurs when
  - The difference between total revenue (TR) and total costs (TC) is the greatest;
  - **Marginal revenue (MR) equals marginal cost (MC); (MR=MC)**

Breakeven Point and Shutdown Point

- **Under perfect competition**

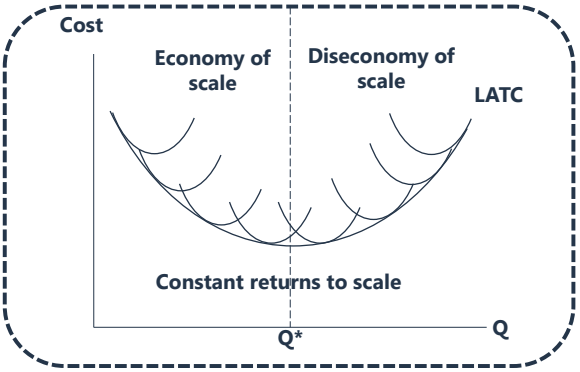
Revenue-Cost Relationship	Short-Run Decision	Long-Run Decision
AR > ATC	Stay in market	Stay in market
AR = ATC	**Breakeven point**	
AVC < AR < ATC	Stay in market	Exit market
AR = AVC	**Shutdown point**	
AR < AVC	Shut down production to zero	Exit market

- **Under imperfect competition**

Revenue-Cost Relationship	Short-Run Decision	Long-Run Decision
TR > TC	Stay in market	Stay in market
TVC < TR < TC	Stay in market	Exit market
TR < TVC	Shut down production to zero	Exit market

Economies of Scale and Diseconomies of Scale

- **Economies of scale** occurs if cost per unit of production falls as input increases, and the slope of LRAC is negative.
- **Diseconomies of scale** occurs if cost per unit rises as input increases, and the slope of LRAC is positive.



Reading 15

The Firm and Market Structures

Market Structure

Type	Number of firms	Degree of difference of products	Difficulty to enter or leave	Pricing Power of Firm	The example in our life
Perfect competition	Many	No difference	Very easy	None	Some agricultural products
Monopolistic competition	Many	Some difference	Relatively easy	Some	Some retail products
Oligopoly	More than one, but not many	Little or no difference	Difficult	Some or Considerable	Steel, automobile, oil
Pure monopoly	Single	Sole product, nearly no substitute	No way	Considerable	Public sectors

Perfect Competition

- A **price taker** is a firm that cannot influence the market price and that sets its own price at the market price.
- Individual firm's **demand schedule** is *perfectly elastic* (horizontal, Price = Demand = Marginal Revenue = Average revenue).
- **Perfectly competition firm's short-run equilibrium**
  - Profit max: MR=MC
  - MR=P=AR=D（price taker）
- **Individual firm's long-run equilibrium under perfect competition**
  - In the long-run, economic profit will attract other entrepreneurs to the market ➔more output
  - The long-run, firms operate at the point where MC= minimum ATC
  - So firms operate at the point **P=MR=MC=ATC**, no firms earn excess profit.

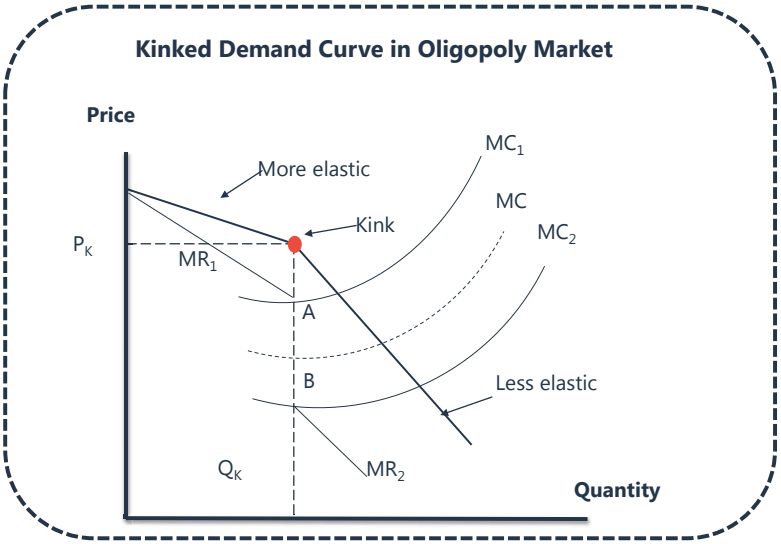
Monopolistic Competition

- **The following market and product features define monopolistic competition:**
  - Firms in monopolistic competition has highly elasticity because each competing products are close substitutes.
  - Firms have a downward-sloping demand curves
- **Product development and marketing**
  - **Innovation and product development**
  - **Brand names**
  - **Advertising**

Oligopoly - Kinked Demand Curve Model

- **The kinked demand curve model of oligopoly** is based on the assumption that each firm believes that if it raises its price, others will not follow, but if it cuts its price, other firms will cut theirs.
  - Between range A and B, the optimum Q is constant, can't determine price.
  - Q_k is the profit-maximizing level of output and the price at which the kink is located is the firm's profit maximizing price.
  - Shortcoming: it is incomplete because what determines the market price (where the kink is located) is outside the scope of the model.

Oligopoly - Kinked Demand Curve Model



Oligopoly - Nash Equilibrium Model

- **Nash equilibrium** is reached when the choices of all firms are such that there is no other choice that makes any firm better off (increases profits or decrease loss) .
- **Prisoners' Dilemma** is a game that illustrates that the best course of action for an oligopoly firm, when engaging in collusion with another oligopoly firm, is to cheat.

	Prisoner Y is silent	**Prisoner Y confesses**
Prisoner X is silent	X gets 5 months Y gets 5 months	X gets 8 years Y goes free
Prisoner X confesses	X goes free Y gets 8 years	X gets 3 years Y gets 3 years

Oligopoly - Dominant Firm Model

- **Dominant firm model**
  - A single firm that generally have 40% or greater market share.
    - ✓ Greater capacity;
    - ✓ Greater customer loyalty.
  - The dominant firm is the price maker
  - The other firms in the market follow the pricing pattern of the dominant firm.
- If the other companies in the market attempts to gain market share by undercutting the price set by the dominant firm, the market share of the dominant firm will increase.
- Over time, the dominant company's market share tends to decrease as profit attract entry by other companies.

Monopoly

- The monopolist's demand schedule is **the aggregate demand** for the product in the relevant market. The slope of the demand curve is negative and therefore downward sloping.
- The profit-maximizing level of output occurs where marginal revenue equals marginal cost, **MR = MC.**
- The monopolists search to realize the maximum profit, instead of the maximum prices.
- To maximize its total profits, monopolists will produce less product and charge higher price for its product, compared to the perfect competition market.
- The relationship between MR and price elasticity, E_p, is: **$MR=P[1-1/E_p]$**

Price Discrimination

- **Price discrimination** is the practice of charging different consumers different prices for the same product or service.
  - **First-degree price discrimination**, where a monopolist is able to charge each customer the highest price the customer is willing to pay.
  - **In second-degree price discrimination**, the monopolist offers a menu of quantity-based pricing options designed to induce customers to self-select based on how highly they value the product.
    - ✓ producers can use not just quantity but also the quality to charge more to customers that value the product highly.
  - **Third-degree price discrimination** happens when customers are segregated by demographic or other traits.

Government Regulation

- **Government regulation**
  - **Average cost pricing** is the more common form of regulation at the point where ATC=D. This will:
    - ✓ Increase output of monopolists to the demand, and decrease price.
    - ✓ Ensure the monopolist a normal profit with less social welfare reduced.
  - **Marginal cost pricing** forces the monopolists to reduce its price to marginal price. This will:
    - ✓ Increase output and reduce price, the pricing method is similar in competitive market.
    - ✓ The monopolist suffer a loss for the price is below ATC.
    - ✓ Government subsidy is needed in order to provide the firm with a normal profit.

Concentration Measures

- **Concentration measures**
  - **The N-Firm Concentration Ratio:** the sum of the market share for largest N firms in a market in percentage aspect..
    - ✓ advantage: simple to compute, and easy to be understood
    - ✓ disadvantage: does not directly quantify market power
    - ✓ **limitation: the ratio is insensitive to the merger of two firms with large market shares.**
  - **The Herfindahl-Hirschman Index (HHI):** summing the squares of the market shares for each company in an industry.
    - ✓ **limitation: either case do not consider the barrier to entry for the industry.** If the barriers to entry are low, even a firm is with high market share, it may not have too much pricing power.

Reading 16

Aggregate Output, Prices, and Economic Growth

GDP& GDP deflator

- **Gross domestic product (GDP)** measures the total market value of all final goods and services produced within the economy in a given period of time (output definition) or, equivalently,
- **GNP (Gross National Product)** measures the market value of all final goods and services produced by factors of production supplied by residents of a country, regardless of whether such production takes place within the country or outside of the country.
- **Implicit price deflator for GDP(GDP deflator)** In order to evaluate an **economy's health**, it is often useful to remove the effect of changes in the general price level on GDP because higher (lower) income driven solely by changes in the price level is not indicative of a higher (lower) level of economic activity.

$$GDP\ deflator = \left(Nominal\ GDP\ /\ Real\ GDP\right) \times 100$$

GDP Measurement

- GDP can be calculated with two approaches
  - **Expenditure approach**, GDP is equal to the sum of the amounts spent on goods and services produced during the period.
  - **Income approach**, GDP is equal to the sum of the amounts earned by households and companies during the period.
  - Since Total expenditures = total income. The equation will be hold for the whole economy. Hence expenditure approach and income approach will have same results.

GDP Measurement

- **Income approach**
  - GDP = National income + Capital consumption allowance (CCA) + Statistical discrepancy
    - ✓ CCA: measure of the wear and tear (**depreciation**) of the capital stock that occurs in the production of goods and services.
- **National income:** the income received by all factors of production used the generation of final output.
  - National income
    - = Compensation of employees 工人
    - + Corporate and government enterprise profits before taxes 企业，税前
    - + Interest income 资本
    - + Unincorporated business net income (proprietor's income) 企业家
    - + Rent 租金
    - + Indirect business taxes less subsidies 间接税

GDP Measurement

- **Personal income**

  = National income

  - Indirect business taxes
  - Corporate income taxes
  - Undistributed corporate profits

  + Transfer payments

  - One of the key determinants of consumption spending, measuring
    - ✓ Household income
    - ✓ Ability of consumers to make purchases. As such, it is Personal income
- **Personal disposable income** = personal income - personal taxes

GDP Measurement

- **Expenditure approach**
  - GDP = C +I+G+(X-M)
- where
  - C = Consumer spending on final goods and services
  - I = Gross private domestic investment, which includes business investment in capital goods (e.g., plant and equipment) and changes in inventory (inventory investment)
  - G = Government spending on final goods and services
  - X = Exports
  - M = Imports
- Total expenditures can be stated as
  GDP = C + I + G + (X - M) ①
- Total income, which must equal total expenditures, can be stated as
  GDP=C+S+T ②
- ① = ② → S = I + (G - T) + (X - M)

IS Curves

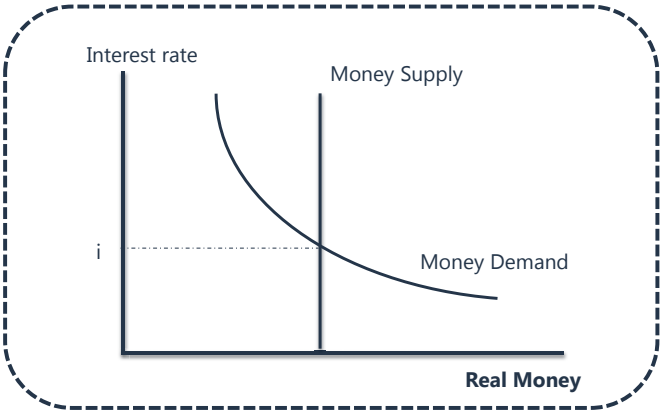
- **The IS Curve**
- **Y = C+I+G+(X-M)**
  - C和Y有关，I和i（利率）有关，其他都看成常数，以上方程可以写成i和Y的函数，这就是IS曲线；
  - IS曲线的shift：
    - ✓ G
    - ✓ X - M

Money Demand

- **The Demand for money** is largely determined by interest rates and it is also influenced by income level and price level
- Three reasons for holding money:
  - **Transactions money balances** that are held to finance transactions increase as the GDP grows. The ratio of transactions balances and GDP remains fairly stable.
  - **Precautionary money balances**: that are held to provide a buffer against unforeseen events that might require money.
  - **Speculative money balances** (portfolio demand for money): relates to the demand to hold speculative money balances based on the potential opportunities or risk that are inherent in other financial instruments (e.g., bonds). The speculative demand for money will tend to fall as the returns available on other financial assets rises.

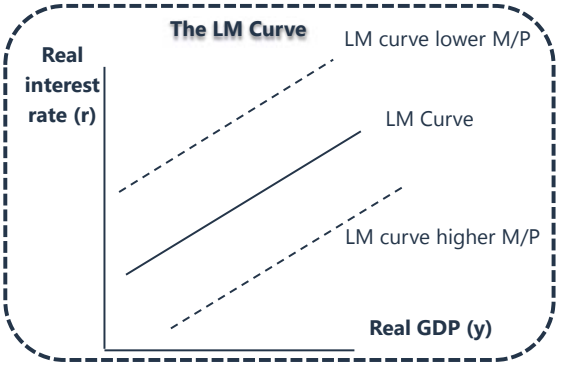
Money Supply

- **Money Supply**
  - The supply of money remains constant, since it is predetermined by the central bank, resulting in vertical graph of money supply.



LM Curves

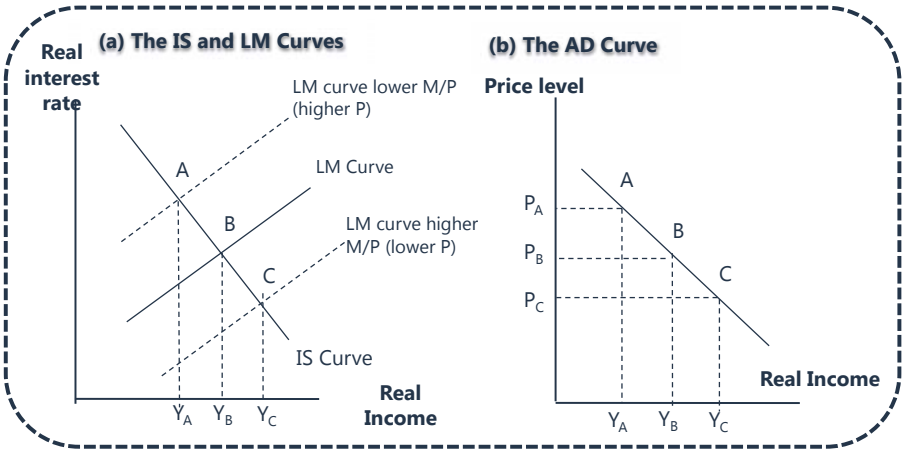
- **The LM Curve**



In equilibrium, there is a positive relationship between real income and the real interest rate for a given level of the real money supply.

Aggregate Demand Curve

➢ **Deriving the Aggregate Demand Curve**



1412 (1)
1506 (1)

Shifts in the Aggregate Demand Curve

Impact of Factors Shifting Aggregate Demand		
An Increase in the Following Factors	**Shifts the AD Curve**	**Reason**
Stock prices	Rightward: Increase in AD	Higher consumption
Housing prices	Rightward: Increase in AD	Higher consumption
Consumer confidence	Rightward: Increase in AD	Higher consumption
Business confidence	Rightward: Increase in AD	Higher investment
Capacity utilization	Rightward: Increase in AD	Higher investment
Government spending	Rightward: Increase in AD	Government spending a component of AD
Taxes	Leftward: Decrease in AD	Lower consumption and investment
Bank reserves	Rightward: Increase in AD	Lower interest rate, higher investment and possibly higher consumption
Exchange rate (foreign currency per unit domestic currency)	Leftward: Decrease in AD	Lower exports and higher imports
Global growth	Rightward: Increase in AD	Higher exports

1406 (1) 1506 (1) 1512 (1)
1606 (1) 1612 (1)

Aggregate Supply Curve

➢ **Aggregate Supply Curve**

➢ **Aggregate supply curve (AS curve):** the level of domestic output (Y) that companies will produce at each price level (P). **We need to consider three aggregate supply curves with different time frames:**

- The **VSRAS curve：** horizontal, Perfectly elastic,
- The **LRAS curve：** vertical, perfectly inelastic
  - ✓ **wages and input** prices change proportionately with **price** level over the long run.
  - ✓ Thus **price level** has no impact on **aggregate supply**.
- The **SRAS curve：** upward sloping.

Shifts in the Aggregate Supply Curve

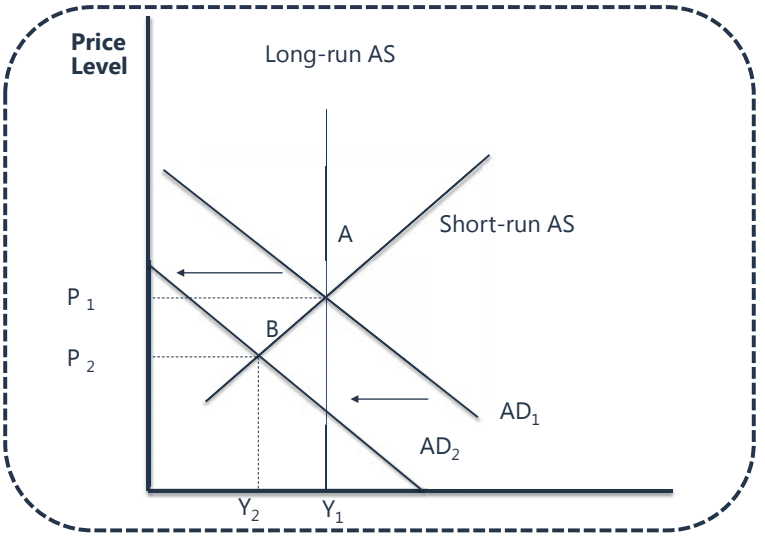
Impact of Factors Shifting Aggregate Supply			
An Increase in	**Shifts SRAS**	**Shifts LRAS**	**Reason**
Supply of labor	Rightward	Rightward	Increases resource base
Supply of natural resources	Rightward	Rightward	Increases resource base
Supply of human capital	Rightward	Rightward	Increases resource base
Supply of physical capital	Rightward	Rightward	Increases resource base
Productivity and technology	Rightward	Rightward	Improves efficiency of inputs

Economic growth

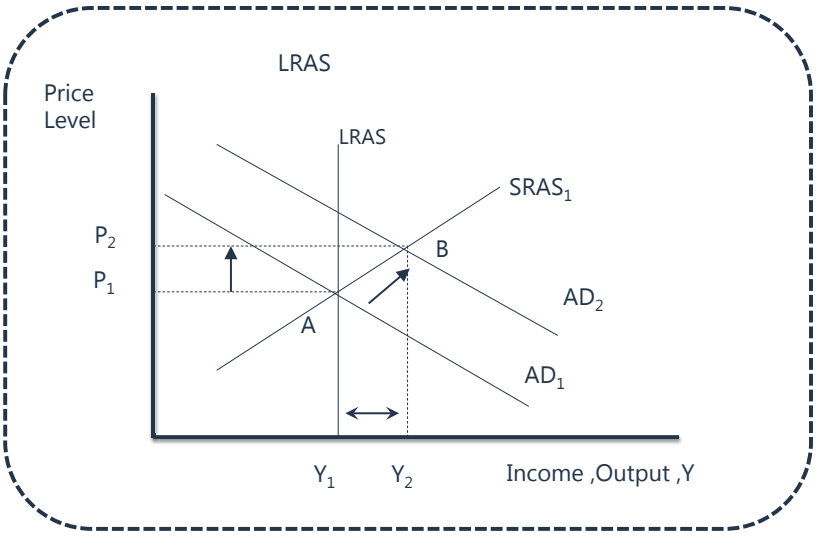
Shifts in the Aggregate Supply Curve

Impact of Factors Shifting Aggregate Supply			
An Increase in	**Shifts SRAS**	**Shifts LRAS**	**Reason**
Nominal wages	Leftward	No impact	Increases labor cost
Input prices (e.g., energy)	Leftward	No impact	Increases cost of production
Expectation of future prices	Rightward	No impact	Anticipation of higher costs and/or perception of improved pricing power
Business taxes	Leftward	No impact	Increases cost of production
Subsidy	Rightward	No impact	Lowers cost of production
Exchange rate（影响进口原料成本）	Rightward	No impact	Lowers cost of production

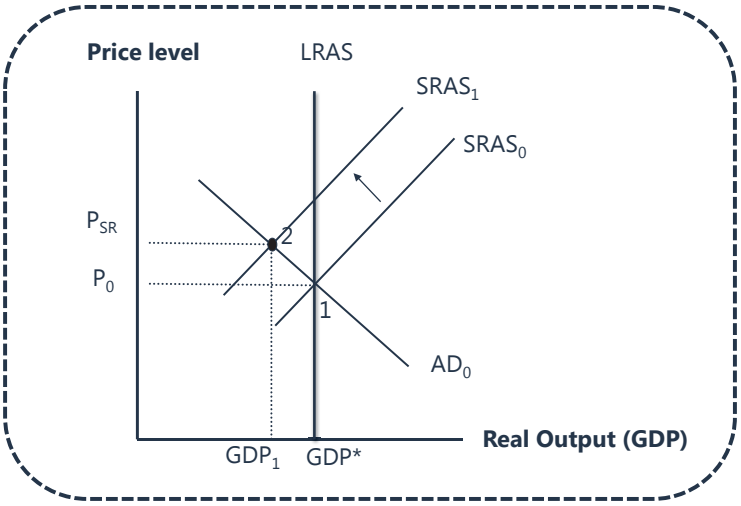
Recessionary Gap



Inflationary Gap



Stagflation



Sources of Economic Growth

- Economic growth can best be explained by examining five important sources of economic growth:
  - **Labor supply.**
  - **Human capital.**
  - **Physical capital stock.**
  - **Technology.**
  - **Natural resources.**

Production Function

- A **production function**: relationship of output (Y) with labor (L), capital (K), and level of technology (A) that determines the productivity.

Y = A ×*f* (L, K) ($Y = TK^{\alpha}L^{(1-\alpha)}$)

where: Cobb-Douglas production function

Y = aggregate economic output ;

L = size of labor force;

K = amount of capital available ;

A = total factor productivity

- **Total factor productivity** is a scale factor that reflects the portion of growth that is not accounted for by the capital and labor inputs.
  - ✓ The main factor influencing TFP is technological change.
  - ✓ Like potential GDP, TFP is not directly observed in the economy and must be estimated.
- It exhibits **constant returns to scale**: increasing all inputs by a fixed percentage leads to the same percentage increase in output.

Growth & Growth of Total Factor Productivity

- Using the production, economists developed a model that explained the contribution of labor, capital, and technology (total factor productivity) to economic growth:

growth in potential GDP

= growth in technology + W_L(growth in labor) + W_C (growth in capital)

where W_L and W_c are the relative shares of labor and capital in national income.

Growth & Growth of Total Factor Productivity

- Growth in total factor productivity is driven by improvements in technology. Sometimes, the relationship between potential GDP, technology improvements, and capital growth is written on a per-capita basis as:

growth in per-capita potential GDP

= growth in technology + W_C (growth in the capital-to-labor ratio)

- Assuming the number of workers and a remain constant, increases in output can be gained by increasing capital per worker **(capital deepening)** or by improving technology (increasing TFP).

