



Exactly!



# ① Financial Management

## 1. Financial Management

### ① Investment (Outward)

- a. the most important
- b. namely "acquisition"
- c. flip side: disinvestment

### ② Financing (Inward)

- a. debt financing & stock financing

b. Dividend-payout ratio = 
$$\frac{\text{Dividend per share}}{\text{Earnings per share}}$$

### ③ Asset management (Extant)

- a. Responsibility
  - Current assets — Financial managers  $\longrightarrow$  Greater emphasis
  - Fixed assets — Operating managers who employ these assets

## 2. The Goal of the Firm

### ① Goal: maximize owner's wealth (value)

a. Shareholder wealth is represented by the stock price, which, in turn, is a reflection of three decisions.  
→ if financial management dissatisfies the owners, stock price ↓

### ② Profit maximization: Maximizing earning after taxes (EAT)

a. Earnings per share (EPS) = 
$$\frac{\text{Earnings after taxes (EAT)}}{\# \text{ of common shares outstanding}}$$

### ③ Wealth maximization ≠ Profit maximization

a. Reliability: Wealth maximization > EPS maximization > EAT maximization (Profit maximization)

Drawbacks

$$\text{Wealth} = \text{EPS recent expectation} + \text{EPS future expectation}$$

△ Risk

△ Dividend (If the objective is to maximize EPS, then the company will never pay a dividend)

merely issue stock and use the proceed to invest in treasury bills

### ④ Agency Problem

- a. The agents will make optimal decisions only if

△ Incentives are given; △ Monitoring

- b. Solutions

Incentives: stock option\*, bonus, perquisites

Monitoring: review perquisites, audit financial statement, limit management decisions



股票期权一般是指经理股票期权(Employee Stock Option, ESO), 即企业在与经理人签订合同时, 授予经理人未来以签订合同时约定的价格购买一定数量公司普通股的权利。经理人在一定时期后出售这些股票, 获得股票市价和行使价之间的差价; 但在合同期内, 期权不可转让, 也不能得到股息。在这种情况下, 经理人的个人利益就同公司股价的表现紧密地联系起来。股票期权制度是上市公司的一项激励机制, 通过激励公司经理人实现长期经营目标的一套制度。

## ⑤ Corporate Social Responsibility (CSR)

a. Definition: The business outlook that acknowledges a firm's responsibilities to its stakeholders and natural environment

b. Focus: Sustainability: Meeting the needs of the present without compromising the needs of future

## 3. Corporate Governance

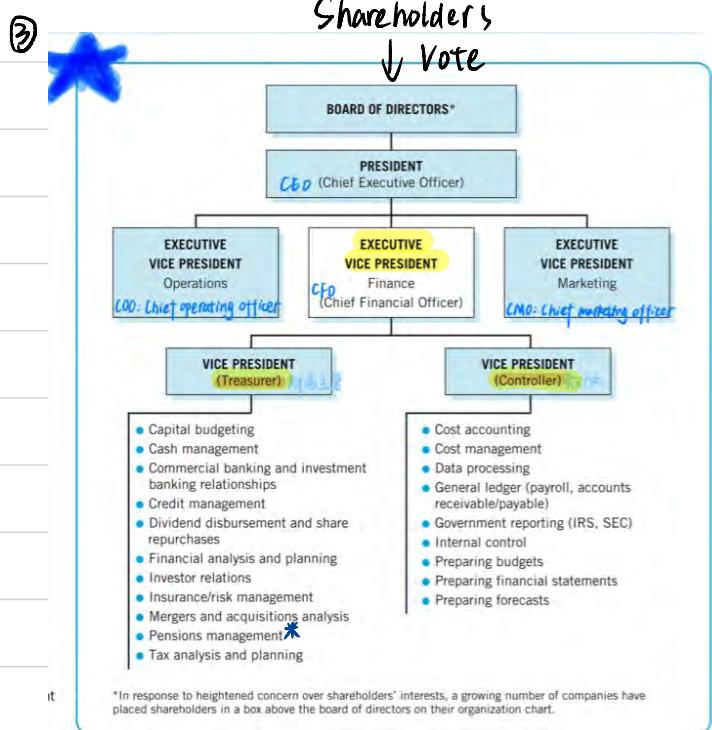
① Definition: It encompasses the relationships among shareholders, board of directors and senior management