Growth & Growth of Total Factor Productivity

- Labor productivity data can be used to estimate the rate of sustainable growth of the economy. A useful way to describe potential GDP is as a combination of aggregate hours worked and the productivity of those workers:

  Potential GDP = Aggregate hours worked X Labor productivity

- Transforming the above equation into growth rate, we can get the following:

  Potential growth rate = Long-term growth rate of labor force + Long-term labor productivity growth rate

Reading 17

Understanding Business Cycles

Business Cycle Characteristics

	Early Expansion (Recovery)	Late Expansion	Peak	Contraction (Recession)
Economic Activity	■ Gross domestic product (GDP), industrial production, and other measures of economic activity stabilize and then begin to increase.	■ Activity measures show an accelerating rate of growth.	■ Activity measures show decelerating rate of growth.	■ Activity measures show outright declines.
Employment	■ Layoffs slow but new hiring does not yet occur and the unem-ployment rate remains high. Business turns to overtime and temporary employees to meet rising product demands.	■ Business begins full time rehiring as overtime hours rise. The unemployment rate falls.	■ Business slows its rate of hiring. The unemployment rate continues to fall but at a decreasing rate.	■ Business first cuts hours and freezes hiring, followed by outright layoffs. The unemployment rate rises.

Business Cycle Characteristics

	Early Expansion (Recovery)	Late Expansion	Peak	Contraction (Recession)
Consumer and Business Spending	■ Upturn in spending often most pronounced in housing, durable consumer items, and orders for light producer equipment.	■ Upturn in spending becomes more broad-based. Business begins to order heavy equipment and engage in construction.	■ Capital spending expands rapidly, but the growth rate of spending starts to slow down.	■ Decreased spending most evident in industrial production, housing, consumer durable items, and orders for new business equipment.
Inflation	■ Inflation remains moderate and may continue to fall.	■ Inflation picks up modestly.	■ Inflation further accelerates.	■ Inflation decelerates but with a lag.

Theories of the Business Cycle

- **Keynesian School**
  - **Conclusion**:
    - ✓ **Business cycle is primarily caused by shifts in demand curve** and can be eased by fiscal policies.
    - ✓ A reduction in wage has **downward stickiness** in short term.
  - **Limitations**:
    - ✓ Fiscal deficit is a danger to government finance.
    - ✓ Expansionary fiscal policy may cause "overheat".
    - ✓ Fiscal policy has a time lag.

由于对于未来的预期的改变导致了总需求的改变，从而引起了经济周期

主张：政府直接干预经济

Theories of the Business Cycle

- **New Keynesians (Neo-Keynesians)**
  - **Conclusion**:
    - ✓ New Keynesians assume the stickiness of price in short term, so government intervention is instead necessary to push the economy back to the long-term equilibrium.
  - **"Menu cost":** It is costly for companies to adjust price frequently to make markets clear.

Theories of the Business Cycle

- **Monetarist School（联系 MV=PY）**
  - **Conclusion**:
    - ✓ **Volatilities in growth of money supply causes business cycle**.
    - ✓ The timing of government policies is uncertain, and it is generally better to let the economy find its new equilibrium automatically.
  - **Objections to Keynesian**:
    - ✓ Keynesians ignore the importance of money supply. When M2 increases, the economy will experience a boom and vise versa.
    - ✓ Keynesians lack a complete representation of utility-maximizing agents.
    - ✓ The intervention from the government is costly in long run.
    - ✓ Time lag

由于央行无规律的货币供给导致了经济周期，主张央行不要乱发货币

Theories of the Business Cycle

- **Neoclassical School**
  - **Conclusion:**
    - ✓ **General equilibrium.** All markets will reach equilibrium because of the "invisible hand, or free market," and the price will be found for every good at which supply equals demand.
    - ✓ **Technology progress** causes cycles within industry, but no economy-wide fluctuation.
  - **Limitations:**
    - ✓ Fail to explain business cycles or a massive crisis, such as Great Depression of the 1930s.

技术的改变引起经济周期，主张政府不要干预经济

Theories of the Business Cycle

- **Austrian School**
  - **Conclusions**:
    - ✓ Share several views with **neoclassical theory**, but focus on the role of money and government.
    - ✓ The fluctuation is caused by government intervention, and money is just a way to simplify exchange.
    - ✓ Government should **not** intervene in the economy.

政府参与引起经济周期，主张政府不要干预经济

Theories of the Business Cycle

- **Real Business Cycle Theory (New classical, model without money)**
  - **Conclusions**:
    - ✓ The business cycle is an efficient reaction to external real shocks.
    - ✓ Government should **not** intervene in the economy.
    - ✓ Focus more on shift in demand curve, comparing to Keynes.
  - **Limitations**:
    - ✓ Fail to explain unemployment, along with decreasing required salaries, in labor market during recession.

实际经济变量（外部冲击&技术）影响了经济周期，主张政府不要干预

Key Terms in the Labor Market

- **Employed:** number of people with a job.
  - This figure normally does not include people working in the informal sector (e.g., unlicensed cab drivers, illegal workers, etc.)
- **Labor force:** number of people who either have a job or are actively looking for a job.
  - This number **excludes** retirees, children, stay-at-home parents, fulltime students, and other categories of people who are neither employed nor actively seeking employment.
- **Participation ratio** (also referred to as the activity ratio or labor force participation rate) is the percentage of the working-age population who are either employed or actively seeking employment

$$\text{Labor force participation rate} = \frac{\text{labor force}}{\text{Working}-\text{age population}} \times 100$$

- **Unemployment rate** is the percentage of people in the labor force who are unemployed.

$$\text{Unemployment rate} = \frac{\text{number of unemployed}}{\text{labor force}} \times 100$$

Inflation, Deflation and Disinflation

- **Inflation** is a persistent increase in the price level over time.
  - If inflation is present, the prices of almost all goods and services are increasing.
  - **Inflation rate** is the percentage increase in the price level, typically compared to the prior year.
  - **Hyperinflation**: an extremely fast increase in aggregate price level, which corresponds to an extremely high inflation rate.
- **Deflation:** a sustained decrease in aggregate price level, which corresponds to a negative inflation rate.
- **Disinflation:** a decline in the inflation rate.
  - Disinflation is very different from deflation because even after a period of disinflation, the inflation rate remains positive and the aggregate price level keeps rising (although at a slower speed).

Inflation Measurement

- **CPI**
- **Producer Price Index (PPI)/Wholesale Price Index (WPI):**
  - reflects the price changes experienced by domestic producers in a country.
- **GDP Deflator**
- **Headline and Core Inflation**
  - **Headline inflation**: basket of **all** goods and services.
    - ✓ Ultimate goal of government;
    - ✓ Represent actual cost of living.
  - **Core inflation**: basket of goods **excludes food and energy.**
    - ✓ Avoid overreactions to short-term fluctuation in food and energy sector.

Example-CPI calculation

Time	May 2017		June 2017	
Goods	Quantity	Price	Quantity	Price
Rice	50kg	¥3/kg	70kg	¥4/kg
Gasoline	70liters	¥4.4/liter	60liters	¥4.5/liter

- **Laspeyres index calculation (set the price index in May 2017 to 100)**
  - For January 2017, the total value of the consumption basket is: **Value of rice + Value of gasoline=(50*3)+(70*4.4)= ¥458**
  - For February 2017, the total value of the consumption basket is: **Value of rice + Value of gasoline=(50*4)+(70*4.5)= ¥515**

$$Laspeyres\ index = \frac{515}{458} \times 100 = 112.45$$

- **Paasche index calculation**

$$Paasche\ Index_{02/2010} = \frac{(70\times 4)+(60\times 4.5)}{(70\times 3)+(60\times 4.4)} \times 100 = 116.03$$

- **Fisher index calculation**

$$Fisher\ index_{02/2010} = \sqrt{I_P \times I_L} = \sqrt{116.03\times 112.45} = 114.23$$

Inflation

- An inflation that results from an initial increase in costs is called **cost-push inflation**. The two main sources of increases in costs are
  - An increase in money wage rates
  - An increase in the money prices of raw materials
- **Demand-pull inflation:** an inflation that results from an initial increase in aggregate demand
  - Factors:
    - ✓ Increase in the quantity of money
    - ✓ Increase in government purchases
    - ✓ Increase in exports

Economic Indicators

Leading	Reason
Average weekly hours, manufacturing	Because businesses will cut overtime before laying off workers in a downturn and increase it before rehiring in a cyclical upturn, these measures move up and down before the general economy.
Average weekly initial claims for unemployment insurance	This measure offers a very sensitive test of initial layoffs and rehiring.
Interest rate spread between 10-year treasury yields and overnight borrowing rates (federal funds rate)	Because long-term yields express market expectations about the direction of short-term interest rates, and rates ultimately follow the economic cycle up and down, a wider spread, by anticipating short rate increases, also anticipates an economic upswing. Conversely, a narrower spread, by anticipating short rate decreases, also anticipates an economic downturn.
Lagging	**Reason**
Inventory-sales ratio	Because inventories accumulate as sales initially decline and then, once a business adjusts its ordering, become depleted as sales pick up, this ratio tends to lag the cycle.

Reading 18

Monetary and Fiscal Policy

How Money is Created

➢ **How Do the Banks Create Money ?**

	Reserve	Loan
Bank1		100
Bank2	10	90
Bank3	9	81
…	…	…

Ms=100/(1-0.9)=1000

$$\text{Money created} = \frac{\text{new deposit}}{\text{reserve requirement}} = \frac{100}{0.1} = 1000$$

$$\text{Money multiplier} = \frac{1}{\text{reserve requirement}} = \frac{1}{0.1} = 10$$

Fisher Effect

- **Fisher Effect:**
  - $R_{Nom} = R_{Real} + E[I]$
  - Real rate of interest in an economy is stable over time so that changes in nominal interest rates are the result of changes in expected inflation.
  - Directly related to money neutrality

Tools of the Central Bank

- **Policy Rate**
  - The most obvious expression of a central bank's intentions and views comes via the interest rate it sets.
  - The policy rate can be achieved by using short-term collateralized lending rates, known as **repo rates**.
  - The ECB's official policy rate is known as the **refinancing rate** and defines the rate at which it is willing to lend short-term money to the euro area banking sector.
  - The most important interest rate used in US monetary policy is the **federal funds rate**. The federal funds rate is the interbank lending rate on overnight borrowing of reserves.

美联储：联邦基金利率，商行和商行之间的隔夜拆借利率
欧洲：再贴现率，商行跟央行融资的利率
英国：回购协议利率

Policy rate ↓ → 融资成本低，释放流动性（扩张的货币政策）
Policy rate ↑ → 融资成本高，收紧流动性（紧缩的货币政策）

Tools of the Central Bank

- **Reserve requirements**
  - Reserve requirement ↑ → available funds for lending ↓ → money supply ↓ → interest rate ↑

存款准备金 ↑ → 紧缩的货币政策
存款准备金 ↓ → 扩张的货币政策

- **Open market operations**
  - Central bank buy securities – funds available funds for lending ↑ - money supply ↑ - interest rate ↓
  - This tool is **the Fed's most commonly used tool.**

央行买债券 → 扩张的货币政策
央行卖债券 → 紧缩的货币政策

Neutral Interest Rate

- **Trend growth**: long-term, sustainable real growth rate in an entity.
- **Neutral interest rate:** the growth rate of the money supply that neither increases nor decreases the economic growth rate.
- **Neutral rate of interest=Trend growth + Inflation target**
  - **Policy rate> Neutral rate: contractionary**
  - **Policy rate< Neutral rate: expansionary**

Limitation of Monetary Policy

- **Long-term rate may not adjusted coincide with short-term rates.**
- **Liquidity trap:** A condition in which the demand for money becomes infinitely elastic (horizontal demand curve) so that injections of money into the economy will not lower interest rates or affect real activity.
  - When the interest rate is already at its low, and further decrease fails to control the amount of money that households and corporates put in bank.

Fiscal Policy Tools

- **Spending Tools**
  - **Transfer payments**: welfare payments made through the social security system
  - **Current spending**: routine and continuing government purchases of goods and services
  - **Capital spending**: Cost on infrastructures by governments and prompts productivity in the future
- **Revenue Tools**
  - **Direct taxes** refers to revenues from income or wealth of both individual and corporate, also including capital gains taxes, national insurance taxes, property taxes, and inheritance taxes.
  - **Indirect taxes** are levied on purchasing of goods and services. Consumptions tend to react more quickly to indirect taxes. **影响更快**

Fiscal Multiplier

- ***Fiscal multiplier***
  - Fiscal multiplier = $\frac{1}{1-\text{MPC}(1\text{-t})} = \frac{1}{1-\text{b}\times(1\text{-t})}$
  - MPC: Marginal propensity of consumption (b)
  - The fiscal multiplier is
    - ✓ negatively related to the tax rate.
    - ✓ positively related to the MPC.

Limitations of Discretionary Fiscal Policy

- **Fiscal policy may be incorrect because of**
  - **Lags in executing fiscal policy**
    - ✓ Recognition lag
      - ◆The time lag between the emergence of economic downturn and the recognition from the government.
    - ✓ Action lag
      - ◆The time lag between the decision of the government and the implementation of the policy.
    - ✓ Impact lag
      - ◆The time lag between the implementation of the policy and the emergence of results.
  - **Crowding out effect**: Competition between government and private sectors increases borrowing cost and crowds out private firms with subsequent less investing and economic growth.

Ricardian Equivalence

- **Ricardian Equivalence:** Increases in the government spending are equal to increases in forward tax rates.
  - Consumers regard the increase in budget deficit as a signal of growing taxes in the future and thus increase present savings to offset the negative influence, therefore, the fiscal policy will not affect aggregate demand as it should be.
- However, Ricardian equivalence will **not** hold when
  - People do not correctly anticipate all the future taxes required to repay the additional government debt, then they feel wealthier when the debt is issued and may increase their spending, adding to aggregate demand.

International Trade and Capital Flows

Absolute and Comparative Advantage

- If two countries have different opportunity cost of producing goods, each will have a comparative advantage in some goods, and trade will increase the total production and consumption possibilities in both countries, improving economic welfare.
- When each country specializes in the good for which they have a comparative advantage and trades each other, there are clear gains existed.

Country / Product	A	B
X	10	9
Y	5	3

Ricardian Model

- In the **Ricardian model**, labor is the only (variable) factor of production. Differences in labor productivity, reflecting underlying differences in **technology**, are the source of comparative advantage and hence the key driver of trade in this model.

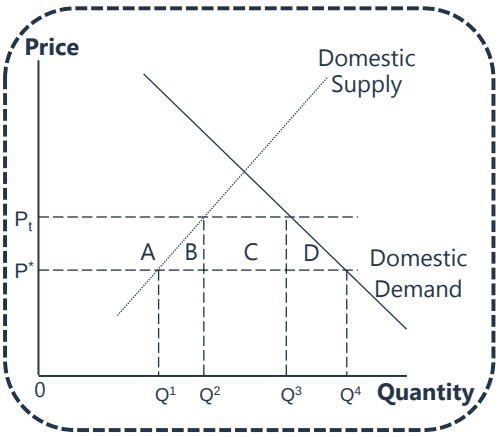
Heckscher—Ohlin Model

- In the **Heckscher—Ohlin Model** (also known as the factor-proportions theory), both capital and labor are variable factors of production.
  - Differences in the relative endowment of these factors are the source of a country's comparative advantage.
  - A country has a comparative advantage in goods whose production is intensive in the factor with which it is relatively abundantly endowed, and would tend to specialize in and export that good.
    - ✓ Capital is relatively more (less) abundant in a country if the ratio of its endowment of capital to labor is greater (less) than that of its trading partner.
    - ✓ A country in which labor is relatively abundant would export relatively labor-intensive goods and import relatively capital-intensive goods.
  - It allows for the possibility of income redistribution through trade.
    - ✓ The price of the relatively less scare (more available) factor of production in each country will increase.
    - ✓ The good that a country imports will fall in price (that is why they import it), and the good that a country exports will rise in price.

Types of Trade Restrictions

- **Types of trade restrictions include:**
  - **Tariffs:** Tariffs are taxes that a government levies on imported goods.
  - **Quotas:** restrict the quantity of a good that can be imported into a country, generally for a specified period of time.
  - **Export subsidies:** paid by the government to the firm when it exports a unit of a good that is being subsidized.
  - **Voluntary export restraint:** a trade barrier under which the exporting country agrees to limit its exports of the good to its trading partners to a specific number of units.

Welfare Effects of an Import Tariff or Quota



	Importing Country
Consumer surplus	-(A+B+C+D)
Producer surplus	+A
Tariff revenue or Quota rents	+C
National welfare	-B-D

BOP Components

- **Current account measures the goods and service flows, and it includes four sub-accounts**.
  - **Merchandise trade:** Consists of all commodities and manufactured goods bought, sold, or given away.
  - **Services** include tourism, transportation, engineering, and business services, and fees from patents and copyrights on new technology, software, books, and movies are also recorded in the services category.
  - **Income receipts** include income derived from ownership of assets, such as dividends and interest payments; income on foreign investments is included in the current account because that income is compensation for services provided by foreign investments.
  - **Unilateral transfers** represent one-way transfers of assets, such as worker remittances from abroad to their home country and foreign direct aid or gifts.

International Organization

- **International organization**
  - International Monetary Fund (IMF)
  - World Bank
  - World Trade Organization (WTO)

Trading Blocs

- **Free trade areas**
  - One of the most prevalent forms of regional integration in which all barriers to the flow of goods and services among members have been eliminated ==> each countries maintains its own policies against non-members.
- **Customs union**
  - It extends the FTA by not only allowing free movement of goods and services among members but also creating a common trade policy against non-members.
- **Common market**
  - It incorporates all aspects of the customs union and extends it by allowing free movement of factors of production among member.

Trading Blocs

- **Economic union**
  - It requires a greater degree of integration.
  - It incorporates all aspects of a common market and in addition requires common economic institutions and coordination of economic policies among members.
  - The European Community became the European Union in 1993.
- **Monetary union**
  - Firstly, the monetary union should be an economic union.
  - If the members of the economic union decide to adopt a common currency, then it is also a monetary union.
  - For example, with the adoption of the euro, part of EU member countries formed a monetary union.

Reading 20

Currency Exchange Rate

Nominal and Real Exchange Rate

- **Exchange rate** is simply the price or cost of units of one currency in terms of another.
- **Nominal exchange rate**: the price that we observe in the marketplace for foreign exchange.
- **Real exchange rate**: the focus shifts from the quotations in the foreign exchange market to what the currencies actually purchase in terms of real goods and services.
  - FX real(d/f) = FX nominal (d/f) *CPI_f/CPI_d

Nominal and Real Exchange Rate

- At a base period, the CPI of the U.S. and Euro are both 100, and the exchange rate is $1.90 per euro. Three years later, the exchange rate is $1.80 per euro, and the CPI has risen to 115 in the U.S. and 118 in the Euro. What is the real exchange rate?

- **Correct Answer:**
  - The real exchange rate is $1.80 per euro * 118/115 = $1.850 per euro.

Cross Rate

- **Cross rate** is the exchange rate between two currencies implied by their exchange rates with a common third country.

- **Example:**
  - 0.7130 EUR/AUD , 20.8500 MXN/EUR
    - ✓MXN/AUD = EUR/AUD * MXN/EUR = 0.7130 * 20.8500 = 14.8660
  - 1.1102 CHF/USD , 0.9421 EUR/USD
    - ✓CHF/EUR = (CHF/USD) / (EUR/USD) = 1.1102 / 0.9421 = 1.1784

Forward Discount or Premium

- **Forward discount or premium**
  - With the convention of giving the value of the quoted currency (the first currency) in terms of units of the second currency, there is a premium on the quoted currency when the forward exchange rate is higher than the spot rate and a discount otherwise.

Interest Rate Parity (IRP)

- **Interest rate parity (IRP)** holds when any forward premium or discount just offsets differences in interest rates so that an investor will earn the same return investing in either currency. Approximated by equating the difference between the domestic interest rate and the foreign interest rate to the forward premium or discount.
- **Interest rate parity relationship**
  - F (forward), S (spot) X/Y, r_X and r_Y is the nominal risk-free rate in X and Y
  - $\frac{F}{S} = \frac{1+r_X}{1+r_Y}$
  - $\frac{F-S}{S} = \frac{1+r_X}{1+r_Y} - 1 = \frac{r_X - r_Y}{1+r_Y} \approx r_X - r_Y$
- The forward rate will be higher than (be at a premium to) the spot rate if the nominal risk-free rate in X is higher than that in Y.
- More generally, and regardless of the quoting convention, the currency with the higher (lower) interest rate will always trade at a discount (premium) the forward market.

Exchange Rate Regimes

- **Arrangements with No Separate Legal Tender:**
  - Countries do not have its own legal tender➔ dollarization
    - ✓ The country uses the currency of another nation as its medium of exchange and unit of account)
  - Monetary union: Euros
- **Countries That Have Their Own Currency：**
  - Currency board system ➔ HK

    The IMF defines a currency board system (CBS) as:

    A monetary regime based on an explicit legislative commitment to exchange domestic currency for a specified foreign currency at a fixed exchange rate, combined with restrictions on the issuing authority to ensure fulfillment of its legal obligation. This implies that domestic currency will be issued only against foreign exchange and it remains fully backed by foreign assets……

Exchange Rate Regimes

- **Countries That Have Their Own Currency：**
  - Fixed parity
    - ✓ In the fixed-rate system, the exchange rate may be pegged to a single currency, or to a basket index of the currencies of major trading partners. There is a band of up to ±1 percent around the parity level within which private flows are allowed to determine the exchange rate.
    - ✓ The difference between currency board system and fixed parity.
      - ◆First, there is no legislative commitment to maintaining the specified parity.
      - ◆Second, the target level of foreign exchange reserves is discretionary.
    - ✓ The credibility of the fixed parity depends on the country's willingness and ability to offset imbalances in private sector demand for its currency.

Exchange Rate Regimes

- **Countries That Have Their Own Currency：**
  - **Target zone:** A target zone regime has a fixed parity with fixed horizontal intervention bands that are somewhat wider, up to ±2 percent around the parity, than in the simple fixed parity regime.
  - **Crawling peg**: the exchange rate is usually adjusted against a single currency, especially during the high inflation periods.
    - ✓ **Passive crawling peg**: The exchange rate was adjusted frequently (weekly or daily) to keep pace with the inflation rate.
      - ◆Example: Brazil
    - ✓ **Active crawling peg**: The exchange rate was pre-announced for the coming weeks with changes taking place in small steps.
      - ◆The aim of the active crawl was to manipulate expectations of inflation.
      - ◆Example: Chile

Exchange Rate Regimes

- **Countries That Have Their Own Currency：**
  - **Fixed Parity with Crawling Bands:** Initially, a country may fix its rates to a foreign currency to anchor expectations about future inflation but then gradually permit more and more flexibility in the form of a pre-announced widening band around the central parity.
  - **Managed Float**: A country may simply follow an exchange rate policy based on either internal or external policy targets.
  - **Independently Floating Rates:** The exchange rate is fully determined by the market, and the central bank is able to exercise independent monetary policy to achieve the objectives of price stability and full employment.

Elasticity Approach

- Two approaches to exam how changes in exchange rates affect the balance of trade:
  - Elasticity approach
  - Absorption approach
- **Elasticity approach**
  - The initial deficit.
  - The influence of exchange rates on domestic import and export prices.
  - Price elasticity of demand of the traded goods.
- **J-curve**
  - Even when the Marshall-Lerner condition is satisfied, it is still possible that devaluation (in a fixed parity regime) or depreciation (in a floating regime) of the currency will initially make the trade balance worse before making it better. This effect, called the J-curve effect.
  - In the very short run, the J-curve reflects the order delivery lags that take place in import and export transactions.
  - A J-curve pattern may also arise if short-term price elasticities do not satisfy the Marshall-Lerner condition but long-term elasticities do satisfy it.

Absorption Approach

- **Absorption approach** is generally a macroeconomic view of exchange rates and trade balance.
- Y = C+ I + G + X - M ➔ X-M = Y – (C + I + G); (C + I + G) means domestic absorption of goods and services.
  - The economy is operating at less than full employment:
    Currency depreciation→ price of domestic goods and assets↓→ expenditures and income↑→saving ↑→ trade balance improved
  - The economy is operating at full employment:
    Currency depreciation→value of domestic assets↓→savers' real wealth ↓→saving ↑→wealth ↑→positive impact on saving ↓→returning the economy to its previous state and balance of trade

It's not the end but just beginning.