### ② Board of directors

a. function: hiring, firing, overseeing...

b. it is the most effective instrument of good governance

c. { in the U.S. chairman of the board = CEO  
in the U.K. chairman of the board ≠ CEO



\* Glossary: ① the flip side: 另一方面

② makeup: 组成部分

③ proceed: 进入

④ undertake: 承担

⑤ be subject to: 受...支配、有...的倾向

⑥ to the extent that: 从某种程度上说

⑦ focal: 惠点的

\* 企业资金用于员工退休后

⑧ delegate: 代表

⑨ outlook: 席望

⑩ stakeholder: 利益相关者

⑪ formulate: 制定

⑫ consistent: 一致的

⑬ encompass: 包括

⑭ oversee (v) 监视  
oversight (n)

⑮ Treasurer: 财务主管

⑯ Controller: 会计长

⑰ forecast: 预测

⑱ disbursement: 支出

⑲ sophisticated: 精细的

⑳ underpinning: 基础

㉑ pertinent: 相关的

㉒ notion: 概念

## ② Environments

### 1. The business environment

① Four basic forms of **business organization**: sole proprietorships, partnerships, limited liability companies (LLC), corporations.

② partnership ↗ general partnership

limited partnership: at least one general partner in the partnership

③ comparison

	Limited Liability	Management	Transfer Ownership	Raising Capitals	Tax
Sole Proprietorship	No	Full control	N/A <i>(Not applicable)</i>	Difficult	Individual income tax
Partnership <i>(General)</i>	No	Shared by owners	Difficult	Difficult	Individual income tax
LLP <i>(Limited partnership)</i>	Mixed	Shared by owners	Difficult	Relatively easy	Individual income tax
LLC	Yes	Shared by owners	Difficult	Relatively easy	Individual income tax
Corporation <i>Private Public</i>	Yes	Separation of management and ownership	Easy	Very easy	Corporate Tax

Life

Short (= owner's life)

Short (= the shortest owner's life)

Relatively short

Unlimited life

Business income is accounted for  
an individual income

Business income = Revenue

Individual income = Dividend

### 2. The tax environment

① Tax rate / marginal tax rate / average tax rate

↗ marginal tax rate: tax rate in the corresponding interval

$$\text{average tax rate} = \frac{\text{tax}}{\text{taxable income}}$$

② Depreciation

a. Straight-line depreciation

b. Declining-balance depreciation → double-declining-balance (DDB) method

⚠ prescribed life ≠ useful life

⚠ m percent declining balance method:  $m\% \cdot (1 - \frac{1}{n}) \text{ NBV}$

⚠ Net book value = the balance at the end of the year

c. Modified Accelerated Cost Recovery System (MACRS)

⚠ DDB method → straight line method

$$n \Rightarrow 0.5 + n + 0.5$$

⚠ When  $\text{Dep.}(DDB) \leq \text{Dep.}(SL)$ , switch the method

d. Depreciation percentages of original cost for each property class

⚠ It's computed with MACRS

△ We just need to compute the periodic depreciation by directly letting original book value time relative rate

### ③ Alternative minimum tax (AMT)

a. Large firms'  $\begin{cases} \text{AMT} \leq \text{Normally computed tax} \Rightarrow \text{Normally computed tax} \\ \text{AMT} > \text{Normally computed tax} \Rightarrow \text{AMT} \end{cases}$  → Choose the larger one

b.  $\text{AMT} = 20\% \times \text{alternative minimum taxable income (AMTI)}$

### ④ Quarterly tax payments

a. pay 25% of their estimated taxes on or before 15<sup>th</sup> of April, June, September and December

### ⑤ Interest expense versus dividends paid

a. Interest expense is tax deductible  $\Rightarrow \text{Cost} = \text{IE} \times (1 - \text{tax rate})$  (Debt)

b. Dividends payment is not tax deductible  $\Rightarrow \text{Cost} = \text{DP}$  (Stock) TAs for cash dividend receipt. 70% is tax exempt

c. Capital gains are not tax deductible. Capital losses are tax deductible.