Life is short. If there was ever a moment to follow your passion and do something that matters to you, that moment is now.

生命苦短，如果你有一个机会跟随自己的激情去做你认为重要的事，那么这个机会就是现在。

Fixed Income

CFA一级培训项目

讲师：单晨玮

Topic Weightings in CFA Level I

Session NO.	Content	Weightings
Study Session 1	Ethics & Professional Standards	15
Study Session 2-3	Quantitative Analysis	12
Study Session 4-5	Economics	10
Study Session 6-9	Financial Reporting and Analysis	20
Study Session 10-11	Corporate Finance	7
Study Session 12	Portfolio Management and Wealth Planning	7
Study Session 13-14	Equity Investment	10
Study Session 15-16	**Fixed Income**	**10**
Study Session 17	Derivatives	5
Study Session 18	Alternative Investments	4

Framework

Fixed Income

- **Basic Concepts**
  - R51 Fixed-Income Securities: Defining Elements
  - R52 Fixed-Income Markets: Issuance, Trading, and Funding
  - R53 Introduction to Fixed-Income Valuation
  - R54 Introduction to Asset-Backed Securities
- **Analysis of Risk**
  - R55 Understanding Fixed-Income Risk and Return
  - R56 Fundamentals of Credit Analysis

计算知识点

1. TIPS
2. Valuation with a single yield
3. The value change attributable to the passage of time
4. Arbitrage-free bond valuation
5. Accrued interest and full price
6. Matrix pricing
7. Floating rate notes valuation
8. Discount rate, add on yield, and BEY
9. Spot rate and forward rate
10. Reinvestment income & annualized HPR
11. Duration: Macaulay duration, Modified duration, Approximate modified duration, Effective duration
12. Money duration & PVBP
13. Portfolio duration
14. Convexity: Approximate convexity & Effective convexity
15. Price change based on duration and convexity

Reading 51

Fixed-Income Securities: Defining Elements

Framework

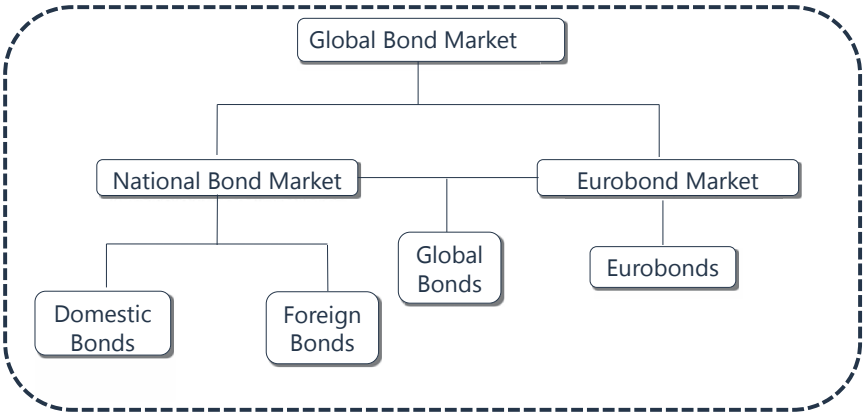
1. Basic features of a bond
2. Bond indenture
   - Legal information
   - Collateral
   - Credit enhancements
   - Covenants
   - Tax
3. Structure of a bond's cash flows
   - Principal repayment structures
   - Coupon payment structures
4. Bonds with contingency provisions
   - Callable bonds
   - Putable bonds
   - Convertible bonds

Basic features of a bond

- Basic features of a bond
  - **Issuer/borrower:** the entities issue bonds, including supranational organizations, sovereign governments, non-sovereign governments, quasi-governments, companies and SPV(SPE).
  - **Bondholder:** is the money supplier, and holds the bond.
  - **Maturity date:** the date when the issuer is obligated to redeem the bond by paying the outstanding principal amount.
  - **Par value//face value/ maturity value:** the amount that the issuer agrees to repay the bondholders on the maturity date.
  - **Coupon rate:** the interest rate that the issuer agrees to pay each year until the maturity date.

Bond Market

- **Sectors of the bond market**



Legal and Regulatory Issues in a Trust Deed

- **Legal information about issuing entities**
  - **Sovereign bonds:** are backed by the "full faith and credit" of the national government.
  - **Corporate bonds:** the issuer is usually the corporate legal entity.
  - **Securitized bonds:** is legally independent and is considered bankruptcy remote from the seller of the loans which is called *special purpose entities(SPEs)* in U.S, and *special purpose vehicles (SPVs)* in Europe.
    - ✓ SPVs is *bankruptcy remote* because the assets can provide cash flows to support the payment of the bond even if the company defaults.

Legal and Regulatory Issues in a Trust Deed

- **Source of repayment proceeds:**

Types of bond	Source of repayment
Supranational organizations	• Repayment of previous loans • Paid-in capital from its members
Sovereign bonds	• Tax revenues • Print money
Non-sovereign debt	• General taxing authority of issuer • Cash flows of the financed project (revenues) • Special taxes or fees
Corporate bonds	• Cash flows from operations
Securitizations	• Cash flows generated by one or more underlying financial assets.

Legal and Regulatory Issues in a Trust Deed

- **Asset or collateral backing:** a way to reduce credit risk.
  - Unsecured bonds: have no collateral; bondholders have only a general claim on the issuer's assets and cash flows.
  - Secured bonds:
    - ✓ Are backed by assets or financial guarantees pledged to ensure debt repayment in the case of default.
  - Unsecured bonds are paid after secured bonds in the event of default.
  - In many jurisdictions, **debentures** are unsecured bonds, with no collateral backing assigned to the bondholders.

Legal and Regulatory Issues in a Trust Deed

- **Credit enhancement:** a variety of provisions used to reduce the credit risk of a bond issue.
  - **Internal credit enhancement:**
    - ✓ **Overcollateralization:** the process of posting more collateral than is needed to obtain or secure financing.
    - ✓ **Excess spread**: involves the allocation into an account of any amounts left over after paying out the interest to bondholders.
    - ✓ Creating more than one bond class or tranche and ordering the claim priorities for ownership or interest in an asset between the tranches. In the event of default, the proceeds from liquidating assets will first be used to repay the most senior creditors. —— **waterfall structure.**

Legal and Regulatory Issues in a Trust Deed

- **External credit enhancement:**
  - ✓ **Surety bond & Bank guarantee**: reimburse bondholders for any losses incurred if the issuer defaults.
    - ◆**Surety bond**: issued by a rated and regulated insurance company;
    - ◆**Bank guarantee**: issued by a bank.
  - ✓ **Letter of credit**: The financial institution provides the issuer with a credit line to reimburse any cash flow shortfalls from the assets backing the issue.

Legal and Regulatory Issues in a Trust Deed

- **Limitation of External credit enhancement:**
  - ✓ The deterioration of credit quality of the guarantor will also reduce the credit quality of the covered bond.
  - ✓ Bank guarantees, surety bonds, and letters of credit expose the investor to **third-party (or counterparty) risk** — that is, the possibility that a guarantor cannot meet its obligations.
- A **cash collateral account** mitigates this concern because the issuer immediately borrows the credit-enhancement amount and then invests that amount, usually in highly rated short-term commercial paper. Because this is an actual deposit of cash rather than a pledge of cash, a downgrade of the cash collateral account provider will not necessarily result in a downgrade of the bond issue backed by that provider.

Legal and Regulatory Issues in a Trust Deed

- **Affirmative VS. negative covenants**
  - Affirmative covenants: are typically administrative in nature.
    - ✓ Frequently used affirmative covenants include what the issuer will do with the proceeds from the bond issue and the promise of making the contractual payments.
  - Negative covenants: frequently costly and do materially constrain the issuer's potential business decisions.
    - ✓ The purpose of negative covenants is to protect bondholders from such problems as the dilution of their claims, asset withdrawals or substitutions, and suboptimal investments by the issuer.

Taxation of Bond Income

- **Tax consideration:**
  - Generally speaking, the income portion of a bond investment is taxed at the **ordinary income tax rate**, which is typically the same tax rate that an individual would pay on wage or salary income.
    - ✓ **Municipal debts** is most often exempt from federal income tax and from the income tax of the state;
    - ✓ The tax status of bond income may also depend on where the bond is issued and traded.
  - **Capital gain or loss:** due to sell a coupon bond prior to maturity
    - ✓ A capital gain or loss is usually treated differently from taxable income. Very often, the tax rate for long-term capital gains is lower than the tax rate for short-term capital gains, and the tax rate for short-term capital gains is equal to the ordinary income tax rate;
    - ✓ Long-term CG: capital gains that are recognized more than 12 months after the original purchase date.

Taxation of Bond Income

- **Tax consideration:**
  - **Original issue discount (OID) bonds**: a prorated portion of the discount must be included in interest income every tax year;
    - ✓ This allows investors to increase their cost basis in the bonds so that at maturity, they face no capital gain or loss;
    - ✓ Pure-discount bonds: a portion of the discount from par at issuance is treated as **taxable interest income**.
  - Premium bonds: allow investors to deduct a prorated portion of the amount paid in excess of the bond's par value from their taxable income every tax year until maturity.

Cash Flow Structure

- **Principal repayment structures**
  - Plain vanilla bond/bullet bonds: periodic interest payments and principal is paid at maturity.
    - ✓ Balloon payment
  - Amortizing loan: means the gradual reduction of the amount borrowed over time.
    - ✓ Fully amortizing: the sum of all the scheduled principal repayments during the mortgage's life is such that when the last mortgage payment is made, the loan is fully repaid.
    - ✓ Partially amortizing: the sum of all the scheduled principal repayments is less than the amount borrowed.

Cash Flow Structure

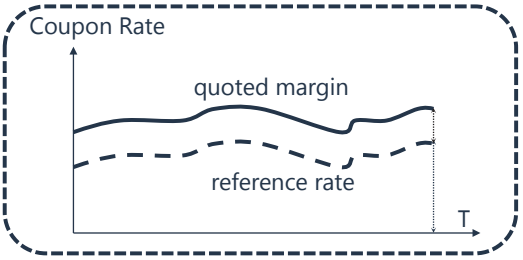
- The **sinking fund provision** is used to reduce the credit risk of the issuer.
- Sinking fund provision: requires the issuer to retire a portion of a bond issue at specific times during the bonds' life.
  - Originally, a sinking fund was a specified cash reserve that was segregated from the rest of the issuer's business for the purpose of repaying the principal.
  - More generally today, a sinking fund arrangement specifies the portion of the bond's principal outstanding, perhaps 5%, that must be repaid each year throughout the bond's life or after a specified date.
  - **Advantages**: less credit risk due to the periodic redemptions of the principal
  - **Disadvantages**: more reinvestment risk. when interest rate decreases, the market price is greater than the redemption price
    - ✓ First, investors face reinvestment risk, the risk associated with having to reinvest cash flows at an interest rate that may be lower than the current yield to maturity.
    - ✓ Another potential disadvantage for investors occurs if the issuer has the option to repurchase bonds at below market prices.

Cash Flow Structure

- **Coupon payment structures**
  - Floating-rate notes
  - Deferred coupon bonds
  - Step-up coupon bonds
  - Credit-linked coupon bonds
  - Payment-in-kind coupon bonds
  - Index-linked bonds

Cash Flow Structure

- **Floating-Rate Notes (FRN)**



Coupon rate = reference rate ± quoted margin

- Such as:
  - LIBOR;
  - U.S. Treasury yield

- It is a constant value.
- It is often quoted in basis point.
- Occasionally, the spread is not fixe, called **variable-rate note.**

Cash Flow Structure

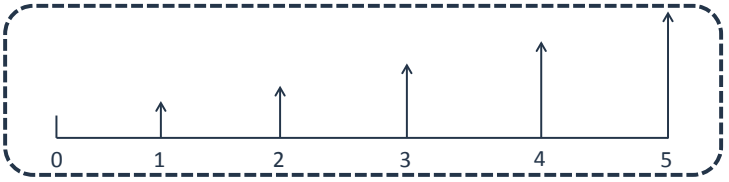
- The coupon rate determined at the coupon reset date is the rate that the issuer promises to pay at the **next coupon date**.
  - The new 1-year rate at that time will determine the rate of interest paid at the end of the next year. Most floater pay quarterly and are based on a quarterly (90-day) reference rate.
  - The reference rate must match the frequency with which the coupon rate on the bond is reset.

Cash Flow Structure

- **Cap and floor**
  - The upper limit is called the cap.
  - The lower limit is called the floor.
  - When a floating-rate security has both a upper limit and a lower limit, the feature is called a collar.
- **Inverse floaters** (also called reverse floaters) have coupon rates that move in the opposite direction from the change in the reference rate.
  - When the reference rate increases, the coupon rate decreases and vice versa.

Cash Flow Structure

- **Step-up coupon bonds:** may be fixed or floating, increases by specified margins at specified dates.



- **Deferred coupon bonds/split coupon bond** interest payments are deferred for a specified number of years.
- **Credit-linked coupon bond:** has a coupon that changes when the bond's credit rating changes.
- **Pay-in-kind (PIK) bond:** allows the issuer to pay interest in the form of additional amounts of the bond issue rather than as a cash payment.

1612 (1)

Cash Flow Structure

- **Equity-linked notes (ELN):** *no periodic interest payments*, and the payment at maturity is *based on an equity index*.
- **Index-linked bond: :** has its coupon payments and/or principal repayment linked to a specified index.)
  - Inflation linked bonds/ linkers: are an example of index-linked bonds.
  - If it will pay equal to or more than its original face value at maturity, even when the index has decreases, which is called **principal protected bonds**

Cash Flow Structure

- Different structure of inflation-index bonds:
  - **Index-annuity bonds**: are fully amortized bonds, in contrast to interest-indexed and capital-indexed bonds that are non-amortizing coupon bonds.
  - **Indexed zero-coupon bonds**: The principal amount to be repaid at maturity increases in line with increases in the price index during the bond's life.
  - **Interest-indexed bonds**: pay a fixed nominal principal amount at maturity, and the inflation adjustment applies to the interest payments only.
  - **Capital-indexed bonds**: pay a fixed coupon rate but it is applied to a principal amount that increases in line with increases in the index during the bond's life

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  - **TIPS**: pay semiannual coupons, at maturity:
  - If adjusted par value (per bond) is *greater than* $1,000 at maturity, the holder receives the *adjusted par value* as the maturity payment.
  - If the adjusted par value is *less than* $1,000 (due to deflation), holders receive $1,000 at maturity as this is the minimum repayment amount.

$$\text{TIPS coupon payment} = \text{inflation-adjusted par value} \times \frac{\text{stated coupon rate}}{2}$$

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Bonds with Embedded Options

- **Call provisions** are beneficial to the issuer.
  - Callable bond offers a higher yield (lower price) than identical noncallable bond
    - ✓ Value callable bond = value of identical non-callable bond- call option value
- If interest rates fall
  - Issuer can retire the bond, and replace it with lower coupon bonds.
- Three styles of exercise for callable bonds:
  - American style: sometimes referred to as continuously callable, for which the issuer has the right to call a bond at any time starting on the first call date;
  - European style: the issuer has the right to call a bond only once on the call date;
  - Bermuda style: the issuer has the right to call bonds on specified dates following the call protection period.
- Reinvestment risk about callable bond
- The price appreciation of callable bond is limited.

Bonds with Embedded Options

- **Putable bonds are beneficial to the bondholders.**
  - Putable bonds have a lower yield and higher price than similar non-putable bonds.
    - ✓ **Value of putable bonds**
    - **= value of an identical nonputable bonds + put option value**
  - If interest rates rise
    - ✓ The bondholders can sell the bond back to the issuer and get cash.
    - ✓ When the bond is put, the proceeds can be reinvested at a higher interest rate.

Bonds with Embedded Options

- **Convertible bonds are beneficial to the bondholders.**
- **Key terms of conversion provision:**
  - Conversion price: share price when the convertible bond can be converted into shares.
  - Conversion ratio: the number of common shares each bond can be converted into.
    - ✓ Conversion ratio = par value / conversion price
  - Conversion value: value of conversion bond if converted right now.
    - ✓ Conversion value = market price of stock X conversion ratio
  - Conversion premium: difference between the convertible bond's price and conversion value
  - Conversion parity:
    - ✓ At parity: Conversion value = convertible bond's price
    - ✓ Above parity: conversion value > convertible bond's price
    - ✓ Below parity: conversion value < convertible bond's price

Reading 52

Fixed-Income Markets: Issuance, Trading, and Funding

Framework

1. Classification of fixed-income markets
2. Issuing & Trading
3. Funding

Classification of Global Fixed-Income Markets

- By type of issuer:
  - Government and government-related sector
  - Corporate sector
    - ✓ Financial company
    - ✓ Non-financial company
  - Securitized sector
- By credit quality:
  - Investment grade
    - ✓ Baa3 or above by Moody's Investors Service
    - ✓ BBB- or above by Standard & Poor's (S&P) and Fitch Ratings
  - Non-investment grade/high yield
- By original maturity
- By coupon structure
- By currency
- By geography

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Primary Market

- **Primary market:** sales of newly issued bonds
  - **Public offering**:
    - ✓ **Underwritten offering**: with the investment bank or syndicate purchasing the entire issue and selling the bonds to dealers.
    - ✓ **Best efforts offering**: investment bank sells the bonds on a commission basis and do not commit to purchase the whole issue.
    - ✓ Auction
    - ✓ **Shelf registration**
  - **Private placement**: sale of an entire issue to a qualified investor or a group of investors, which are typically large institutions.
- **Secondary markets:** trade of previously issued bonds.
  - **Exchange market:** transaction must obey the rules imposed by the exchange.
  - **OTC Dealer Market** (largest): dealers post bid and ask price.
    - ✓ Spread between bid and ask prices are narrower (wider) for liquid (less liquid) issues
  - Electronic Trading Network (growth)

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Characteristics of Different Kinds of Bonds

- **Sovereign bonds:** issued by national governments and backed by their tax power.
  - High credit ratings and essentially free of default risk.
  - Denominated in the local currency or a foreign currency.
- **Nonsovereign government bonds**: issued by governments below the national level.
  - High credit quality, but lower than sovereign bonds
  - **Municipal bond (in the U.S.)**
    - ✓ **GO (general obligation)/Tax-Backed Debt**: Support by taxing power of local government
      - ◆ Almost no credit risk
    - ✓ **Revenue Bonds**
      - ◆ Supported only through revenues generated by projects.
      - ◆ Involve more risk, provide higher yield.

Characteristics of Different Kinds of Bonds

- **Agency/quasi-government bonds:** issued by entities created by national government and may be explicitly or implicitly backed by government.
- **Supranational bonds:** issued by supranational agencies (multilateral agencies) that operate across national.
  - Highly rated supranational agencies, such as the World Bank, frequently issue large-size bond issues that are often used as benchmarks issues when there is no liquid sovereign bond available;
  - E.g. World bank, the IMF, the Asian Development Bank.

Types of Corporation Debts

- **Commercial paper:** *short term, unsecured, low rate* (issued by corporations of high credit quality) debt.
  - Exempt from registration, *directly placed* (sold directly by issuer) or *dealer placed* (sold to investor through agents/brokers).
  - There is very *little secondary trading* of commercial paper.
  - *Reissued or rolled over* when it matures.
  - **Rollover risk**: the risk that a company will not be able to sell new commercial paper to replace maturing paper.

Types of Corporation Debts

- **U.S commercial paper Vs. Eurocommercial paper**

Feature	U.S commercial paper	Eurocommercial paper
Currency	U.S dollar	Any currency
Maturity	Overnight to 270 days	Overnight to 364 days
Interest	Discount basis (pure discount security)	Interest-bearing basis (add-on yield)
Settlement	T+0	T+2
Negotiable	Can be sold to another	Can be sold to another

Types of Corporation Debts

- **Corporate bonds**
  - Serial bond issue: with several maturity dates (known at issuance) and can be redeemed periodically.
  - Term maturity structure: all the bonds maturing on the same date.
- **Medium-term notes (MTNs):**
  - Various maturities(9 months to 100 years);
  - Life insurance companies, pension funds, and banks are among the largest buyers of MTNs because they can customize the bond issue to their needs and stipulate the amount and characteristics of the securities they want to purchase.
    - ✓ E.g. structured security: combination of the derivative and notes

Repurchase Agreement

- **Repurchase (repo) Agreement:** is the sale of a security with a simultaneous agreement by the seller to buy the same security back from the purchaser at an agreed-on price and future date.
  - Repurchase agreements are not regulated by the Federal Reserve.
  - Collateral position of the lender in a repo is better in the event of bankruptcy of the dealer. (liquidity)
- **Reverse repo agreement:** a repurchase agreement is viewed through the lens of the cash lending counterparty.

Repurchase Agreement

- **Repo rate:** is the interest rate on a repurchase agreement. The repo rate is lower when:
  - Repo term is shorter;
  - Credit quality of the collateral security is higher;
  - Collateral security is delivered to the lender;
  - Interest rate for alternative sources of funds are lower.
- **Repo margin/haircut:** the difference between the market value of the security used as collateral and the value of the loan. The repo margin is lower when:
  - Repo term is shorter;
  - Credit quality of the collateral security is higher;
  - Credit quality of the borrower is higher;
  - Collateral security is in high demand or low supply.

Reading 53

Introduction to Fixed-Income Valuation

Framework

1. Bond valuation
2. Yield-to-maturity
3. The value change attributable to the passage of time
4. Pricing bonds with spot rate
5. Full price, clean price, accrued interest
6. Matrix pricing
7. Yield measure
8. Yield curve
9. Forward rate
10. Yield spread

Yield to Maturity (YTM)

- Internal rate of return, implied market discount rate
- Critical **assumptions**:
  - hold the bond until maturity
  - full, timely coupon, principal payments (no default)
  - coupons are reinvested at original YTM
- Calculation: iteration, back out
  - **Annual -coupon bond**

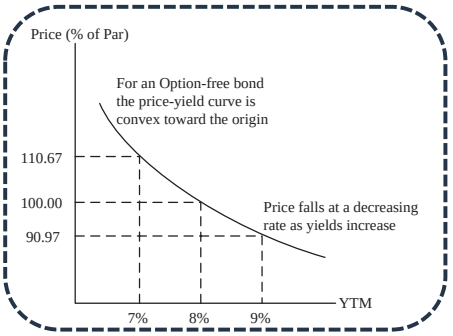
$$bond\ \ price = \frac{CPN_1}{(1+YTM)} + \frac{CPN_2}{(1+YTM)^2} + \ldots + \frac{CPN_N + Par}{(1+YTM)^N}$$

  - **Semiannual-coupon bond:**

$$bond\ \ price = \frac{CPN_1}{(1+YTM/2)} + \frac{CPN_2}{(1+YTM/2)^2} + \ldots + \frac{CPN_{2N} + Par}{(1+YTM/2)^{2N}}$$

Relationships Between Price and Yield

- A bond's price and YTM are *inversely related*.
- A bond will be priced at a *discount (premium)* to par value if coupon rate is *less (more)* than its YTM.
- For a given change in yield, the percentage price increase is *greater* than the percentage price decrease.



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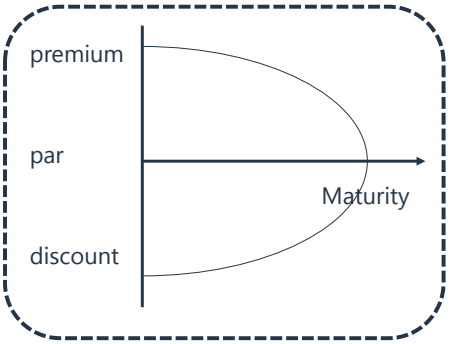
Relationships Between Price and Time



- Example: 3-year bond, coupon rate 10%, semi-annual, par 1000, buy at 8% today, after one-year, the rate change to 7%, the value change attributable to the passage of time?
- **Correct Answer:** $\Delta P_t = P_1(8\%) - P_0(8\%)$

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1606 (1) 1612 (2) 1706 (1)

Example: Arbitrage-Free Valuation

- Using the U.S. Treasury spot rates provided below, the arbitrage-free value of a 2-year Treasury, $100 par value bond with a 6% coupon rate is closest to:

Period	Years	Spot Rate
1	0.5	1.60%
2	1.0	2.20%
3	1.5	2.70%
4	2.0	3.10%

A. $99.75.
B. $105.65.
C. $107.03.

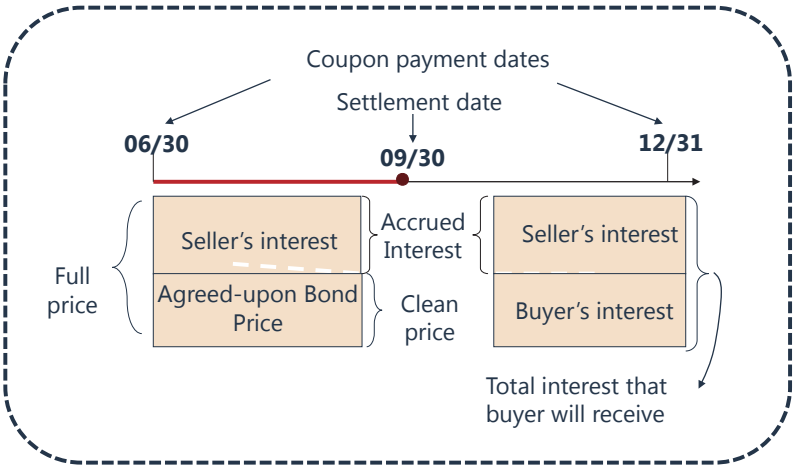
- **Correct answer: B**

$$\frac{3}{(1+0.0160/2)^1}+\frac{3}{(1+0.0220/2)^2}+\frac{3}{(1+0.0270/2)^3}+\frac{103}{(1+0.0310/2)^4}=105.65$$

Full Price, Clean Price, Accrued Interest

- **Accrued Interest:** the interest received by the seller when a bond trades between coupon dates.
- **Clean(flat) Price**: the agreed upon price of the bond.
- **Full Price** (or dirty price): the amount that the buyer pays to the seller, which equals the clean price plus any accrued interest.
  - **Full Price = Clean Price +Accrued Interest**

Full Price, Clean Price, Accrued Interest



Example

- Bond G, described in the exhibit below, is sold for settlement on 16 June 2014.Calculate the clean price that Bond G will settle at on 16 June 2014

Annual Coupon	5%
Coupon Payment Frequency	Semiannual
Interest Payment Dates	10 April and 10 October
Maturity- Date	10 October 2016
Day Count Convention	30/360
Annual Yield-to-Maturity	4%

- **Answer:**
- The bond's full price is determined in the following manner: As of the beginning of the coupon period on 10 April 2014, there are 2.5 years to maturity. These five semiannual periods occur on 10 October 2014, 10 April 2015, 10 October 2015, 10 April 2016 and 10 October 2016.

PMT=2.5, I/Y=2, N=5, FV=100, CPT PV=102.36

$P_{full} = 102.36 \times (1.02)^{66/180} = 103.10$

$P_{clean} = 103.10 - 0.92 = 102.18$

$\text{Accrued interest} = 2.5 \times \frac{66}{180} = 0.92$

Matrix Pricing

- **Matrix pricing:** a method of estimating the required YTM of bonds that are *currently not traded or infrequently traded* bonds according to the yields of traded bonds with the same credit quality.
- **Linear interpolation** can be used when the maturities between the valued bond and the traded bond are different.

- **Example :** Estimate the YTM of a non-traded 5%, 4-year annual-pay bond
  - 3-year annual-pay, 4% coupon bond: YTM=3.68%
  - 6-year annual-pay, 5% coupon bond: YTM=5.17%
- **Correct Answer:**
  - Using linear interpolation:

    YTM of the non-traded bond=3.68+[(4-3)/(6-3) X (5.17-3.68)=4.18%

Yield measures for floating-rate notes

- Coupon rate = reference rate + quoted margin
  - **Quoted margin:** margin used to calculate the bond coupon payments
- Discount rate = reference rate + required margin (or discount margin)
  - **Required/discount margin**: margin required to return the FRN to its par value at each reset date.
    - ✓ Selling at par(credit unchanged): required margin = quoted margin
    - ✓ Selling at discount(downgrade of credit): quoted margin < required margin
    - ✓ Selling at premium(upgrade of credit): quoted margin > required margin

Example

- A two-year floating-rate note pays 6-month Libor plus 80 basis points. The floater is priced at 97 per 100 of par value. Current 6-month Libor is 1.00%. Assume a 30/360 day-count convention and evenly spaced periods. The **discount margin** for the floater in basis points (bps) is closest to:

  A. 180 bps.

  B. 236 bps.

  C. 420 bps.

- **Correct answer: B**

Introduction to Fixed-Income Valuation

- **Yield measures for money market instruments**
  - Discount yield: (e.g., U.S. Treasury bills)

$$PV = FV \times (1 - \frac{Days}{Year} \times DR)$$

  - Add-on yield: (e.g., LIBOR, bank CD rates)

$$PV = \frac{FV}{(1 + \frac{Days}{Year} \times AOR)}$$

  - Both discount basis and add-on yields in the money market are quoted as simple annual interest and can be based on a 360-day or 365-day basis.
  - **Bond equivalent yield(investment yield) for money market security:** yield stated on a 365-day add-on rate basis.

Yield Measures for Fixed-Rate Bonds

- **Current yield (income or interest yield):** not consider capital gains/loss or reinvestment income.

$$current\ yield = \frac{annual\ coupon}{price}$$

- **Yield to call (put)** is calculated as a YTM but with the number of periods until the call (put) price substituted for the number of periods to maturity and the maturity value.

1412 (1)

Yield Curve

- **Yield curve** shows the term structure of interest rates by displaying yields across different maturities.
- **Spot curve:** a yield curve for single payments in the future, such as zero-coupon bonds or stripped Treasury bonds.
  - Spot curve for U.S. Treasury bonds is called the zero-curve or strip curve.
- **Yield curve for coupon bonds** shows the YTM for coupon bonds at various maturities, which can be calculated by linear interpolation
- **Par bond yield curve:** shows the coupon rates for bonds of various maturities that would result in bond prices equal to their par values.

- **Example :** Consider a 3-year annual-pay bond with spot rates of 2.6%, 3.2%, 3.9% , the coupon payment satisfies: $\frac{PMT}{1.026} + \frac{PMT}{(1.032)^2} + \frac{PMT+100}{(1.039)^3} = 100$
- **Correct Answer**: PMT=3.86, par bond coupon rate=3.86%
- **Forward yield curve** shows the future rates for bonds or money market securities for the same maturities for annual periods in the future.

Forward Rates

- **Forward Rates:** is the interest rate on a bond or money market instrument traded in a forward market. Marginal return for extending the time-to-maturity for an additional period
  - E.g. The int. of a 1-year loan that would be made 2 years from now
  - Notation: 2y1y rate of a 1-year loan to be made 2 years from now
- **Relationship Between Forward Rates and Spot Rates**

$$(1+S_T)^T = (1+S_1)(1+1y1y)\ldots(1+(T-1)y1y)$$

Yield Spread

- **Benchmark spread:** the yield spread over a specific benchmark, usually measured in basis points.
  - **G-spread**: the benchmark is government bond yield
  - **Interpolated spread (I-spread)**: the benchmark is swap rate
  - **Zero-volatility spread (Z-spread)**: is based on the entire benchmark spot curve. It is the constant spread that is added to each spot rate such that the present value of the cash flows matches the price of the bond.
- **Option-adjusted spread (OAS)**: is the Z-spread minus the theoretical value of the embedded call option.
  - Callable bond: ZS > OAS
  - Putable bond: ZS < OAS

Example

Bond	Coupon rate	Time-to-maturity	Price
U.K. Government Benchmark Bond	2%	3 years	100.25
U.K. Corporate Bond	5%	3 years	100.65

- Both bonds pay interest annually. The current three-year EUR interest rate swap benchmark is 2.12%. The G-spread in basis points (bps) on the U.K. corporate bond is closest to:
  - A. 264 bps.
  - B. 285 bps.
  - C. 300 bps .
- **Correct Answer: B**

Reading 54

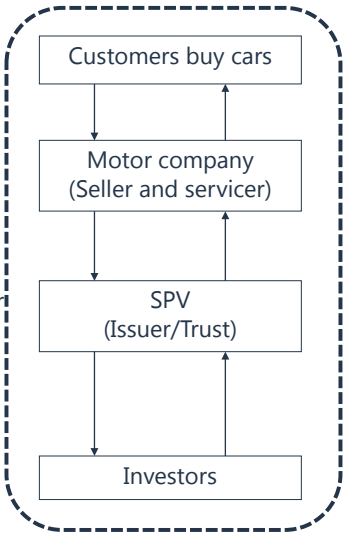
Introduction to Asset-Backed Securities

Framework

1. Securitization
2. Mortgage-Backed Securities (MBS)
   - Residential Mortgage Loans
   - RMBS
     - ✓ Agency MBS
       - ☐ MPS
       - ☐ Prepayment risk
       - ☐ Structure of CMO
     - ✓ Non-agency MBS
   - CMBS
3. Non-Mortgage-Backed Securities (ABS)
4. Collateralized Debt Obligations (CDO)

Introduction to Asset-backed Securities

- ***Asset-backed securities***:
  - Fixed income securities that are backed, or collateralized, by a **pool(collection) of** assets such as loans or receivables are referred to as **asset-backed securities**.
- Securitization:
  - A process in which relatively simple debt obligations, such as loans or bonds, are repackaged into more complex structure that involving the participation of several new entities. (moving assets from the owner of the assets into a special legal entity, then sell);
  - **Securitized assets:** Assets that are typically used to create asset backed securities, including residential mortgage loans, commercial mortgage loans, automobile loans, student loans, bank loans, and credit card debt.



Structures of Securitizations

- **Credit tranching**: Different tranches have different risk exposures
  - It is common for securitizations to include a form of internal credit enhancement called subordination.
  - In such a structure, there is more than one bond class or tranche, and the bond classes differ as to how they will share any losses resulting from defaults.
- **Time tranching:**
  - Bond classes that posses different expected maturities.
- In common, for a securitization to have structures with both credit tranching and time tranching.

Residential Mortgage Loans

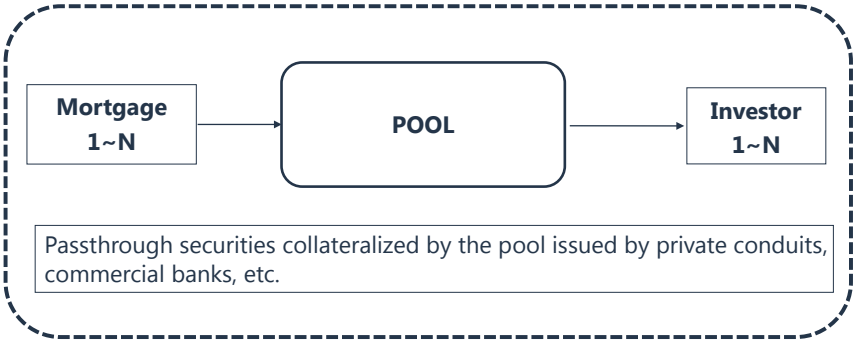
- Rights of the lender in a foreclosure
  - **Recourse loan**: the lender has a claim against the borrower for the shortfall between the amount of the mortgage balance outstanding and the proceeds received from the sale of the property.
    - ✓ Residual mortgage in most European countries are recourse loan
  - **Nonrecourse loan:** the lender does not have such a claim, so the lender can look only to the property to recover the outstanding mortgage balance.
    - ✓ In the United States, residential mortgages are typically non-recourse loans.
- **Strategic default:** the borrower has an incentive to default and allow the lender to foreclose on the property if the value of the property declines below the amount owed by the borrower, even if resources are available to continue to make mortgage payments

Residential Mortgage-Backed Securities

• Government National Mortgage Association (Ginnie Mae)	• Federal-related institution, its guarantees carries the full faith and credit of the U.S. government
• Federal Home Loan Mortgage Corporation (Freddie Mac)	• Freddie Mac and Fannie Mae are government sponsored enterprises. Their guarantee does not carry the full faith and credit of the government.
• Federal National Mortgage Association (Fannie Mae)	• The pass-through securities issued by Fannie and Freddie are called conventional pass-through securities

- **Conforming mortgage**: a loan satisfies the underwriting standards for inclusion as collateral for an agency RMBS**.**
- ***Non-conforming mortgage:*** a loan fails to satisfy the underwriting standards.

Residential Mortgage-Backed Securities



- **Pass-through rate**
  - Pass-through rate is less than the mortgage rate on the underlying pool of mortgages by servicing and guaranteeing fees
  - **Mortgage rate – Pass-though rate = Servicing fees**

Residential Mortgage-Backed Securities

- **Type of prepayment risk**
  - **Contraction risk** occurs as interest rates fall, prepayment rates increase, the security will have a shorter maturity than was anticipated at the time of purchase because of refinancing at now-available lower rate.
    - ✓ The proceeds received must now be invested at lower interest rates
    - ✓ Price appreciation is not as great as that of an otherwise identical bond that does not have a prepayment or call option
    - ✓ Contraction risk occurs as mortgage rates fall, prepayment rates increase, and the average life of the pass-through security decreases.

Residential Mortgage-Backed Securities

- **Extension risk** occurs as interest rates rise, prepayment rates slow, and the security becomes longer in maturity than anticipated at the time of purchase because investors are reluctant to give up the benefits of a contractual interest rate that now looks low.
  - ✓ The value of the security has fallen because interest rates are higher
  - ✓ Income they receive can potentially reinvest is typically limited to the interest payment and scheduled principal repayments
  - ✓ Extension risk occurs as mortgage rates rise, prepayment rates slow, and the average life of the pass-through security increase

Mortgage Pass-Through Securities

- **Prepayment rates**
  - Two industry conventions have been adopted as benchmarks for prepayment rates: the **conditional prepayment rate (CPR)** and the **Public Securities Association (PSA)** prepayment benchmark.
    - ✓ CPR is **the annual rate** at which a mortgage pool balance is assumed to be prepaid during the life of the pool.

The PSA standard benchmark:100%PSA

- CPR=0.2% for the first month after origination, increasing by 0.2% per month up to 30 months. For example, the CPR in month 14 is 2.8%.
- CPR=6% for months 30 to 360
- After 30 months, no prepayment rate is added.

- **Monthly prepayment rate:** single monthly mortality rate (SMM)

$$\text{SMM} = \frac{\text{Prepayment for month}}{(\text{Beginning mortgage balance for month} - \text{scheduled principal repayment for month})}$$

$$\text{SMM} = 1-(1-CPR)^{\frac{1}{12}}$$

Collateralized Mortgage Obligations(CMO)

- **Creating collateralized Mortgage Obligations (CMO)**
  - **CMOs** are securities issued against pass-through securities for which the cash flow have been reallocated to different tranches.
  - Each CMO tranche represents a different mixture of contraction and extension risk.
  - Redistribution of the original passthrough securities' cash flows does not eliminate contraction and extension risk.

Collateralized Mortgage Obligations(CMO)

- **Different types of CMOs**
  - **1. Sequential Pay tranches**
    - ✓ Each class of bonds is retired sequentially in sequential pay **CMO.**

$$total\ CF \rightarrow \frac{total\ P}{total\ I} \begin{matrix} \xrightarrow{2,3} \frac{P}{I}(A) \\ \xrightarrow{1,1} \frac{P}{I}(B) \end{matrix}$$

    - ✓ The CMO structure with sequential-pay tranches allows investors concerned about extension risk to invest in shorter-term tranches and those concerned about contraction risk to invest in the longer-term tranches.

Collateralized Mortgage Obligations(CMO)

- **2.Planned amortization class (PAC) and Support tranche**
  - ✓ A PAC is a tranche that is amortized based on a sinking fund schedule that is established within a range of prepayment speeds called the **initial PAC collar**.
  - ✓ This is a principal repayment schedule that must be satisfied
  - ✓ **PAC bondholders have priority over all other classes** in the CMO structure in receiving principal repayments from the collateral.
  - ✓ The greater certainty of the cash flow for the PAC bonds comes at the expense of the non-PAC tranches (**support tranches**). It is these tranches that **absorb the prepayment risk**.
  - ✓ PAC tranches have **protection against both extension risk and contraction risk**, providing two-sided prepayment protection.

Collateralized Mortgage Obligations(CMO)

➢ The average life for the PAC tranche and the support tranche in assuming various actual prepayment rate

Prepayment Rate(PSA)	Average Life(years)	
	PAC Tranche(P)	Support Tranche(S)
50	10.2	24.9
100	8.6	22.7
150	↑	20.0
200	7.7 Initial Collar	10.7
250	↓	3.3
300	5.5	1.9
350	4.0	1.4

Non-agency RMBS

➢ Non-agency RMBS not guaranteed by Ginnie Mae, Fannie Mae, or Freddie Mae

➢ **Differences between Agency and Non-agency securities**

- ***Agency securities*:** CMOs are created from pools of passthrough securities.
- ***Non-agency securities*:** CMOs are created from unsecuritized mortgage loans.
- Non-agency securities have no explicit or implicit government guarantee of payment of interest and principal as agency securities have.
- All non-agency securities are **credit enhanced**: external and internal.

Commercial mortgage-backed securities

- **Commercial mortgages** are ***non-recourse loans***, the lender can look only to the income-producing property backing the loan for interest payments and principal repayments
- **Call protection at the structure level**
  - Structural call protection is achieved when CMBS are structured to have sequential-pay tranches, by credit rating.
  - A lower-rated tranche cannot be paid down until the higher-rated tranche is completely retired, so the AAA rated bonds must be paid off before the AA rated bonds are, and so on.
  - Principal losses resulting from defaults, however, are affected from the bottom of the structure upward.

Mortgage-backed sector of the bond market

- **Call protection at the loan level**
  - **Prepayment lockout** is a contractual agreement that prohibits any prepayments during a specified period of time;
  - **Defeasance**: The borrower provides sufficient funds for the servicer to invest in a portfolio of government securities that replicates the cash flows that would exist in the absence of prepayments;
    - ✓ The cost of assembling such a portfolio is the cost of defeasing the loan that must be repaid by the issuer.
  - **Prepayment penalty points**: Predetermined penalties that a borrower who want to refinance must pay;
  - **Yield maintenance charges(make-whole charge)** is a penalty paid by the borrower that makes refinancing solely to get a lower mortgage rate uneconomical for the borrower;
    - ✓ Designed to make the lender indifferent as to the timing of prepayments.

Commercial mortgage-backed securities

- **Balloon maturity provisions**
  - Many commercial loans backing CMBS are balloon loans that require substantial principal payment at maturity of the loan.
  - If the borrower fails to make the balloon payment, the borrower is in default.
    - ✓ The risk that a borrower will not be able to make the balloon payment because either the borrower cannot arrange for refinancing or cannot sell the property to generate sufficient funds to pay off the balloon balance is called **balloon risk**.
    - ✓ Balloon risk is a type of extension risk.

Non-Mortgage Asset-backed Securities

Non-Mortgage Asset-backed Securities(ABS)

- **1. Auto Loan ABS**
  - The cash flows for auto loan-backed securities consist of scheduled monthly payments (that is, interest payments and scheduled principal repayments) and any prepayments.
  - All auto loan-backed securities have some form of credit enhancement.
    - ✓ Senior/subordinated structure
    - ✓ Overcollateralization
    - ✓ Reserve account
      - ◆Excess spread account / excess interest cash flow, is an amount that can be retained and deposited into a reserve account and that can serve as a first line of protection against losses.

Non-Mortgage Asset-backed Securities

- **2. Credit Card Receivable ABS:** credit card receivables are used as collateral for the issuance, **non-amortizing loans**
  - For a pool of credit receivables, the cash flows consist of
    - ✓ **Finance charges collected:** represent the periodic interest the credit card borrower is charged on the unpaid balance after the grace period
    - ✓ **Fees:** include late payment fees and any annual membership fees
    - ✓ **Principal repayments:** "early amortization" or "rapid amortization" provisions included to safeguard the credit quality of the issue
  - **lockout periods:** cash flow paid out based on finance charges collected and fees
    - ✓ **After lockout periods:** principal no longer reinvested but paid to investors

Collateralized debt obligation (CDO)

- **Collateralized debt obligation (CDO)**
  - A collateralized debt obligation (CDO) is a security backed by a diversified pool of one or more of the following types of debt obligations:

U.S. domestic high-yield corporate bonds	Collateralized bond obligation (CBO)
Structured financial products	
Emerging market bonds	
Bank loans	Collateralized loan obligation (CLO)
Special situation loans and distressed debt	

  - A structure of a CDO

Senior tranche	At least A
Mezzanine tranche	BBB but no less than B
Subordinate/equity tranche	Receive the residual cash flow

- ✓ In typical structure, one or more of the tranches is a **floating-rate security.**
- ✓ Asset manager uses **interest rate swap** to deal with the mismatch.

Reading 55

Understanding Fixed-Income Risk and Return

Framework

1. Annualized holding period return
2. Interest rate risk
   - Duration
   - Convexity
   - Duration gap

Source of Return

- **Three sources of return:**
  - Receipt of the promised coupon and principal payments on the scheduled dates;
  - Reinvestment of coupon payments;
  - Potential capital gains or losses on the sale of the bond prior to maturity.
- **Total return:** future value of reinvested coupon interest payments and the sale price (par value if the bond is held to maturity);
- **Annualized holding period return:** A horizon yield is the internal rate of return between the total return (the sum of reinvested coupon payments and the sale price or redemption amount) and the purchase price of the bond. The horizon yield on a bond investment is the annualized holding-period rate of return.

$$annualzed\ holding\ period\ return = \left(\frac{total\ return}{bond\ price}\right)^{1/n} - 1$$

Interest Rate Risk

- **Interest risk**
  - Interest rate risk: the price sensitivity to interest rate changes. More sensitive, more possible price volatility.
  - Use duration to measure interest rate risk. The higher duration, more interest rate risk.

$$duration = -\frac{percentage\ change\ in\ bond\ \ price}{yield\ \ change\ in\ \ percent}$$

Percentage price change= - duration × yield change in %

1512 (1) 1606 (1)
1612 (2) 1706 (1)

Duration

- **Duration:** a measure of a bond's interest tare risk or sensitivity of a bond's full price to a change in its yields.
  - **Yield duration:**
    - ✓ **Macaulay duration**

$$Macaulay\ duration = \frac{\sum_{t=1}^{n} t \times PVCF_t}{\sum PVCF_t (= P_0)} = \sum_{t=1}^{n} [t \times (PVCF_t / P_0)]$$

    - ✓ **Modified duration**

$$Modified\ duration = \frac{Macaulay\ duration}{1 + periodic\ market\ \ yield}$$

    - ✓ **Approximate modified duration**

$$Approximate\ \ \mathrm{mod}\,ified\ \ duration = \frac{V_- - V_+}{2 \times V_0 \times \Delta YTM}$$

  - **Curve duration:**
    - ✓ **Effective duration** $Effective\ duration = \frac{V_- - V_+}{2 \times V_0 \times \Delta curve}$

1612 (1) 1606 (1)
1512 (2) 1506 (1)
1412 (1) 1406 (1)

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Money Duration and PVBP

- Money duration/dollar duration

  Money duration=annual modified duration * full price of bond

- Money duration expressed as money duration per 100 of bond par value

  Money duration per 100 units of par value
  = annual modified duration * full price of bond per 100 of par

- **Price value of a basis point (PVBP):** is the money change in full price of a bond when its YTM changes by one basis point(0.01%)

$$PVBP = P \times D \times 1bp$$

$$\mathrm{PVBP} = \frac{V_- - V_+}{2}$$

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1512 (1) 1406 (1)

Duration

- **Interpreting duration:**
  - Duration is the **slope** of the price-yield curve at the bond's current YTM. (the first derivative of the price-yield curve with respect to yield);
  - Duration is a **weighted average of time (in years)** until cash flow will be received. The weights are the proportions of the total bond value that each cash flow represents.
  - Duration is the **approximate percentage change** in price of 1% change in yield. (price sensitivity)

Duration

- **Effects of bond characteristics on duration：**
  - Longer maturity, higher duration.
  - Lower coupon, higher duration.
  - Lower market yield, higher duration
  - Bond with embedded options (callable bond & putable bond) has lower duration.
- **注：**
  - $D_{perpetuity} = (1+YTM)/YTM$
  - $D_{zero\text{-}coupon\ bond} = M_{zero\text{-}coupon\ bond}$
  - $D_{discount} > D_{premium}$
  - $D_{discount}$ 随着时间的变化先增加后减小，并不是时间越长，duration越大。

Portfolio duration

- **Portfolio Duration**

$$\textbf{Portfolio duration} = w_1D_1 + w_2D_2 + \ldots\ldots + w_nD_n$$

✓ **Limitations**: the measure of portfolio duration implicitly assumes a **parallel shift in the yield curve.** 1506 (1) 1406 (1)

◆A parallel yield curve shift implies that all rates change by the same amount in the same direction.