△ Taxable income = (Revenue - COGS - Dep. - Interest expense) (EBIT)

△ Income tax = (Revenue - COGS - Dep. - Interest expense)  $\times$  Tax rate

△ After-tax income = Taxable income - Income tax (EAT)

### ⑥ Carryback and Carryforward

a. Carryback 2 years  $\Rightarrow$  Carryforward 20 years

( $a_1 \rightarrow a_2$ ) ( $b_1 \rightarrow b_2 \rightarrow \dots \rightarrow b_{20}$ )

退款

b. Tax refund & Tax exempt  $\Rightarrow$  avoid sharply fluctuating income

(Carryback) (Carryforward)

## 3. The financial environment

### ① Key institutions: Secondary market, financial intermediaries and financial brokers

#### a. The secondary market

PE, VC, 天使投资

### △ primary market versus secondary market

△ Secondary market: A market for existing securities.

#### b. Financial Intermediaries

△ Purchase direct (primary) securities and issue indirect (secondary) securities to the public.

For example, purchase mortgage  $\Rightarrow$  issue savings account / a certificate of deposit

(定期)

(定期)

△ market efficiency

Cost

Convenience

△ i) Deposit institution (e.g. Commercial banks)

demand (checking) deposit

time deposit

ii) Insurance company:

Property and casualty company

Life insurance company

iii) Fund

c. Financial brokers

△ i) Investment banker: buy the issue at wholesale and sell it at retail

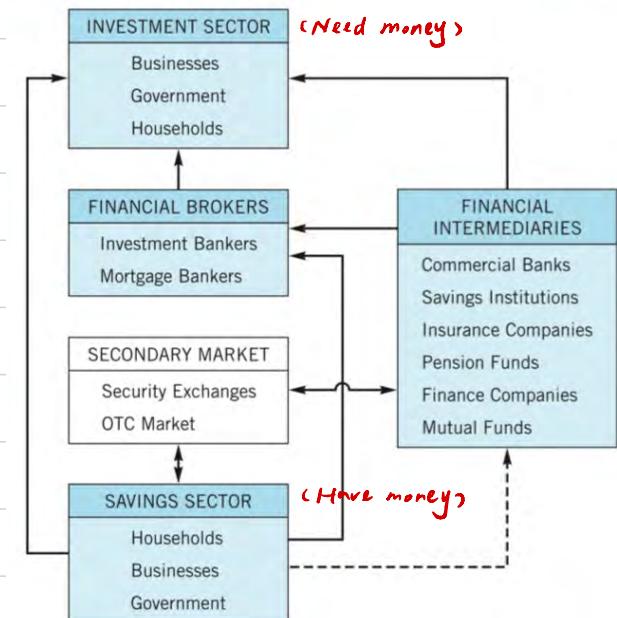
i) Mortgage banker: match the buyers and sellers for mortgage

△ The difference between financial intermediaries and financial brokers:

Financial intermediary: Direct lending function (bear the losses)

Financial broker: Matchmaker

d. Relationship



② Nature: Financial markets are mechanisms

③ Two classes: the money market and the capital market.

a. Money market: The market for short-term securities

货币市场

b. Capital market: The market for long-term securities

资本市场

④ Function: allocate savings efficiently to ultimate users

## ⑤ Some factors that influence the price of the securities

### a. Default risk

△ Risk  $\rightarrow$  risk premium

△ Risk (Stock) > Risk (Bond); Risk (Common stock) > Risk (Preferred stock)

### b. Marketability

△ marketability = liquidity

△ it relates to the ability to convert it into cash

### c. Maturity

### d. Taxability

△ it shows whether the securities are tax deductible or not

△ the most important tax — income tax

### e. Option Features

### f. Inflation

* Glossary:	① estate: 房地产	⑦ evidence: 证明	⑬ quoted price: 标价
	② consent: 满意, 同意	⑮ prosper: 萌芽	㉓ substantial: 大量的
	③ terminate: 终止	⑯ entail: 项必需	㉔ annum: 年
	④ surtax: 附加税	㉐ mechanism: 机制	㉕ progressive: 递增的 regressive: 递减的
	⑤ favorable: 有利的	㉑ channel: 程度	
	⑥ stimulus: 刺激	㉒ full line: 实线 broken line: 虚线	㉖ tax: 征税
	⑦ exempt: 免除	㉓ claim: 权利	㉗ magnitude: 量级
	⑧ fluctuate: 波动	㉔ casualty: 意外事故	㉘ dent: 减少
	⑨ proceed: 收入	㉕ mortality: 死亡数	㉙ net worth: 净资产
	⑩ tax bracket: 税收等级	㉖ phase: 时期	㉚ attributable: 可归咎于
	⑪ trigger: 触发	㉗ enterprise: 企业	㉛ owe: 欠
	⑫ account for: 解释	㉘ facilitate: 促进	㉜ moderate: 适量的
	⑬ municipal: 市政的	㉙ outbid: 出价高于	
	⑭ varying: 不同的	㉚ speculative: 投机的	
	⑮ idle: 闲置的	㉛ concession: 让步	
	⑯ durable: 长久的		