◆In reality, interest rate changes frequently result in a steeper or flatter yield curve. **(non-parallel shifts → key rate duration)** 1512 (1)

Convexity

- **Convexity** is a measure of the curvature of the price-yield curve.

$$\text{approximate convexity}=\frac{V_- + V_+ - 2V_0}{(\Delta YTM)^2 V_0}$$

  - Effective Convexity

$$\text{effective convexity}=\frac{V_- + V_+ - 2V_0}{(\Delta \text{curve})^2 V_0}$$

  - The convexity adjustment is always positive when convexity is positive

$$\frac{\Delta P}{P}=\left[-MD\times(\Delta y)\right]+\left[0.5\times Conv\times(\Delta y)^2\right]$$

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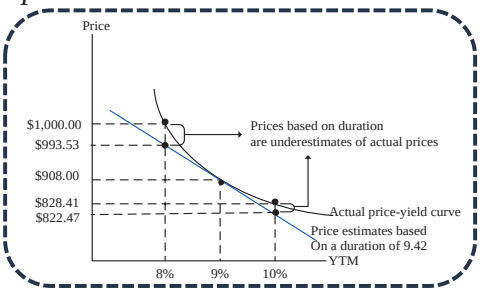

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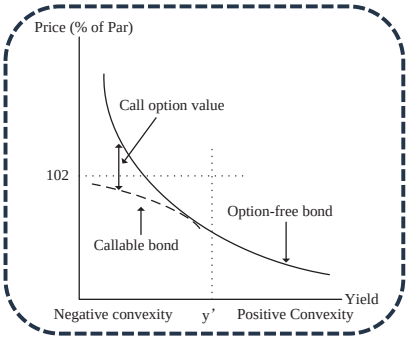
Effective Convexity

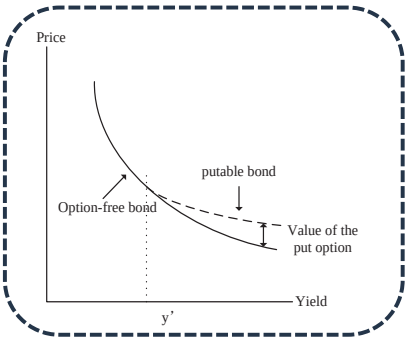
Callable

- High yield →unlikely call, → positive convexity
- Yield decline → may call the bond →negative convexity

Putable

- price/yield relationship will be more convex when yield increase





HPR, Duration, and Investment Horizon

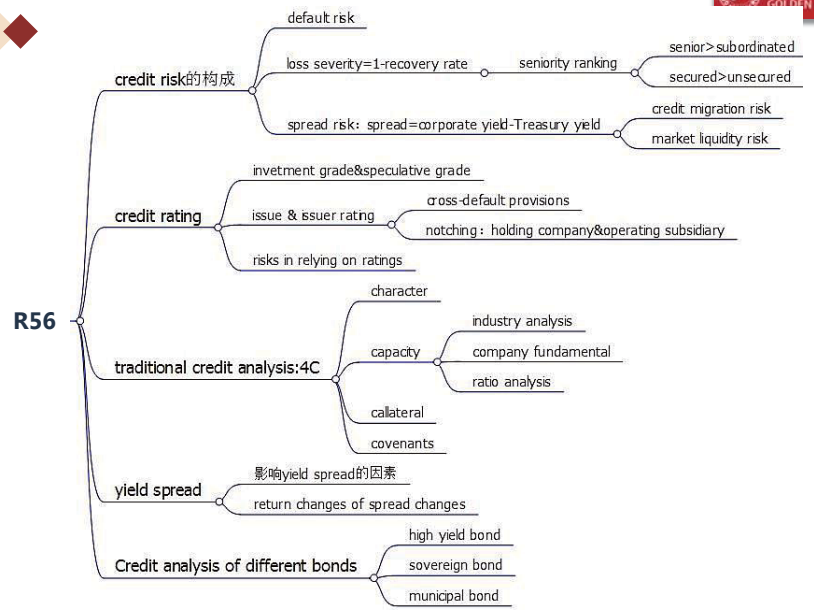
- **Duration gap:**

  Duration gap = Macaulay duration – investment horizon

  - **Duration gap=0:** coupon reinvestment risk and market price risk just offset each other.
  - **Positive gap** exposes the investor to market price risk from increasing interest rates
  - **Negative gap** exposes the investor to reinvestment risk from decreasing interest rates
- Relationships among interest rate risk, Macaulay duration, and investment horizon:
  1. if investment horizon > Macaulay duration, then reinvestment risk dominates price risk, investor's risk is to lower interest rates.
  2. if investment horizon = Macaulay duration, then reinvestment risk offsets price risk
  3. if investment horizon < Macaulay duration, then price risk dominates reinvestment risk, investor's risk is to higher interest rates.

Reading 56

Fundamentals of Credit Analysis

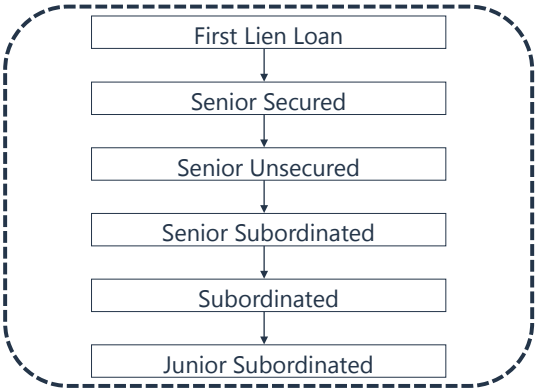


Fundamentals of Credit Analysis

- **Credit risk** is the risk of loss resulting from the borrower (issuer of debt) failing to make full and timely payments of interest and/or principal. It has two components.
  - **Default risk**, or default probability, is the probability that a borrower defaults – that is, fails to meet its obligation to make full and timely payments of principal and interest, according to the terms of the debt security;
  - **Loss given default**, or loss severity, in the event of default, is the portion of a bond's value (including unpaid interest) an investor loses.
- **Expected loss = Default probability × Loss severity given default**
  - Loss severity given default = 1 – Recovery rate;
  - **Recovery rate** is the percentage of the principal amount recovered in the event of default.

Fundamentals of Credit Analysis

- **Capital Structure:** the composition and distribution across operating units of a company's debt and equity, including bank debt, bonds of all seniority rankings, preferred stock, and common equity.
- **Seniority Ranking**



Fundamentals of Credit Analysis

- **Pari Passu**: All creditors at the same level of the capital structure are treated as one class; thus, a senior unsecured bondholder whose debt is due in 30 years has the same pro rata claim in bankruptcy as one whose debt matures in six months. This provision is referred to as bonds ranking pari passu ("on an equal footing") in right of payment.
- To avoid unnecessary delays, **bankruptcy** negotiation and compromise among various claimholders may result in a reorganization plan that does not strictly conform to the original priority of claims.

Fundamentals of Credit Analysis

- **Credit rating**
  - Investment grade
    - ✓ Baa3 or above by Moody's Investors Service
    - ✓ BBB- or above by Standard & Poor's (S&P) and Fitch Ratings
  - Non-investment grade/high yield
    - ✓ Below investment grade

Fundamentals of Credit Analysis

- ***Issuer credit rating***: address an obligor's overall creditworthiness – its ability and willingness to make timely payments of interest and principal on its debt.
  - Issuer credit rating usually applies to its senior unsecured debt.
- ***Issue ratings*** refer to specific financial obligations of an issuer and take into consideration such factors as ranking in the capital structure (e.g., secured or subordinated).
- **Notching** is a ratings adjustment methodology where specific issues from the same borrower may be assigned different credit ratings.
  - As a general rule, the higher the senior unsecured rating, the smaller the notching adjustment will be. For lower-rated credits, the risk of default is greater and thus the potential difference in loss from a lower (or higher) priority ranking is a bigger consideration in assessing an issue's credit riskiness. Thus, the rating agencies will typically apply larger rating adjustments.

Fundamentals of Credit Analysis

- **Cross default provision:** reduce credit risk.
- **Structural subordination**
  - When a corporation with a holding company structure has debt at both its parent holding company and operating subsidiaries, debt at the operating subsidiaries will get serviced by the cash flow and assets of the subsidiaries before funds can be passed ("upstreamed") to the holding company to service debt at that level.

Fundamentals of Credit Analysis

- **The four Cs of credit analysis**
  - ***Capacity*** refers to the ability of the borrower to make its debt payments on time.
  - ***Collateral*** refers to the quality and value of the assets supporting the issuer's indebtedness.
  - ***Covenants*** are the terms and conditions of lending agreements that the issuer must comply with.
  - ***Character*** refers to the quality of management.

Fundamentals of Credit Analysis

- **Factors affect the spreads on corporate bonds:**
  - **Credit cycle**
    - ✓ The bond market perceives low aggregate credit risk and is generally bullish. Spreads narrow as the credit cycle improves.
  - **Economic conditions**
    - ✓ A strengthening economy will cause credit spreads to narrow.
  - **Financial market performance**
    - ✓ Including equities, in weak financial markets, credit spreads will widen, whereas in strong markets, credit spreads will narrow.
  - **Broker-dealer capital**
    - ✓ If there is sufficient capital available for making markets, yield spreads will be narrow.
  - **General market demand and supply**
    - ✓ In periods of heavy new issue supply, credit spreads will widen if there is insufficient demand.

It's not the end but just beginning.

This moment will nap, you will have a dream; But this moment study, you will interpret a dream.

现在睡觉的话会做梦，而现在学习的话会让梦实现。

Quantitative Methods

CFA一级培训项目

讲师：单晨玮

Topic Weightings in CFA Level I

Session NO.	Content	Weightings
Study Session 1	Ethics & Professional Standards	15
Study Session 2-3	**Quantitative Analysis**	**12**
Study Session 4-5	Economics	10
Study Session 6-9	Financial Reporting and Analysis	20
Study Session 10-11	Corporate Finance	7
Study Session 12	Portfolio Management and Wealth Planning	7
Study Session 13-14	Equity Investment	10
Study Session 15-16	Fixed Income	10
Study Session 17	Derivatives	5
Study Session 18	Alternative Investments	4

Framework

Quantitative Methods

- **Time Value Calculation**
  - R6 The Time Value of Money
  - R7 Discounted Cash Flow Applications
- **Probability & Statistics**
  - R8 Statistical Concepts and Market Returns
  - R9 Probability Concepts
  - R10 Common Probability Distributions
- **Inferential statistics**
  - R11 Sampling and Estimation
  - R12 Hypothesis Testing
- **Technical Analysis**
  - R13 Technical Analysis

Reading 6

Time Value of Money

Time Value of Money

- **Time Value of Money**
  - Required interest rate on a security的组成
  - EAR
  - Annuities的计算：FV, PV, required payment

1506 (1) 1512 (1)
1606 (1)

Time Value of Money

- **EAR calculation:**

$$EAR = (1 + periodic\ rate)^{m} - 1 \longleftrightarrow 1 + EAR = \left(1 + \frac{r}{m}\right)^{m}$$

  - If semi-annually compounding, then m=2
  - If quarterly compounding, then m=4
  - If continuously compounding, then EAR = $e^{\text{annual int}}-1$
- **Tips：**
  - Calculation——calculate EAR，or calculate the frequency of compounding
  - Feature
    - ✓ The greater the compounding frequency, the larger the EAR
    - ✓ The largest EAR exists when it is continuously compounding

1406 (1+1) 1412 (2+1) 1506 (1)
1512 (2) 1706 (1)

Time Value of Money

- **Type of annuity**
  - **Ordinary annuity**（后付年金）
  - **Annuity due**（先付年金）
    - ✓ **Definition:** an annuity where the annuity payments occur at the beginning of each compounding period.
    - ✓ **Calculation:**
      - ◆**Measure 1:** put the calculator in the BGN mode and input relevant data.
      - ◆**Measure 2:** treat as an ordinary annuity and simply multiple the resulting PV by (1+I/Y)
      - ◆**Measure 3:** treat as an ordinary annuity and simply plus the resulting PV by PMT
  - **Perpetuity**（永续年金）
    - ✓ **Definition:** A perpetuity is a financial instruments that pays a fixed amount of money at set intervals over an infinite period of time.
    - ✓ **Calculation:** $PV = \frac{PMT}{1+I/Y} + \frac{PMT}{(1+I/Y)^2} + \frac{PMT}{(1+I/Y)^3} + \ldots = \frac{PMT}{I/Y}$

Reading 7

Discounted Cash Flow Applications

Discounted Cash Flow Applications

- **Discounted Cash Flow Applications**
  - ✓ NPV & IRR
  - ✓ Calculate measures of return such as HPY, EAY and convert among them
  - ✓ Money-weighted return & Time-weighted return

Discounted Cash Flow Applications

$$NPV = CF_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \ldots + \frac{CF_N}{(1+r)^N} = \sum_{t=0}^{N} \frac{CF_t}{(1+r)^t}$$

$$NPV = 0 = CF_0 + \frac{CF_1}{(1+IRR)^1} + \frac{CF_2}{(1+IRR)^2} + \ldots + \frac{CF_N}{(1+IRR)^N} = \sum_{t=0}^{N} \frac{CF_t}{(1+IRR)^t}$$

- **IRR (Internal Rate of Return)**
  - When NPV= 0, the discount rate.
  - Multiple solutions Problem of the IRR calculation (# sign changes)
  - Basic assumption: Reinvestment rate = IRR

Discounted Cash Flow Applications

$$r_{BD} = \frac{(F - P_0)}{F} \times \frac{360}{t}$$

$$HPR = \frac{P_1 - P_0 + CF_1}{P_0}$$

$$r_{MM} = HPR \times \frac{360}{t}$$

$$EAR = (1 + HPR)^{365/t} - 1$$

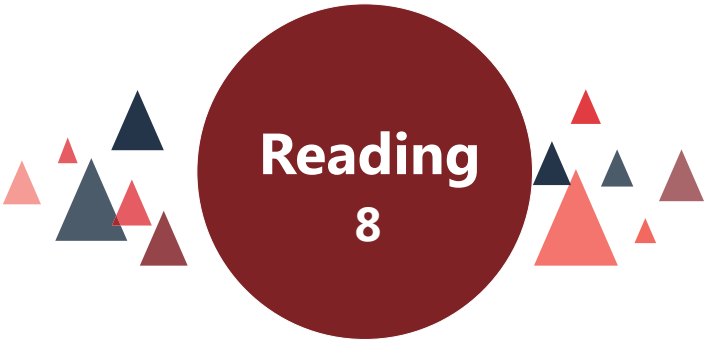
$$(1 + \frac{\text{BEY}}{2})^2 = 1 + \text{EAR}$$

Discounted Cash Flow Applications

- **Money-weighted and time-weighted Rate of Return**
  - ●Time-weighted return掌握概念及公式：
    - ✓ Time-weighted rate of return measures the compound rate of growth of $1 initially invested in the portfolio over a stated measurement period.
  - Calculation
    - ✓ Firstly, calculate the HPR on the portfolio for each subperiod;
    - ✓ Then, compound the HPR to obtain an annual rate of return for the year.
    - ✓ Lastly, take the geometric mean of the annual returns over the measurement period.

Discounted Cash Flow Applications

- **Money-weighted and time-weighted Rate of Return**
  - ●Money-weighted return掌握概念及公式：
    - ✓ The IRR based on the cash flows related to the investment
    - ✓ Calculation
      - ◆ Firstly, determine the timing of each cash flow;
      - ◆ then, using the calculation to compute IRR, or using geometric mean.
  - The relationship between TWRR and MWRR
    - ✓ Both TWRR and MWRR are **annual rates**.
    - ✓ Time-weighted return **is not influenced by cash flow**, but money-weighted return will be affected by cash flow.



Statistical Concepts and Market Returns

Statistical Concepts and Market Return

➢ **Statistical concepts**

1. Types of measurement scales
2. Measures of central tendency
3. Quantile
4. MAD和Var计算以及比较
5. Chebyshev's inequality
6. CV & Sharp ratio
7. Skewness & Kurtosis

Statistical Concepts and Market Return

➢ **Types of measurement scales:**

- Nominal scales
  - ✓ Distinguishing two different things, no order, only has mode
  - ✓ Example: The number 1 refers to male, the number 2 to female.
- Ordinal scales (>, <)
  - ✓ Making things in order, but the difference are not meaningful
  - ✓ Example: One star represents a group of funds judged to have had relatively the worst performance, with two, three, four, and five stars representing groups with increasingly better performance.
- Interval scales (>, <, +, -)
  - ✓ Subtract is meaningful
  - ✓ Example: Temperature
- Ratio scales (>, <, +, -, *, /)
  - ✓ With original point
  - ✓ Example: If we have twice as much money, then we have twice the purchasing power.

Statistical Concepts and Market Return

- **Frequency distribution**

Interval Relative	Absolute Frequency	Relative Frequency	Cumulative Absolute Frequency	Cumulative Relative Frequency
-10 - -5	3	0.97%	3	0.97%
-5 – 0	35	11.29%	38	12.26%
0 – 5	176	56.77%	214	69.03%
5 – 10	74	23.87%	288	92.90%
10 - 15	22	7.10%	310	100%
Total	**310**	**100%**		

Statistical Concepts and Market Return

The Arithmetic Mean: $\overline{X} = \dfrac{\sum_{i=1}^{N} X_i}{n}$

The Weighted Mean: $\overline{X_W} = \sum_{i=1}^{n} w_i X_i = (w_1 X_1 + w_2 X_2 + \cdots + w_n X_n)$

The Geometric Mean: $G = \sqrt[N]{X_1 X_2 X_3 \ldots X_N} = (\prod_{i=1}^{N} X_i)^{1/N}$

The Harmonic Mean: $\overline{X_H} = \dfrac{n}{\sum_{i=1}^{n} (1/X_i)}$

Harmonic Mean<= Geometric Mean<=Arithmetic Mean

Statistical Concepts and Market Return

- **Quantiles**
  - Quartile /Quintile/Deciles/Percentile
    - ✓ The third quartile: 75%, or three-fourths of the observations fall below that value.
  - Calculation L_y = (n+1)y/100, Ly is the position.
- Quantiles and measures of central tendency are known collectively as measures of location.

- The median of a distribution is least likely equal to the:
  - A. Second quartile
  - B. Third quintile
  - C. Fifth decile
- **Correct answer: B**

Statistical Concepts and Market Return

- **Absolute dispersion:** is the amount of variability present without comparison to any reference point or benchmark.

Range = maximum value – minimum value

$$MAD = \frac{\sum_{i=1}^{N}\left|X_i - \bar{X}\right|}{n}$$

$$\text{For population: } \sigma^2 = \frac{\sum_{i=1}^{N}(X_i - \mu)^2}{N}$$

$$\text{For sample: } s^2 = \frac{\sum_{i=1}^{n}(X_i - \bar{X})^2}{n-1}$$

Statistical Concepts and Market Return

- **Chebyshev's inequality**
  - For any distribution with finite variance, the proportion of the observations within k standard deviations of the arithmetic mean is at least 1-1/k^2 for all k>1.

$$P\left(\mu - k\sigma \le X \le \mu + k\sigma\right) \ge 1 - \frac{1}{k^2}$$

  - This relationship applies regardless of the shape of the distribution

Statistical Concepts and Market Return

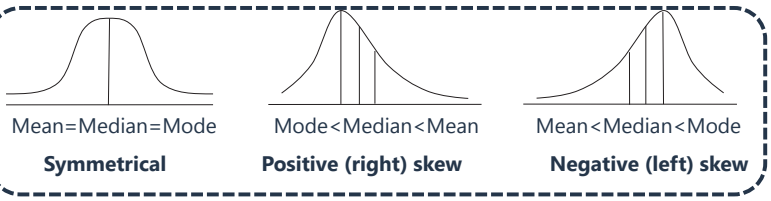
- Coefficient of variation is the ratio of the standard deviation of a set of observations to their mean value, which measures the amount of risk (standard deviation) per unit of mean return. (relative dispersion)

$$CV = \frac{s_X}{\bar{X}} \times 100\%$$

- The Sharpe ratio measures the reward, in terms of mean excess return, per unit of risk, as measured by standard deviation of return.

$$\text{Sharpe ratio} = \frac{R_p - R_f}{\sigma_p}$$

Statistical Concepts and Market Return



- Positive skewed：Mode<median<mean, having a right fat tail
- Negative skewed：Mode>media>mean, having a left fat tail
- Investors should be attracted by a *positive skew* because the mean return falls above the median.
- Sample skewness:

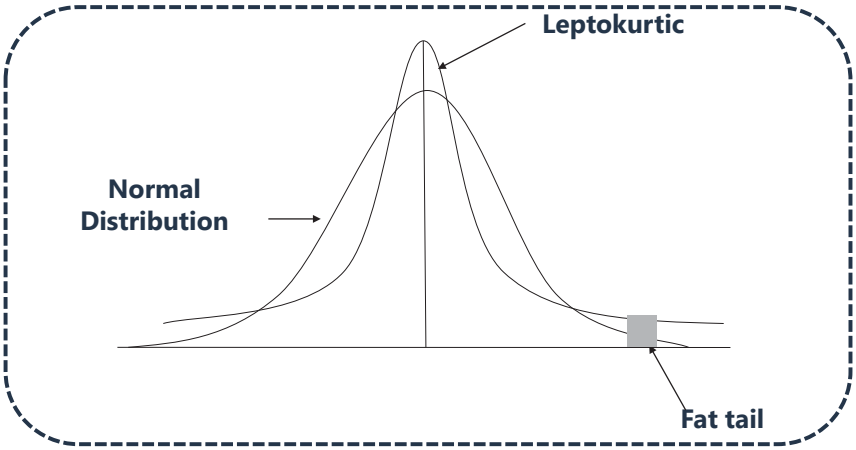
$$S_K = [\frac{n}{(n-1)(n-2)}] \frac{\sum_{i=1}^{n}(X_i - \overline{X})^3}{s^3} \approx (\frac{1}{n}) \frac{\sum_{i=1}^{n}(X_i - \overline{X})^3}{s^3}$$

Statistical Concepts and Market Return

- **Leptokurtic vs. platykurtic**
  - It deals with whether or not a distribution is more or less "peaked" than a normal distribution
- **Excess kurtosis = sample kurtosis – 3**

	leptokurtic	Normal distribution	platykurtic
Sample kurtosis	>3	=3	<3
Excess kurtosis	>0	=0	<0

Statistical Concepts and Market Return



- **A leptokurtic** return distribution has more frequent extremely large deviations from the mean than a normal distribution.

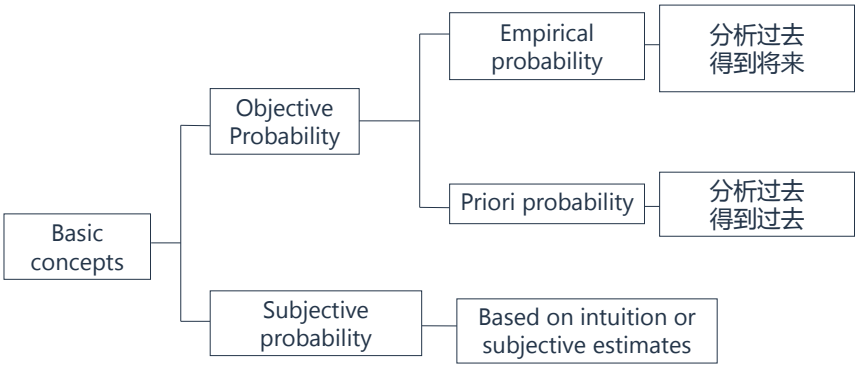
Reading 9

Probability Concepts

Probability Concepts

- **Probability concepts**
  - Two defining properties of probability
  - Empirical, subjective, and priori probabilities
  - Odds for or against
  - Multiplication rule and addition rule
  - Dependent and independent events
  - Covariance & correlation
  - Expected value, variance, and standard deviation of a random variable and of returns on a portfolio
  - Bayes' formula

Probability Concepts



Probability Concepts

- **Odds for an event**
  - P(E)/(1-P(E))
- **Odds against an event**
  - (1-P(E))/P(E)

Probability Concepts

- Joint probability : P(AB)
  - **Multiplication rule**:
    - ✓ $P(AB)=P(A|B)\times P(B)= P(B|A)\times P(A)$
  - If A and B are mutually exclusive events, then:

    $P(AB)=P(A|B)=P(B|A)=0$
- Probability that at least one of two events will occur:
  - **Addition rule**:
    - ✓ P(A or B)=P(A)+P(B)-P(AB)
  - If A and B are mutually exclusive events, then:

    P(A or B)=P(A)+P(B)

Probability Concepts

- **Mutually exclusive events —** can not both happen at the same time.
- **Independence events —** The occurrence of A doesn't affect the occurrence of B
  - $P(A|B)=P(A)$ or $P(B|A)=P(B)$
  - $P(AB)=P(A)\times P(B)$
  - P(A or B)=P(A)+P(B)-P(AB)
- **Independence and Mutually Exclusive are quite different**
  - If exclusive, must not independence;
    - ✓ Because exclusive means if A happen, B can not happen, A affects B.
    - ✓ $P(AB)=P(A)\times P(B)$

Probability Concepts

- **Expected value:** $E(X) = \sum P(X_i)X_i$

$$E(X) = \sum x_i * P(x_i) = x_1 * P(x_1) + x_2 * P(x_2) + \cdots + x_n * P(x_n)$$

- **Variance:** $\sigma^2 = \sum_{i=1}^{N} P_i(X_i - EX)^2$

Probability Concepts

- **Covariance:**
  - Covariance measures how one random variable moves with another random variable
  - The covariance of R_A with itself is equal to the variance of R_A
  - Covariance ranges from negative infinity to positive infinity

$$COV(X,X) = E[(X - E(X))(X - E(X))] = \sigma^2(X)$$

$$COV(X,Y) = E[(X-E(X))(Y-E(Y))]$$

- **Correlation:** $\rho_{XY} = \dfrac{COV(X,Y)}{\sigma_X \sigma_Y}$
  - Correlation measures the **linear relationship** between two random variables
  - Correlation has no units, ranges from –1 to +1, standardization of covariance
  - Understand the difference between correlation and independence
    - ✓If ρ=0, this indicates?

Probability Concepts

- **Expected return, variance and standard deviation of a portfolio**

$$E(r_p) = \sum_{i=1}^{n} w_i E(R_i)$$

$$\sigma^2{}_p = \sum_{i=1}^{n}\sum_{j=1}^{n} w_i w_j \operatorname{cov}(R_i, R_j)$$

Reading 10

Common Probability Distributions

Common Probability Distributions

- **Common Probability Distributions**
  - Properties of discrete distribution and continuous distribution
  - Uniform random variable and a binomial random variable
  - The key properties of the normal distribution
  - Standardize a random variable
  - Confidence interval for a normally distributed random variable
  - Lognormal distribution
  - Safety-first ratio
  - Monte Carlo simulation

Common Probability Distributions

- **Probability Distribution**
  - Describe the probabilities of all the possible outcomes for a random variable.
- **Discrete and continuous random variables**
  - Discrete random variables: the number of possible outcomes can be counted, and for each possible outcome, there is a measurable and positive probability.
  - Continuous variables: the number of possible outcomes is infinite, even if lower and upper bounds exist.
    - ✓ P (x)=0 even though x can occur.
    - ✓ P (x_1<X<x_2)
    - ✓ Probability density function (p.d.f) : f(x)

Common Probability Distributions

➢ **Discrete uniform**

- Discrete uniform distribution would be a known, finite number of outcomes equally likely to happen. Every one of n outcomes has equal probability 1/n.
- For example, rolling a dice will have 6 possible outcomes as X={1,2,3,4,5,6}
  - ✓ In that case, the probability for each outcome is 0.167 [i.e. p(1)=p(2)=p(3)=p(4)=p(5)=p(6)=0.167].

Common Probability Distributions

➢ **Binomial distribution**

- Bernoulli random variable

  P(Y=1)=p P(Y=0)=1-p
- Binomial random variable，the probability of x successes in n trials

$$p(x) = P(X = x) = {}_nC_x p^x (1-p)^{n-x}$$

Common Probability Distributions

➢ **Continuous Uniform Distribution**

- All intervals of the same length on the Continuous Uniform Distribution's support are equally probable.
  - ✓ The support is defined by the two parameters, a and b, which are its minimum and maximum values

➢ **Properties of Continuous uniform distribution**

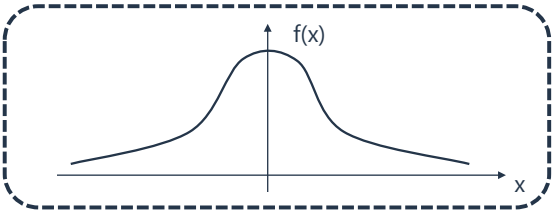
- For all $a \le x_1 < x_2 \le b$

$$P(x_1 \le X \le x_2) = (x_2 - x_1)/(b-a)$$

- P (X<a or X>b) = 0

Common Probability Distributions

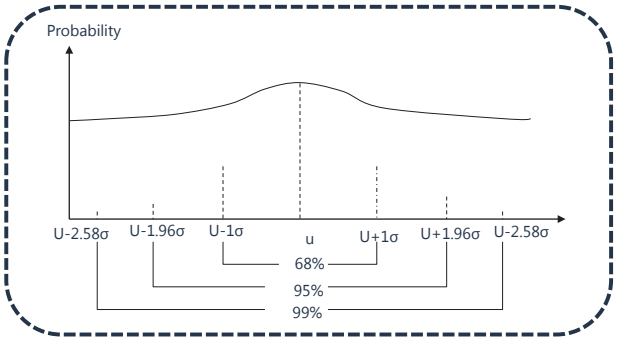
- **The shape of the density function**



- **Properties:**
  - X~N(μ , σ^2)
  - Symmetrical distribution: skewness=0; kurtosis=3
  - A linear combination of random variables these are in normally distribution is also normally distributed.
  - As the values of x gets farther from the mean, the probability density get smaller and smaller but are always positive.

Common Probability Distributions

- **The confidence intervals**
  - 68% confidence interval is $[\mu-\sigma, \mu+\sigma]$
  - 90% confidence interval is $[\mu-1.65\sigma, \mu+1.65\sigma]$
  - 95% confidence interval is $[\mu-1.96\sigma, \mu+1.96\sigma]$
  - 99% confidence interval is $[\mu-2.58\sigma, \mu+2.58\sigma]$



Common Probability Distributions

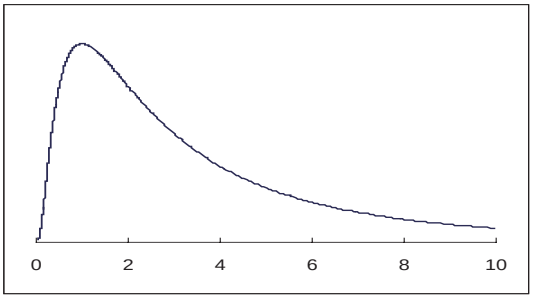
- **Standard normal distribution**
  - N(0,1) or Z
  - Standardization: if X~N(μ , σ^2), then $Z = \frac{X-\mu}{\sigma}$ ~ N(0,1)
  - Z-table
- F(-z)=1-F(z)
- P(Z>z) = 1 –F(z)

Common Probability Distributions

- **Shortfall risk:** R_L= threshold level return, minimum return required
  - Minimize (Rp< R_L)
- **Roy's safety-first criterion**
  - $[E(R_P) - R_L] / \sigma_P$
- **Maximize S-F-Ratio**
  - Maximize $SFR=\frac{E(R_P)-R_L}{\sigma_P}$ <=> Minimize P (Rp< R_L)

Common Probability Distributions

- Definition: If lnX is normal, then X is the lognormal distribution.
- Right skewed
- Bounded from below by zero
- The lognormal distribution is used to model asset Prices



Reading 11

Sampling and Estimation

Sampling and Estimation

- **Sampling and estimation**
  - Simple random and stratified random sampling, time-series and cross-sectional data
  - Central limit theorem
  - Standard error of the sample mean的意义及计算
  - The desirable properties of an estimator
  - Student's t-distribution的特点
  - Criteria for selecting the appropriate test statistic，计算confidence interval
  - Five kinds of biases

Sampling and Estimation

- **Sampling and estimation**
  - Simple random sampling
  - Stratified random sampling: to separate the population into smaller groups based on one or more distinguishing characteristics. Stratum and cells=M*N
- **Sampling error:** sampling error of the mean= sample mean- population mean
- The sample statistic itself is a random variable and has a probability distribution.

Sampling and Estimation

- **Time-series data**
  - a collection of observations at equally spaced intervals of time.
- **Cross-sectional data**
  - a collection of observations at a single point in time.

Time-series data	Cross-sectional data
a collection of data recorded over a period of time	a collection of data taken at a single point of time.

Sampling and Estimation

- **Central Limit Theory**
  - For sufficiently large sample sizes n**(n ≥30)**, for any underlying distribution for a random variable with **known population mean and variance**, the sampling distribution
    - ✓ will be approximately normal,
    - ✓ has mean equals to the population mean μ
    - ✓ has variance equal to the population variance of the variable divided by sample size, which equals σ^2/n.

  条件：1. $n \geq 30$　　2. 总体均值、方差已知

  结论：1.服从正态分布　2. $\mu_{population} = \mu_{sample}$　$s^2 = \sigma^2/n$

- **Standard error of the sample mean**
  - Known population variance　$\sigma_{\bar{x}} = \sigma / \sqrt{n}$
  - Unknown population variance　$s_{\bar{x}} = s / \sqrt{n}$

Sampling and Estimation

- **The desirable properties of an estimator：**
  - **Unbiasedness:** the expected value of the estimator equals the population parameter.
  - **Efficiency:** the unbiased estimator has the smallest variance.
  - **Consistency:** the probability of accurate estimates increases as sample size increases.
    - ✓ the standard deviation of the parameter estimate decreases as the sample size increases.
    - ✓ If the sample size raises, the standard error of the sample mean falls.

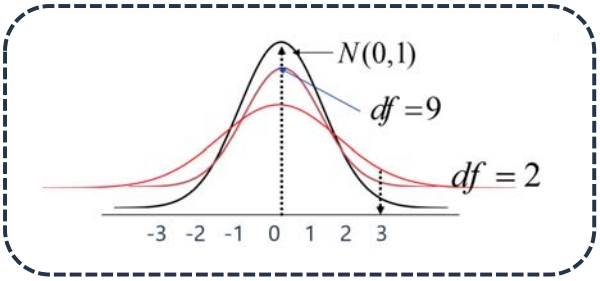
Sampling and Estimation

- **Point estimate:** the statistic, computed from sample information, which is used to estimate the population parameter
- **Confidence interval estimate:** a range of values constructed from sample data so the parameter occurs within that range at a specified probability.

  α—the level of significance
- **Interval Estimation（also see Chapter: Hypothesis Testing ）**
  - Level of significance （alpha）
  - Degree of Confidence （1－alpha）
  - Confidence Interval = [Point Estimate +/- (reliability factor) * Standard error]

Sampling and Estimation

- **Student's t-distribution**
  - Symmetrical
  - Degrees of freedom (df): n-1
  - Less peaked than a normal distribution ("fatter tails")
  - Student's t-distribution converges to the standard normal distribution as degrees of freedom goes to infinity.



Sampling and Estimation

- Calculate and interpret a confidence interval for a population mean, given a normal distribution with 1) a known population variance, 2) an unknown population variance, or 3) an unknown variance and a large sample size;

$$\bar{x} \pm z_{\alpha/2}\frac{\sigma}{\sqrt{n}} \qquad \bar{x} \pm t_{\alpha/2}\frac{s}{\sqrt{n}}$$

Sampling from:	Normal distribution with known variance	Normal distribution with unknown variance	Nonnormal distribution with known variance	Nonnormal distribution with unknown variance
Statistic for small sample size(n<30)	z- Statistic	t- Statistic	not available	not available
Statistic for large sample size(n>=30)	z- Statistic	t- Statistic/z	z- Statistic	t- Statistic/z

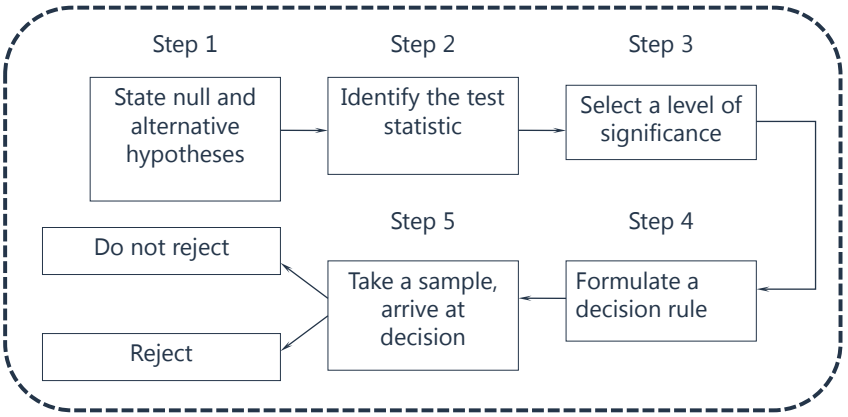
Reading 12

Hypothesis Testing

Hypothesis Testing

- **Hypothesis testing**
  - The steps of hypothesis testing
  - The null hypothesis and alternative hypothesis, one-tailed and two-tailed test
  - Test statistics的选择和计算
  - Type I and type II errors
  - Decision rule
  - The Chi-square test and F-test
  - Parameter tests and non-parameter tests

Hypothesis Testing



Hypothesis Testing

- **Define Hypothesis**
  - Statistical assessment of a statement or idea regarding a population parameter.
  - Null hypothesis and Alternative hypothesis (we want to assess)

    $H_0 : \mu = \mu_0 \qquad H_a : \mu \neq \mu_0$
- **One-tailed and Two-tailed tests of Hypothesis**

Two-tailed	$H_0 : \mu = \mu_0$	$H_a : \mu \neq \mu_0$
One-tailed	$H_0 : \mu \leq \mu_0$ $or, H_0 : \mu \geq \mu_0$	$H_a : \mu > \mu_0$ $H_a : \mu < \mu_0$

Hypothesis Testing

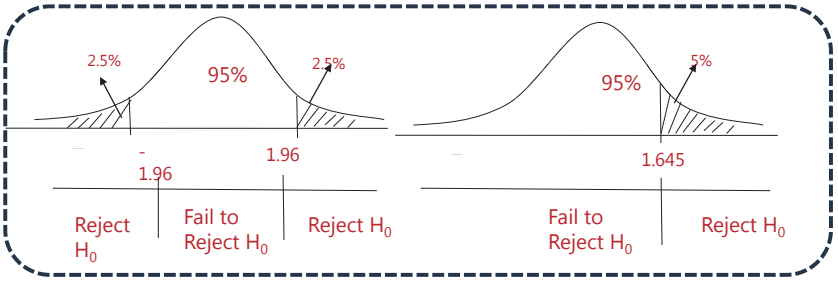
- **Test statistic**
  - Test for population mean

$$Test\ Statistic = \frac{\overline{X} - \mu_0}{\sigma / \sqrt{n}} \qquad Test\ Statistic = \frac{\overline{X} - \mu_0}{s / \sqrt{n}}$$

- **Critical value (关键值，实际就是分位数）**
  - Found in the Z, T, Chi Square or F distribution tables not calculated by us
  - Under given one tailed or two tailed assumption, critical value is determined solely by the significance level.

Hypothesis Testing

- Reject H_0 if |test statistic|>critical value
- Fail to reject H_0 if |test statistic|<critical value



- **Statement**
  - cannot say "accept the null hypothesis", only can say "cannot reject"
  - ***** is significantly different from ******
  - *****is not significantly different from ******

Hypothesis Testing

Test type	Assumptions	H_0	Test-statistic	Critical value
Mean hypothesis testing	Normally distributed population, known population variance	$\mu=0$	$Z=\frac{\bar{x}-\mu_0}{\sigma/\sqrt{n}}$	N(0,1)
	Normally distributed population, unknown population variance	$\mu=0$	$t=\frac{\bar{x}-\mu_0}{s/\sqrt{n}}$	t(n-1)
	Independent populations, unknown population variances assumed equal	$\mu_1-\mu_2=0$	t	$t(n_1+n_2-2)$
	Independent populations, unknown population variances not assumed equal	$\mu_1-\mu_2=0$	t	t
	Samples not independent, paired comparisons test	$\mu_d=0$	$t=\bar{d}/s_{\bar{d}}$	t(n-1)
Variance hypothesis testing	Normally distributed population	$\sigma^2=\sigma_0^2$	$\chi^2=\frac{(n-1)s^2}{\sigma_0^2}$	$\chi^2(n-1)$
	Two independent normally distributed populations	$\sigma_1^2=\sigma_2^2$	$F=s_1^2/s_2^2$	$F(n_1-1,n_2-1)$

Hypothesis Testing

- **P-value Method**
  - The **p-value** is the smallest level of significance at which the null hypothesis can be reject
  - p-value < α: reject H_0; p-value > α: do not reject H_0.
  - P↓, easier to reject H_0

- A two-tailed test of the null hypothesis that the mean of a distribution is equal to 4.00 has a p-value of 0.0567. Using a 5% level of significance (i.e. α=0.05), the best conclusion is to:
  - A. reject the null hypothesis.
  - B. accept the null hypothesis.
  - C. increase the level of significance to 5.67%.
- **Correct Answer: B.**

Hypothesis Testing

Decision	True condition	
	H_0 is true	H_0 is false
Do not reject H_0	Correct Decision	Incorrect Decision Type II error
Reject H_0	Incorrect Decision Significance level α =P (Type I error)	Correct Decision Power of test = 1- P (Type II error)

- With other conditions unchanged, either error probability arises at the cost of the other error probability decreasing.
- How to reduce both errors? Increase the Sample Size.

Hypothesis Testing

- **Parametric tests**
  - based on specific distributional assumptions for the population
  - concerning a parameter of population.
  - For example, t-test.
- **Nonparametric tests**
  - a nonparametric test either **is not concerned with a parameter** or **makes minimal assumptions about the population** from which the sample comes.
  - Nonparametric tests are used:
    - ✓ When there is concern about quantities other than the parameters of a distribution.
    - ✓ When the assumptions of parametric tests can't be supported.
    - ✓ When the data are not suitable for parametric tests.

Reading 13

Technical Analysis

Technical Analysis

- **Technical Analysis**
  - the principles of technical analysis, its applications, and its underlying assumptions
  - Types of charts
  - the uses of trend
  - Common chart patterns
  - Common analysis indicators
  - the use of cycles

Technical Analysis

- **Principles:**
  - Prices are the result of the interaction of supply and demand in the real time.
  - The greater the volume of trades, the more impact that market participants will have on price.
  - Trades determine volume and price.
- **Assumptions:**
  - Market prices reflect both rational and irrational investor behavior.
    - ✓ Market trends and patterns reflect the irrational human behavior.
    - ✓ Efficient markets hypothesis dose not hold.
    - ✓ Market trends and patterns repeat themselves and are somewhat predictable.

Technical Analysis

- The differences among technicians, fundamentalists and Efficient market followers.
  - Fundamental analysis of a firm seeks to **determine the underlying long-term(intrinsic) value** of an asset by using the financial statements and other information.
  - While technical analysis uses more concrete data, primarily **price and volume data**, and seek to project the level at which a financial instrument will trade.
  - Fundamentalists believe that prices react quickly to changing stock values, while technicians believe that the reaction is slow. Technicians look for changes in supply and demand, while fundamentalists look for changes in value.

Technical Analysis

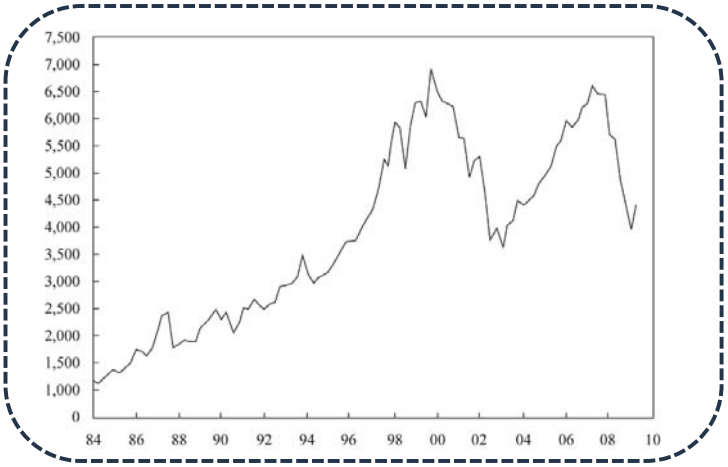
- **Advantages of technical analysis:**
  - Actual price and volume data is easy to access
  - Technical analysis itself is objective (although require subjective judgment), while much of the data used in fundamental analysis is subject to assumptions or restatements.
  - It can be applied to the prices of assets that do not produce future cash flows, such as commodities.
  - Fundamental analysis may have the risk of financial statement fraud, while technical analysis doesn't have.
- **Disadvantage:**
  - In markets that are subject to large outside manipulation, the application of technical analysis is limited.
  - Technical analysis is also limited in illiquid markets, where even modestly sized trades can have an inordinate impact on prices.

Technical Analysis

- Charts are the graphical display of **price and volume data**.
  - Horizontal axis: usually time interval (daily, weekly, monthly)
  - Vertical axis: Price
- **Types of charts:**
  - Line charts
  - Bar charts
  - Candlestick charts

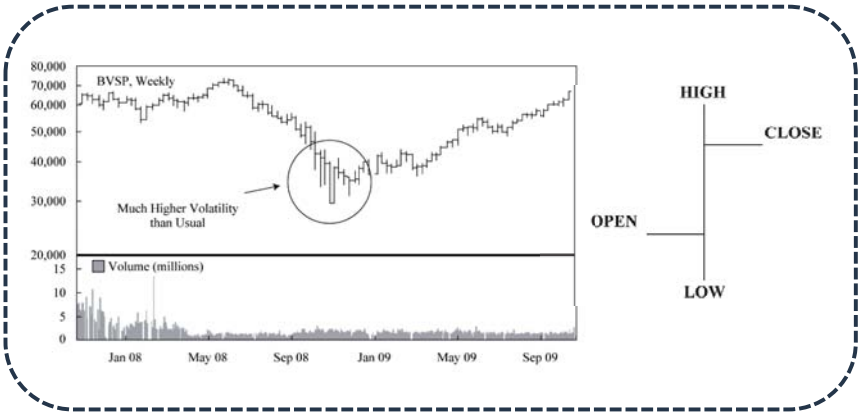
Technical Analysis

- **Line Charts** are a simple graphic display of price trends over time. Line charts are typically drawn with closing prices as the data points.