# ③ Time Value of Money

## 1. Basic Concepts in TVM

### ① Simple interest & compound interest

$$\Delta \begin{cases} \text{Simple interest: } FV = P(1+ni) \\ \text{Compound interest: } FV = P(1+i)^n \end{cases}$$

Δ Difference: The part of principal that has an interest

### ② FV & PV

$$\begin{cases} FV: \text{Terminal value} \leftrightarrow \\ PV: \text{Discounted value} \leftrightarrow, \text{Current value} \end{cases}$$

③ Capitalization rate = interest rate ( $FV \rightarrow PV$ ) = discount rate

④  $FVIF_{i,n}$  &  $PVIF_{i,n}$  (X value interest factor)

$$\begin{cases} FVIF_{i,n} = (1+i)^n \\ PVIF_{i,n} = (1+i)^{-n} \end{cases}$$

⑤  $FVAn$  &  $PVAn$  (There is no  $i$  denoted)

$$\begin{cases} FVAn = R \cdot FVIFA_{i,n} = R(FVIF_{i,1} + FVIF_{i,2} + \dots + FVIF_{i,n}) \\ PVAn = R \cdot PVIFA_{i,n} = R(PVIF_{i,1} + PVIF_{i,2} + \dots + PVIF_{i,n}) \end{cases}$$

⑥  $FVIFA_{i,n}$  &  $PVIFA_{i,n}$

$$\begin{cases} FVIFA_{i,n} = (FVIF_{i,1} + FVIF_{i,2} + \dots + FVIF_{i,n}) \\ PVIFA_{i,n} = (PVIF_{i,1} + PVIF_{i,2} + \dots + PVIF_{i,n}) \end{cases}$$

⑦  $FVAD_n$  &  $PVAD_n$

$$\begin{cases} FVAD_n = FVAn(1+i) \\ PVAD_n = PVAn(1+i) \end{cases} \quad \text{(decrease less)}$$

⑧ Receipt ( $R$ ) = Payment ( $PMT$ )

$$\begin{cases} \text{Annual percentage rate (APR)} = \text{Nominal (stated) rate} \\ \text{Effective annual rate (EAR)} \end{cases} \quad \leftarrow \text{that is: the rates to see are all APRs} \quad \leftarrow 1 + EAR = \left(1 + \frac{APR}{m}\right)^m$$

## 2. Models

### ① Fractional period

② (Original) Annuity & Annuity Due

$$\begin{cases} \text{Perpetuity: } PV_{AD} = \frac{R}{i} \\ \text{if } \frac{1+g}{1+i}, \text{ we need to compute X of } \frac{i}{1+X} \end{cases} \quad \rightarrow \text{be aware of the denominator and numerator}$$

④ Rule of 72: Double the money:  $ni = 72$  (approximation) (Premise: in compound interest)

## ⑤ Mixed flows

## ⑥ Continuous compounding

$$\Delta FV = \lim_{m \rightarrow \infty} PV e^{(1/m)^{mn}} = PV e^{in}$$

△ It is the maximum of possible FV (You will get the minimum of PV)

## 3. Amortizing schedule

END OF YEAR	(1) INSTALLMENT PAYMENT	(2) ANNUAL INTEREST $(4)_{t-1} \times 0.12$	(3) PRINCIPAL PAYMENT $(1) - (2)$	(4) Net Principal $(4)_{t-1} - (3)$
				PRINCIPAL AMOUNT OWING AT YEAR END $(4)_{t-1} - (3)$
0	—	—	—	\$22,000
1	\$ 5,351	\$ 2,640	\$ 2,711	19,289
2	5,351	2,315	3,036	16,253
3	5,351	1,951	3,400	12,853
4	5,351	1,542	3,809	9,044
5	5,351	1,085	4,266	4,778
6	5,351	573	4,778	0
	\$32,106	\$10,106	\$22,000	

$$\text{The primary Eq: } \frac{PMT}{(1+i)} + \cdots + \frac{PMT}{(1+i)^n} = \text{Principal}$$