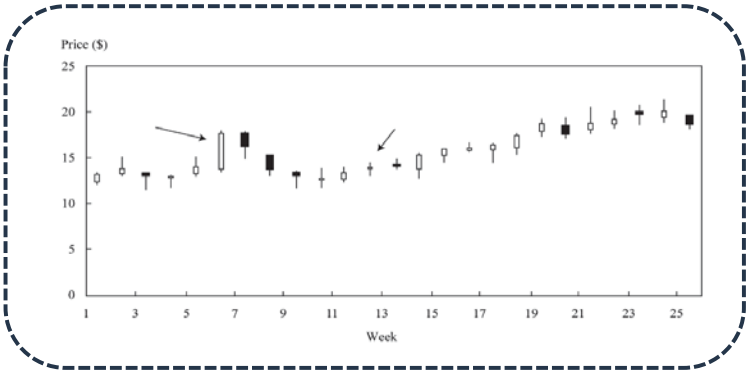
Technical Analysis

- **Bar charts** have four bits of data in each entry—the high and low price encountered during the time interval plus the opening and closing prices.



Technical Analysis

- **Candlestick charts** provides four prices per data point entry: the opening and closing prices and the high and low prices during the period.
  - Box is clear: closing price>opening price;
  - Box is filled: closing price<opening price



Technical Analysis

- **Trend:** is the most important aspect of technical analysis.
  - **Uptrend:** An uptrend for a security is when the price goes to higher highs and higher lows. (Demand>Supply)
  - **Downtrend:** A downtrend is when a security makes lower lows and lower highs. (Demand<Supply)
- **Trend line:** can help to identify whether a trend is continuing or reversing.
  - Uptrend line: connecting the low of the price chart.
  - Downtrend line: connecting the highs of the price chart.
  - When price drops through and below the trend line by a significant amount, indicate that the uptrend is over and may signal a further deadline in the price.

Technical Analysis

- **Common chart patterns.**
  - Reversal patterns
    - ✓ For uptrend: Head-and shoulders pattern, Double top and triple top
    - ✓ For downtrend: inverse head-and shoulders pattern, Double bottom, and triple bottom
  - Continuation patterns
    - ✓ Triangles
    - ✓ Rectangles

Technical Analysis

- **Common Analysis Indicators**
  - Price-based
    - ✓ Moving average lines
    - ✓ Bollinger bands
  - Momentum oscillators
    - ✓ Rate of change oscillator
    - ✓ Relative Strength Index
    - ✓ Moving average convergence/divergence
    - ✓ Stochastic oscillator

Technical Analysis

- **Technical Analysis Indicators**
  - Sentiment
    - ✓ Put/call ratio
    - ✓ Volatility Index
    - ✓ Margin debt
    - ✓ Short interest ratio
  - Flow of funds
    - ✓ Short-term trading index
    - ✓ Margin debt
    - ✓ Mutual fund cash position
    - ✓ New equity issuance

It's not the end but just beginning.

Life is short. If there was ever a moment to follow your passion and do something that matters to you, that moment is now.

生命苦短，如果你有一个机会跟随自己的激情去做你认为重要的事，那么这个机会就是现在。

Portfolio Management

CFA一级培训项目

讲师：单晨玮

Topic Weightings in CFA Level I

Session NO.	Content	Weightings
Study Session 1	Ethics & Professional Standards	15
Study Session 2-3	Quantitative Analysis	12
Study Session 4-5	Economics	10
Study Session 6-9	Financial Reporting and Analysis	20
Study Session 10-11	Corporate Finance	7
Study Session 12	**Portfolio Management and Wealth Planning**	**7**
Study Session 13-14	Equity Investment	10
Study Session 15-16	Fixed Income	10
Study Session 17	Derivatives	5
Study Session 18	Alternative Investments	4

Framework

Portfolio Management

- **Portfolio Management**
  - R40 Portfolio Management: An Overview
  - R41 Risk Management: An Introduction
  - R42 Portfolio Risk and Return: Part I
  - R43 Portfolio Risk and Return: Part II
  - R44 Basic of Portfolio Planning and Construction

Reading 42

Portfolio Risk and Return: Part I

Portfolio Risk and Return: Part I

➢ **An individual investment:**

- Expected Return $E(R) = \sum_{i=1}^{n} P_i R_i = P_1 R_1 + P_2 R_2 + \cdots + P_n R_n$
- Variance of Return $\text{Var} = \sigma^2 = \sum_{i=1}^{n} [R_i - E(R)]^2 P_i$
- Standard Deviation of Return $\text{SD} = \sigma = \sqrt{\sum_{i=1}^{n} [R_i - E(R)]^2 P_i}$
- Covariance $Cov_{1,2} = \sum_{i=1}^{n} P_i [R_{i,1} - E(R_1)][R_{i,2} - E(R_2)]$
- Correlation

$$\rho_{1,2} = \frac{Cov_{1,2}}{\sigma_1 \sigma_2} \qquad Cov_{1,2} = \rho_{1,2} \sigma_1 \sigma_2$$

Portfolio Risk and Return: Part I

➢ **The portfolio standard deviation formula**

$$\sigma_P = \sqrt{\sigma_P^2} = \sqrt{\sum_{i=1}^{n} w_i^2 \sigma_i^2 + \sum_{i=1}^{n} \sum_{j=1}^{n} w_i w_j Cov_{i,j}}$$

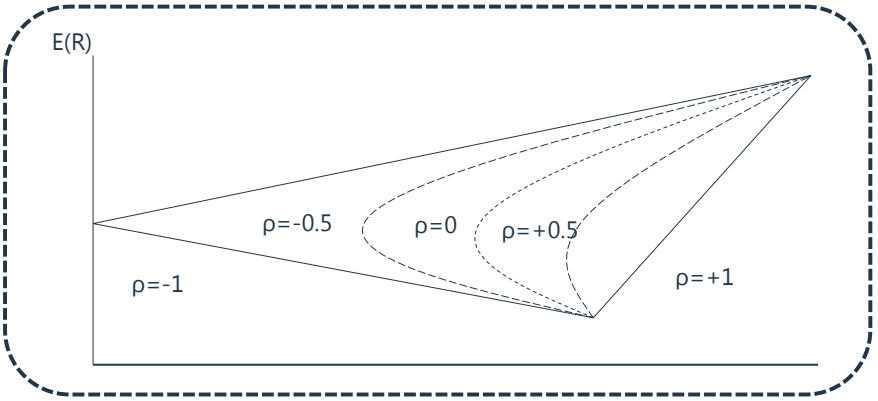
- The risk of a portfolio of risky assets depends on the asset weights and the standard deviations of the assets returns, and crucially on the correlation (covariance) of the asset returns.
- The lower the correlation between the returns of the stocks in the portfolio, all else equal, the greater the diversification benefits.
- Two-asset portfolio:

$$\sigma_p^2 = w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 COV_{1,2}$$

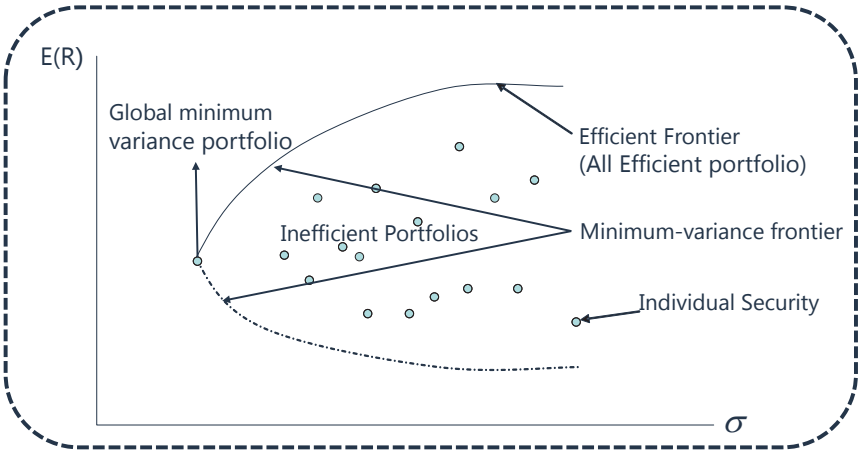
$$= w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \sigma_1 \sigma_2 \rho_{1,2}$$

Portfolio Risk and Return: Part I

➢ **Risk and return for different values of correlation**



Portfolio Risk and Return: Part I



Portfolio Risk and Return: Part I

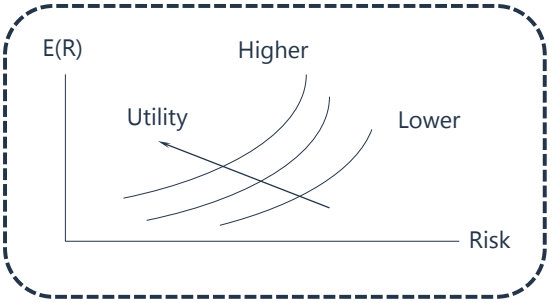
- **Utility Theory**
  - **Utility function**:

$$U = E(r) - \frac{1}{2} A\sigma^2$$

  - ✓ U: the utility of an investment
  - ✓ E(r): the expected return
  - ✓ σ^2: the variance of the investment
  - ✓ A: a measure of risk aversion, which is measured as the marginal reward that an investor requires to accept additional risk.
    - ◆A is higher for more risk-averse individuals.
    - ◆Risk-aversion: A>0
    - ◆Risk-neutral: A=0
    - ◆Risk-seeking: A<0

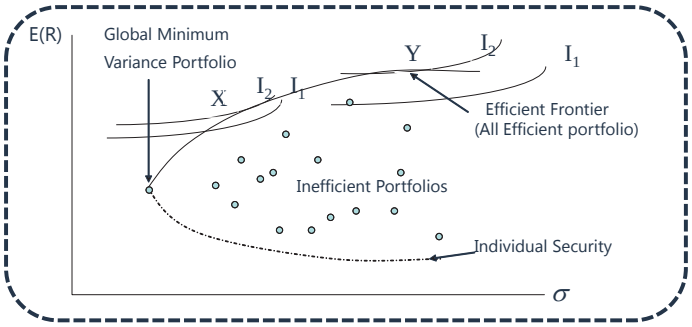
Portfolio Risk and Return: Part I

- **Risk aversion**
  - Refers to the fact that individuals prefer less risk to more risk.
  - Risk-averse investors:
    - ✓ Prefer lower to higher risk for a given level of expected returns
    - ✓ Will only accept a riskier investment if they are compensated in the form of greater expected return



Portfolio Risk and Return: Part I

- **The optimal portfolio for an investor**
  - At the point of where an investor's (highest) risk-return indifference curve is tangent to the efficient frontier.



- **Optimal portfolio**
  - The highest indifference curve that is tangent to the efficient frontier
  - Different investors may have different optimal portfolios

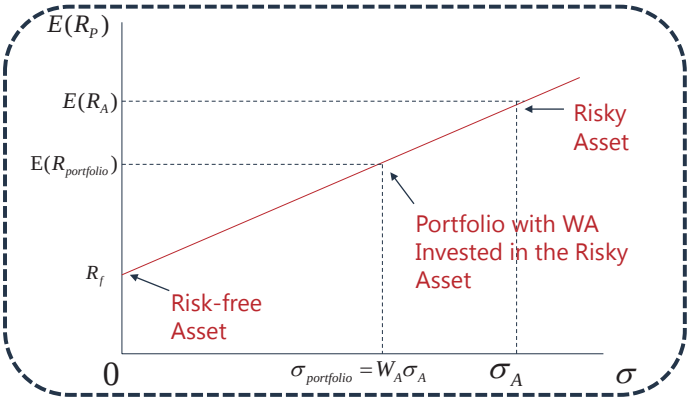
Reading 43

Portfolio Risk and Return: Part II

Portfolio Risk and Return: Part II

- **Two-fund separation theorem:**
  - Combining a risky portfolio with a risk-free asset
  - All investors' optimum portfolios will be made up of some combination of an optimal portfolio of risky assets and the risk-free asset.
- **CAL**
  - The line representing these possible combinations of risk-free assets and the optimal risky asset portfolio.
- **Optimal CAL**
  - The optimal capital allocation line connects the risk-free assets and **the optimal risky asset portfolio**.
  - The optimal risky portfolio is at the tangent of CAL and the efficient frontier of risky assets.

Portfolio Risk and Return: Part II

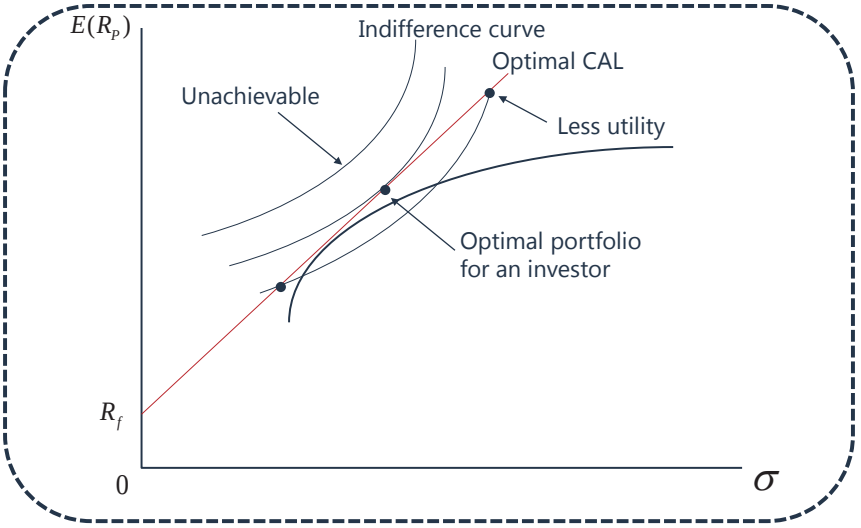


$$E(R_P) = W_A E(R_A) + W_B E(R_B)$$

$$\sigma_P = \sqrt{W_A^2\sigma_A^2 + W_B^2\sigma_B^2 + 2W_A W_B \rho_{AB}\sigma_A\sigma_B}$$

$$\sigma_P = \sqrt{W_A^2\sigma_A^2} = W_A\sigma_A$$

Portfolio Selection



Portfolio Risk and Return: Part II

- **Capital market line**
  - Difference between the CML and the CAL
    - ✓ homogeneity of expectations: there are many CALs, but only one CML.
  - The Market Portfolio:
    - ✓ Is the tangent point where the CML touches the Markowitz efficient frontier.
    - ✓ Based on the assumption of **homogeneity of expectations.**
    - ✓ Consists of every risky assets.
    - ✓ The weights on each asset are equal to the percentage of the market value of the asset to the market value of the entire market portfolio.

Portfolio Risk and Return: Part II

- **Capital market line**
  - When investors share identical expectations about the mean returns, variance of returns, and correlations of risky assets, the CAL for all investors is the same and is known as the capital market line (CML):

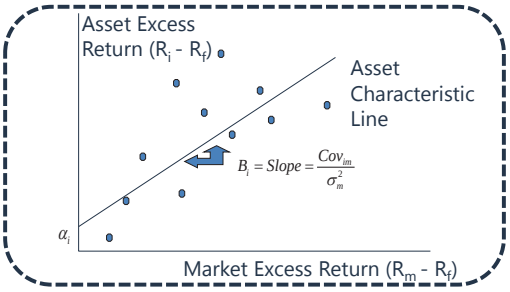
$$E(R_P) = R_F + \frac{E(R_M) - R_F}{\sigma_M}\sigma_P$$

  - Investment using CML follows a
    - ✓ passive investment strategy
      - ◆ i.e., invest in an index of risky assets that serves as a proxy for the market portfolio and allocate a portion of their investable assets to a risk-free asset.
    - ✓ leverage strategy
  - Borrowing portfolio and lending portfolio
  - Difference between the CML and the CAL

Portfolio Risk and Return: Part II

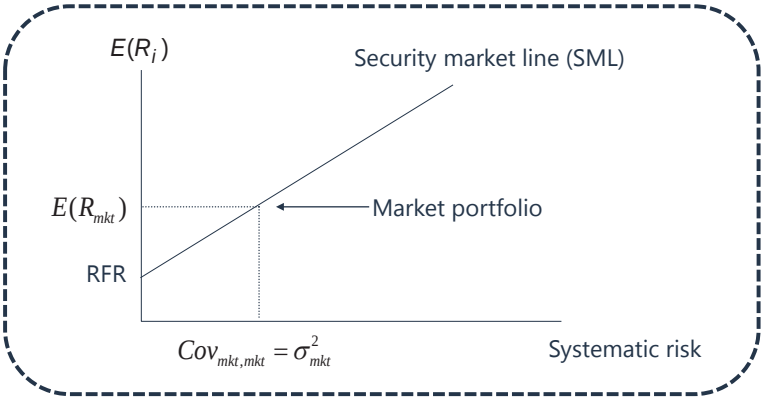
- **Unsystematic risk (or unique, diversifiable, firm-specific risk):**
  - The risk that disappears in the portfolio construction process
- **Systematic risk (or market risk):**
  - The risk that is left cannot be diversified away.
  - Total risk = systematic risk + unsystematic risk
- **Beta:** the sensitivity of an asset's return to the return on the market index in the market model.

$$\beta_i = \frac{Cov_{i,mkt}}{\sigma^2_{mkt}} = (\frac{\sigma_i}{\sigma_{mkt}}) \times \rho_{i,mkt}$$



Portfolio Risk and Return: Part II

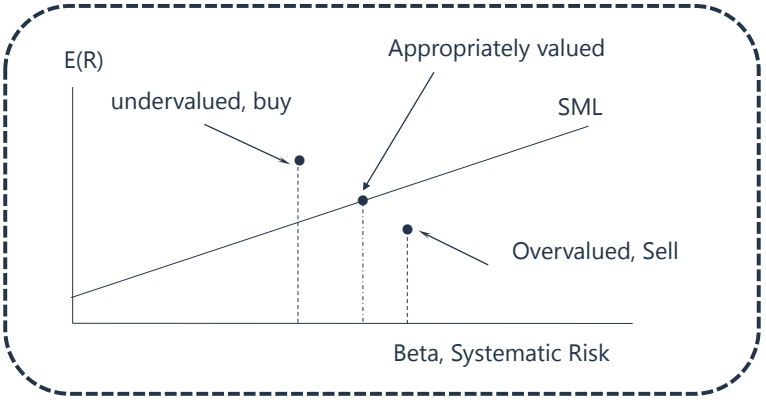
- **Capital Asset Pricing Model**



- **The Equation of SML:** $E(R_i) = R_f + \beta_i[E(R_M) - R_f]$

Portfolio Risk and Return: Part II

- **How to judge if a stock is properly valued**



Portfolio Risk and Return: Part II

- **Differences between the SML and the CML**

	SML	CML
Measure of risk	Uses systematic risk (non-diversifiable risk)	Uses standard deviation (total risk)
Application	Tool used to determine the appropriate expected (benchmark) returns for securities	Tool used to determine the appropriate asset allocation (percentages allocated to the risk-free asset and to the market portfolio) for the investor
Definition	Graph of the capital asset pricing model	Graph of the efficient frontier
Slope	Market risk premium	Market portfolio Sharpe ratio

Portfolio Risk and Return: Part II

- **Sharpe Ratio**

$$\text{Sharpe ratio}=\frac{R_P-R_f}{\sigma_P}$$

- **M-squared (M^2)**

$$M^2=(R_P-R_f)\frac{\sigma_M}{\sigma_P}-(R_M-R_f)$$

- **Treynor measure**

$$\text{Treynor measure}=\frac{R_P-R_f}{\beta_P}$$

- **Jensen's alpha**

$$\alpha_P=(R_P-R_f)-\beta_P(R_M-R_f)$$

Reading 40

Portfolio Management: An Overview

Portfolio Management: An Overview

- **Characteristics of different types of investors**

Investor	Risk Tolerance	Time Horizon	Liquidity Needs	Income Needs
Individuals	Varies by individual	Varies by individual	Varies by individual	Varies by individual
DB plan	High	Long	Quite low	High—mature funds Low—growing funds
Banks	Quite low	Short	High	Pay interest and operational expenses
Endowments and foundations	High	Very long	Quite low	Meet spending commitments
Insurance	Quite low	Long—life Short—P&C	High	Low
Mutual funds	Varies by fund	Varies by fund	High	Varies by fund

Portfolio Management: An Overview

- **Planning step:**
  - Analyse the investor's needs: investment objectives and constraints
  - Develop an IPS: describes the investor's investment objectives and constraints; state an objective benchmark; reviewed and updated regularly.
- **Execution step:**
  - Asset allocation; top-down analysis & bottom-up
- **Feedback step:**
  - monitor and rebalance the portfolio;
  - Measure portfolio performance.

Reading 41

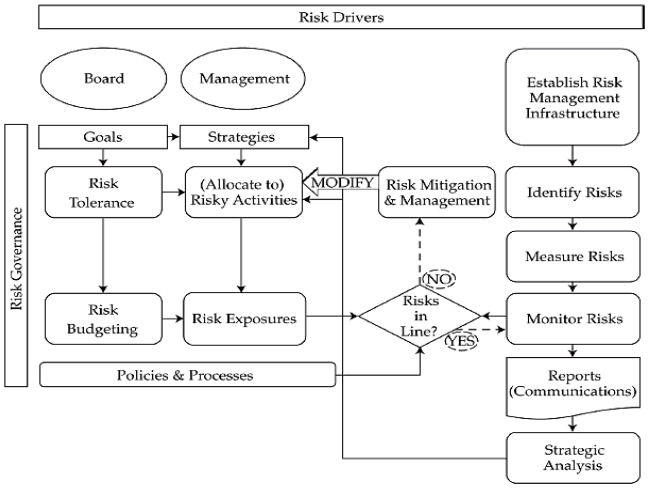
Risk Management: An Introduction

Risk Management: An Introduction

- **Risk**
  - Exposure to uncertainty
  - Many decision makers focus on return, which is not something that is easily controlled, as opposed to risk, or exposure to risk, which may actually be managed or controlled
- **Risk exposure**
  - The extent to which an entity's value may be affected through sensitivity to underlying risks.
- **Risk management**
  - Risk management is the process by which an organization or individual **defines** the level of risk to be taken, **measures** the level of risk being taken, and **adjusts** the latter toward the former; with the goal of **maximizing** the company's or portfolio's value or the individual's overall satisfaction, or utility.
  - It is comprises all the decisions and actions needed to best achieve organizational or personal objectives while **bearing a tolerable level of risk**.
  - **Not about minimizing risk.**

Risk Management: An Introduction

Exhibit 1. The Risk Management Framework in an Enterprise Context



Risk Management: An Introduction

- **Risk governance**
  - Risk governance is the foundation for risk management.
  - **Risk governance** refers to senior management's determination of the **risk tolerance** of the organization, the elements of its optimal **risk exposure strategy**, and the framework for oversight of the risk management function.
  - Employing a risk management committee, along with a chief risk officer (CRO), are hallmarks of a strong risk governance framework.
    - ✓ **Risk management committee** provides top decision makers with a forum for regularly considering risk management issues.

Risk Management: An Introduction

- **Risk tolerance**
  - *At the governance level*, the duty is generally not to select these activities—a job that usually falls to management—but to **establish the organization's risk appetite**.
    - ✓ Certain risks or levels of risks may be deemed acceptable, other risks deemed unacceptable, and in the middle are risks that may be pursued in a risk-limited fashion.
    - ✓ Said differently, risk tolerance identifies the extent to which the entity is willing to experience losses or opportunity costs and to fail in meeting its objectives
  - When analyzing risk tolerance, management should examine risks that may exist within the organization as well as those that may arise from outside. **("inside" view and "outside" view)**
  - The risk tolerance should be chosen and communicated **before** a crisis, and will serve as the high-level guidance for management in its strategic selection of risks.
  - If a company has the **ability to adapt quickly to adverse events** may allow for a higher risk tolerance.

Risk Management: An Introduction

- **Risk budgeting** is the process of allocating firm resources to assets (or investments) by considering their various risk characteristics and how they combine to meet the organization's risk tolerance.
  - The process of risk budgeting forces the firm to consider **risk tradeoffs**.
  - The **goal** is to allocate the overall amount of acceptable risk to the mix of assets or investments that have the greatest expected returns over time. (**The return per unit of risk is the highest**.)
- The risk budget may be **a single metric**, such as portfolio beta, value at risk(VaR), portfolio duration, or returns variance.
- A risk budget may be constructed based on **categories of investments**, such as domestic equities, domestic debt securities, international equities, and international debt securities.
- Another way to allocate a risk budget is to identify **specific risk factors**, such as interest rate risk, equity market risk, and foreign exchange rate risk.

Risk Management: An Introduction

- **Financial risks** refer to the risks that arise from events occurring in the financial markets. 3 main types:
  - **Market risk**
  - **Credit risk**
  - **Liquidity risk**: Liquidity risk could also be called transaction cost risk and is most associated with a widening bid-ask spread.

Risk Management: An Introduction

- **Non-financial** risks arise from actions within an entity or from external origins, such as the environment, the community, regulators, politicians, suppliers, and customers. Examples are:
  - Operational risk
  - Solvency risk
  - Regulatory risk
  - Governmental or political risk (including tax risk)
  - Legal risk
  - Model risk
  - Tail risk
  - Accounting risk
- **Individuals** face many of the same organizational risks outlined here but also face **health risk, mortality or longevity risk, and property and casualty risk.**

Risk Management: An Introduction

- **Risk drivers** are the fundamental global and domestic **macroeconomic and industry factors** that create risk.
- **Metrics**
  - Standard deviation or volatility;
  - Asset-specific measures, such as beta or duration;
  - Derivative measures, such as delta, gamma, vega, and rho;
  - Tail measures such as VaR, CVaR and expected loss given default.
    - ✓ **Value at risk (VaR)** is a measure of the size of the tail of the distribution of profits on a portfolio or for an entity, which
      - ◆Three elements: an amount stated in units of currency, a time period, and a probability
      - ◆e.g. A VaR of $100 at 1% for one day means it is expected to lose a minimum of $100 in one day 1% of the time.
    - ✓ **Conditional VaR (CVaR)** is the weighted average of all loss outcomes in the statistical distribution that exceed the VaR loss.

Risk Management: An Introduction

- **Modifying risk exposures**
  - Risk management does not seek to eliminate all risks. The goal is to retain the optimal mix of risks for the organization.
- **Methods of risk modification:**
  - **Risk prevention and avoidance**
    - ✓ Not engage in the activity with the uncertain outcome.
  - **Risk acceptance**: self-insurance and diversification
    - ✓ **Self-insurance** is obtained by setting aside sufficient capital to cover losses.
    - ✓ Another form of accepting risk, but doing so in the most efficient manner possible, is **diversification**.

Risk Management: An Introduction

- **Risk transfer** (insurance)
  - ✓ Risk transfer is the process of passing on a risk to another party, often, but not always, in the form of an **insurance policy**.
- **Risk shifting** (derivatives)
  - ✓ Whereas risk transfer refers to actions taken that pass the risk on to other parties, risk shifting refers to actions that change the distribution of risk outcomes. Risk shifting generally involves **derivatives** as the risk modification vehicle.

- The determinants of which method is best for modifying risk are the benefits weighed against the costs.

Reading 44

Basic of Portfolio Planning and Construction

Basic of Portfolio Planning and Construction

➢**The need for a policy statement**

- Understand and articulate realistic investor goals, needs and risk tolerance
- Ensure that goals are realistic
- Provide an objective measure of portfolio performance

➢**Major components of IPS**

- Description of client
- Statement of the purpose
- Statement of duties and responsibilities
- Procedures to update IPS and to respond to various possible situations
- Investment objectives
- Investment constraints
- Investment guidelines
- Evaluation of performance
- Appendices: information on asset allocation

Basic of Portfolio Planning and Construction

➢ **Investment objectives: risk and return**

- Risk objective

Situation		Risk tolerance
Willingness > Ability		Ability (Education)
Willingness < Ability	Return Objective = Willingness	Willingness (Reevaluation)
	Return Objective = Ability	Ability (Education)

- Return objectives
  - ✓ Return measurement: total return, inflation-adjusted return, after-tax return
  - ✓ Total return perspective: balance between capital gains and income
  - ✓ Stated return desire vs. Required return
  - ✓ Consistent with risk objective

Basic of Portfolio Planning and Construction

➢ **Investment constraints**

- **Liquidity**—for cash spending needs (anticipated or unexpected)
- **Time horizon**—the time between making an investment and needing the funds
- **Tax concerns**—the tax treatments of various accounts, and the investor's marginal tax bracket
- **Legal and regulatory factors**—restrictions on investments in retirement, personal, and trust accounts
- **Unique needs and preferences**—constraints because of investor preferences or other factors not already considered

Basic of Portfolio Planning and Construction

- **Strategic asset allocation:**
  - the set of exposures to IPS-permissible asset classes that is expected to achieve the client's **long-term objectives** given the client's investment constrains.
  - Correlations within the class is **higher** than correlations between asset classes.
- **Tactical asset allocation**: is the decision to **deliberately deviate** from the policy exposures to systematic risk factors with the intent to add value based on forecasts of the **near-term returns** of those asset classes.
  - The manager's ability to identify shot-term opportunities in specific asset classes;
  - The existence of such short-term opportunities.
- **Security selection:** is an attempt to generate higher returns than the asset class benchmark by **selecting securities with a higher expected return.**
  - The manager's skill
  - The opportunities with in a particular asset class.

It's not the end but just beginning.

If you have people you love, allow them to be free beings. Give and don't expect. Advise, but don't order. Ask, but never demand. It might sound simple, but it is a lesson that may take a lifetime to truly practice. It is the secret to true Love. To truly practice it, you must sincerely feel no expectations from those who you love, and yet an unconditional caring.

如果你有爱的人，允许他们自由随意的存在。给予而不指望；建议而不命令；请求而不要求；可能听起来简单，但这需要一辈子去实践。这就是真爱的秘诀。真正去实践它，你必须对那些你爱的人没有期望，并给予无条件的关爱。

Ethics

CFA一级培训项目

讲师：单晨玮

Topic Weightings in CFA Level I

Session NO.	Content	Weightings
Study Session 1	**Ethics & Professional Standards**	**15**
Study Session 2-3	Quantitative Analysis	12
Study Session 4-5	Economics	10
Study Session 6-9	Financial Reporting and Analysis	20
Study Session 10-11	Corporate Finance	7
Study Session 12	Portfolio Management and Wealth Planning	7
Study Session 13-14	Equity Investment	10
Study Session 15-16	Fixed Income	10
Study Session 17	Derivatives	5
Study Session 18	Alternative Investments	4

Framework

Ethics

- Ethics and Trust in the Investment Profession
- Code of Ethics
- Guidance for Standards I-VII
- Global Investment Performance Standards (GIPS)

The Code of Ethics

- **DRC（纪律审查委员会）**
  - 对 PCP负责
  - 对code and standards的实行负责
- **Hearing panel的组成成员**
  - DRC member
  - CFA institute member volunteers

Ethics & Professional Standards

➢ **Members of CFA Institute ("Members and Candidates") must:**

- Act with **integrity**, competence, diligence, respect, and in an ethical manner with the public, clients, prospective clients, employers, employees, colleagues in the investment profession, and other participants in the global capital markets.
- Place the **integrity** of the investment profession and the interests of clients above their own personal interests.
- Use reasonable **care** and exercise **independent** professional judgment when conducting investment analysis, making investment recommendations, taking investment actions, and engaging in other professional activities.
- Practice and encourage others to practice in a professional and ethical manner that will reflect **credit** on themselves and the profession.
- Promote the **integrity and viability** of the global capital markets for the ultimate benefit of society.
- Maintain and improve their professional **competence** and strive to maintain and improve the competence of other investment professionals.

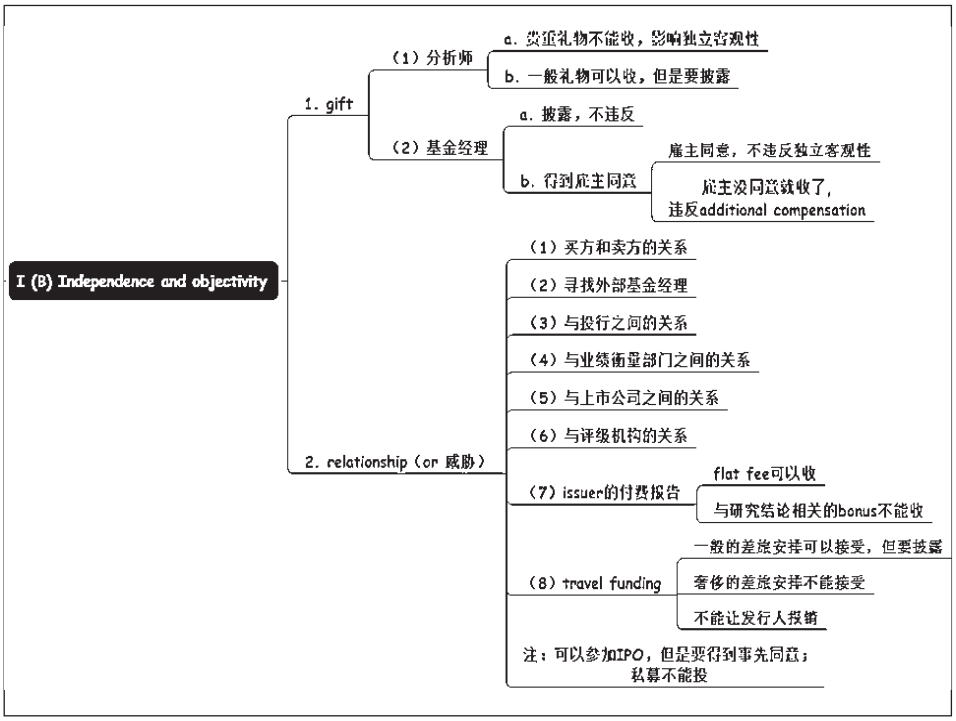
Guidance for Standards I-VII

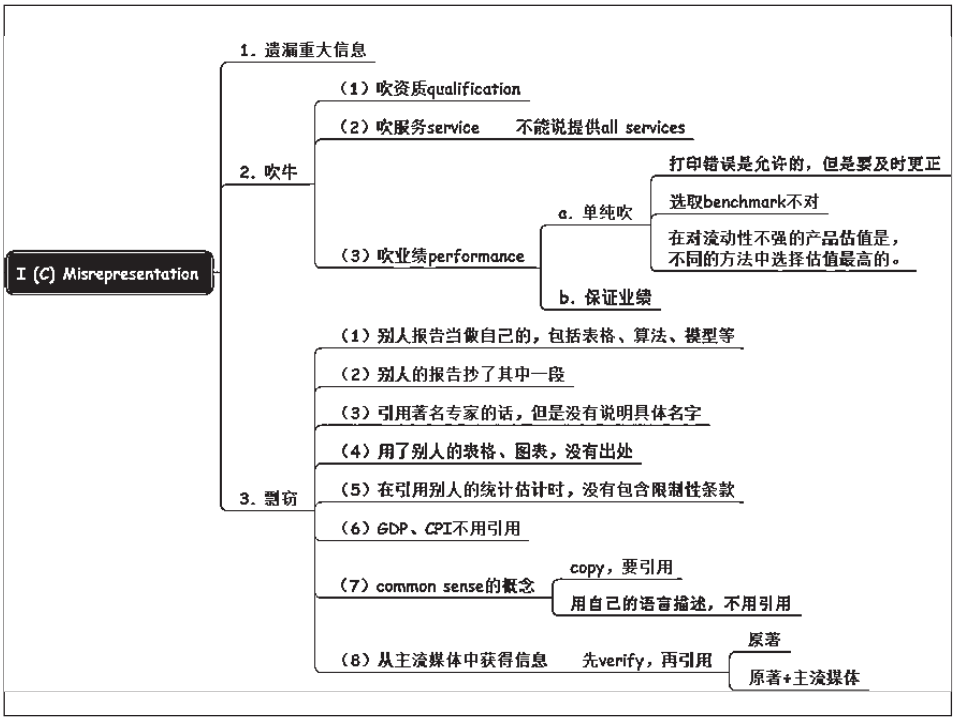
Standards		
	Professionalism	Knowledge of the law; Independence and objectivity; Misrepresentation; Misconduct
	Integrity of capital markets	Material nonpublic information; Market manipulation
	Duty To Clients	Loyalty, prudence and care; Fair dealing; Suitability; Performance presentation Preservation of confidentiality
	Duty To employers	Loyalty; Additional compensation arrangements; Responsibility of supervisors
	Investment	Diligence and reasonable basis; Communication with clients; Record retention
	Conflicts of interest	Disclosure of conflicts; Priority of transaction; Referral fees
	Responsibility as members	Conduct as members and candidates; Reference to CFA institute, designation

Standard I. Professionalism

➢ **I (A) Knowledge of the law**

1. 知法，知道和工作相关的法律
2. 守法，守更为严格的法律
3. 发现违法，要脱离出来
   - 发现违法，先报告给supervisor或合规部门，不受理，脱离，及时辞职也在所不惜
   - 不作为等同于继续违法
   - 协会没有要求一定要把违法事件报告给CFA协会





Standard I. Professionalism

- I (D) Misconduct

1.欺诈

2. 不正当行为/违法行为
(1) 与本职工作相关、与专业相关，属于
(2) 私生活、与本职工作不相关，不属于

Standard II. Integrity of Capital Markets

II (A) Material Nonpublic Information

- 1. 原则：内幕信息自己不能用也不能给他人用
- 2. 内幕信息判断
  - （1）来源可靠
  - （2）material--会对股价产生重大影响OR 会对投资者的判断产生重大影响
    - a. 与公司有关的，利润、兼并收购等
    - b. 宏观经济有关的
    - c. 大额订单
    - d. 知名分析师的报告
      - 注：知名分析师的报告可以只给自己的客户
  - （3）nonpublic　selective disclosure选择性披露可能会违反内幕信息
- 3. Mosaic theory--可以用：
  - material public information
  - nonmaterial nonpublic information

Standard II. Integrity of Capital Markets

II (B) Market Manipulation

- 1. information-based，散播谣言，误导客户
- 2. transaction-based，虚增交易量，扭曲价格　（特例）不属于
  - a. 执行特定的交易策略
  - b. 避税目的
  - c. 为了增强市场的流动性

Standard III. Duty to Clients

III (A) Loyalty, prudence and care

- 1. 识别客户
  - a. individual
  - b. beneficiary
    - pension fund--公司员工是受益人（客户）
    - trust--以beneficiary的利益为主，不是委托人
  - c. Mandate
    - 基金经理不会为了某一个客户而改变了整个基金投资风格
    - 不会关注到底谁买了这只基金
    - 只关注此基金的投资指令
  - d.investing public
- 2. 是否适合客户，要站在portfolio的角度来看
- 3. soft dollar
  - 寻找外部broker：best execution, lower price, suitable
  - 对客户有利的soft dollar可以收
- 4. proxy voting policies　代表客户利益

Standard III. Duty to Clients

III (B) Fair dealing

1. fair不等于equal，可以提供差别性服务，但要披露
2. 按照order size分配，要披露给所有客户
3. 若建议改变，第一时间通知所有客户，如果客户坚持原有意见，尊重客户意见，保留书面证明
4. 家庭成员的账户视同普通账户，夫妻双方的账户视为自己的账户

Standard III. Duty to Clients

III (C) Suitability

1.流程
- 第一步：了解客户
- 第二步：写IPS
- 第三步：按照客户的IPS投资，投适合客户IPS的产品

2.细节
- （1）投适合客户的，要站在portfolio的角度
- （2）基金经理不对每一个具体的客户负责，只对整个基金负责，遵循投资指令
- （3）客户主动找你做投资，若不适合他
  - 拒绝
  - 写书面确认
- （4）IPS至少每年更新1次，有重大改变要更新，投资一定要遵循IPS

Standard III. Duty to Clients

III (D) Performance presentation

1. 吹业绩
   - （1）错误陈述业绩
   - （2）保证收益率
2. 披露业绩，要包含所有的portfolio，一定要包括terminated portfolio
3. 计算业绩的时候要计算加权平均收益，不能选最好的披露
4. 允许简单披露，但要告诉详细信息获得的渠道
5. GIPS
   - （1）自愿遵守
   - （2）一旦宣称遵守，就要全部遵守
6. 要充分披露
   - （1）模拟的业绩可以使用，要披露
   - （2）基金经理在过去公司的业绩可以披露，但要披露在哪个公司，角色是什么
   - （3）要披露是gross of fee，还是net of fee，是before tax还是after tax

Standard III. Duty to Clients

III (E) Preservation of confidentiality

1. 原则：要为客户保密
2. 两个例外
   - （1）如果客户有违法行为，可以不保密
     - 客户违法，CFA协会调查，配合CFA协会调查，不违反
     - 例外的例外：当地法律法律要求即使客户有违法行为也一定要保密，不得披露
   - （2）可以向服务于同一个客户的同事披露

A. Loyalty
1. 离职前
   - （1）业余时间可做业余爱好，只要不影响工作
   - （2）上班时不能做与本职工作无关的
   - （3）不能从事与雇主相竞争的业务
   - （4）离职前可用业余时间找工作，但不能招揽原雇主客户
   - （5）self-dealing
     - 业务没开--业余时间可注册
     - 业务已开--业余时间不能做
2. 离职后
   - （1）原雇主任何东西都不能带走
   - （2）客户名单
   - （3）只有知识&技能可以带走
   - （4）即使原雇主不用的资料，也不能带走
3. use of social media
   - 遵守法律章程和规范
   - Best practice：保持一个独立账户
4. whistleblowing（在职揭发）
   - 基本原则：只要是为了保护资本市场、保护客户，不是为了个人利益，可以揭发雇主
5. independent contractor
   - 兼职也应对雇主忠诚

Standard IV. Duty to Employer

IV (B) Additional compensation arrangement

1. Additional compensation：除雇主支付的、与本职工作相关的报酬
2. 与独立客观性对比
   - 只是披露，没有得到同意--additional compensation arrangement
   - 没披露--additional compensation arrangement &独立客观性

Standard IV. Duty to Employer

➢ IV (C) Responsibility of supervisor

1. 积极预防：完善公司规章制度，若不完善可拒绝
2. 积极发现，积极检查
3. 发现下属有违法行为，及时制止，要有一定的处罚措施，确保以后不会再犯

注
- （1）可将supervisor的责任委托给别人，但自己不能免责
- （2）如何调动下属积极性
  - 要有相应的培训
  - 要有一定的激励措施，不单单是和业绩挂钩的激励

Standard V. Investment

➢ V (A) Diligence and reasonable basis

1. 使用第三方研究报告时，一定要审慎审查
2. 团体研究报告
   - （1）不能少数服从多少，不看别人的报告就直接签字
   - （2）若各自意见都合情合理，有不同意见也可不签字
   - （3）不同意见要保留
3. 不能总是推荐最热门股票
   - （1）因为太忙，没时间分析，建议热门股票--违反
   - （2）做了研究后，建议热门股票--不违反
4. 使用定量分析模型时
   - （1）模型使用者：
     - 不要求成为建模专家，但要求理解模型的假设和限制
     - 要检验模型结果，且检验时要考虑所有情况
   - （2）建模的人：责任重大，要更审慎、勤勉

Standard V. Investment

➢ V (B) Communication with clients

1. 充分披露，不能遗漏任何信息
2. 有任何重大改变，要立即通知客户
3. 投资的风险和限制要告诉客户
4. 区分fact和opinion
5. 可以简短形式告知客户，但要告知客户详细信息可从何处获得

Standard V. Investment

- V (C) Record retention

1.任何建议都要保存记录

2. 保存记录：如果当地法律有要求，就按照当地法律要求；没有要求，保存7年。

Standard VI. Conflicts of Interest

- VI (A) Disclosure of conflicts

1. 利益冲突披露内容
   - （1）个人持股情况
   - （2）与投行的关系
   - （3）若公司是做市商，要披露
   - （4）管理层：若公司有人是所研究公司的管理层，要披露
   - （5）个人关系，关联账户
2. 有利益冲突如何做
   - （1）只要披露即可，不建议，别人还会怀疑
   - （2）有利益冲突的公司把他放入restricted list，推荐
   - （3）直接拒绝

Standard VI. Conflicts of Interest

- VI (B) Priority of transaction

核心--交易顺序：客户 > 雇主 > 自己

- VI (C) Referral fees

1.个人与个人：介绍费可以收，但要披露给相关主体，e.g.,客户&雇主

2. 部门与部门：介绍费可以收，但要披露给相关主体，e.g.,客户

Standard VII. Responsibility as members

- **VII (A) Conduct as members and candidates**
  - 考试作弊
  - 泄露考试信息
  - 损害CFA协会利益

Standard VII. Responsibility as members

- **VII (B) Reference to institute, designation, program**

1. How to use CFA
   - （1）CFA是形容词，不是名词
   - （2）Always capitalized
   - （3）不能说CFA level I
   - （4）不能说C.F.A
   - （5）不能改变或者创造新词，e.g. China CFA
   - （6）不能用在公司的名字后面
   - （7）不能显著强调
2. 不能说预期自己何时获得charterholder称号
3. candidate通过了三级考试，但是没有证书，不能用CFA称号
4. 拿到证书后，每年交会费且述职报告才可以继续使用CFA称号
5. 可以对外宣称一次性通过CFA三级，但不能说保证收益率

GIPS

1. Who can claim compliance
   - （1） 遵守GIPS是自愿的
   - （2）只有投资管理公司才能宣称遵守GIPS
   - （3）宣称遵守GIPS一定是全公司全部都遵守
2. Composite
   - （1）定义
   - （2）一个composite一定要包含所有的相同风格的portfolio
3. Verification
   - 验证是自愿的
4. Firm assets
   - （1）Discretionary portfolio
     - fee-paying portfolio -- must be included in composite
     - non-fee-paying portfolio --can be included in composite
   - （2）Non-discretionary portfolio　must not be included in composite
   - 注：公司资产以fair value计量

GIPS

5. Key characteristics

- （1）至少要有5年的业绩遵守GIPS
- （2）如果没有过去5年的业绩，只要从成立开始遵守GIPS即可
- （3）GIPS要求，记录不需要太多年份，只要公司持续有10年的业绩数据即可
- （4）若GIPS与当地的法律法规有冲突的话，以当地法律法规为主，并且披露出去

6. Nine major sections of GIPS

- (0) fundamentals of compliance
- (1) input data
- (2) calculation methodology
- (3) composite construction
- (4) disclosure
- (5) presentation and reporting
- (6) real estate
- (7) private equity
- (8) wrap fee/ separately managed account portfolios

It's not the end but just beginning.

Always believe that good things are possible, and remember that mistakes can be lessons that lead to discoveries. Take your fear and transform it into trust; learn to rise above anxiety and doubt. Turn your "worry hours" into "productive hours". Take the energy that you have wasted and direct it toward every worthwhile effort that you can be involved in. You will see beautiful things happen when you allow yourself to experience the joys of life. You will find happiness when you adopt positive thinking into your daily routine and make it an important part of your world.

请坚信，美好的降临并非不可能，失误也许是成功的前奏。将惶恐化作信任，学会超越担忧和疑虑。让"诚惶诚恐"的时光变得"富有成效"。不要挥霍浪费精力，将它投到有意义的事情中去。当你下意识品尝生命的欢愉时，美好就会出现。当你积极地看待生活，并以此作为你的日常准则时，你就会找到快乐的真谛。