(PMT - n ≠ Principal)

\* Glossary: ① fundamentals = 基础原理

② bypass = 绕过

③ reciprocal = 相互的

④ span = 跨越、跨度

⑤ fraction = 分数、部分

fractional = 分数的、部分的

⑥ identical = 相同的

⑦ setting = 环境

⑧ In contrast to = 相比于

⑨ blueprint = 蓝图

⑩ congression = 会议

⑪ distinguishing = 有区别的  
distinguishable

⑫ prevalent = 流行的

⑬ underlie = 成为…的基础

⑭ advent = 出现

⑮ lump = 总共的

# ④ Valuation of Long-Term Securities

## 1. Concepts

① **Liquidation value**: The value of assets that are separated (**dead company**)

**Going-Concern value**: The value of assets from a continuing operating business (**alive company**)

② **Book value**: a. Accounting value of an asset; b.  $(Assets - Liability - preferred stock)$  for a firm carrying value  
Market value = market price  
 $\rightarrow$  regardless of Time

Intrinsic value: a. the price a security "ought to have" based on all factors, namely, economic value b. it is present value  
then valuation

## 2. Bond valuation

① Coupon rate = stated rate

② Perpetual Bonds

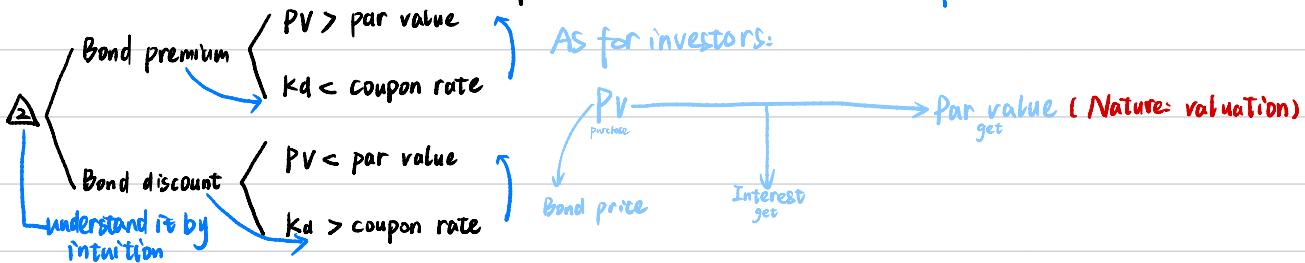
a. it is the simplest form (**never matures**)

b.  $K_d$ : the required rate of return  $\text{capital gain rate} = \text{capitalization rate} = K$   
 $\text{demanded}$

③ Bonds with a Finite Maturity

a. Nonzero Coupon Bonds

△ MV: maturity value = par value = face value = book value ( $=1000$  for American bond)



b. Zero-Coupon Bonds

c. Semianual Compounding of Interest

3. Preferred stock valuation

① Properties of preferred stock

a. a fixed dividend at regular intervals (**usually, not always**)

b. preference in dividends, and claim

c. no voting right

d. no maturity date

(similar to a perpetual bond, so the calculations are the same)

② Parameters  
 $D_p$ : cash dividend  
 $k_p$ : appropriate discount rate

$R$  Bond = Interest  
Stock = Dividend

#### 4. Common stock valuation

① Parameters  
 $D_t$ : cash dividend (not fixed)  
 $k_e$ : required return rate (expected)

#### ② models

##### a. Constant growth

$$\Delta V = \frac{D_0(1+g)}{(1+k_e)^1} + \frac{D_0(1+g)^2}{(1+k_e)^2} + \dots + \frac{D_0(1+g)^n}{(1+k_e)^n}$$

$$\Delta k_e > g \Rightarrow n \rightarrow \infty \Rightarrow V = \frac{D_1}{k_e - g} \quad (\text{B-S})$$

Be careful for the tense expression in the questions to determine the  $D_1$

##### △ Conversion to an Earnings Multiplier Approach ( $D_1 \Rightarrow E_1 \cdot b$ )

i) The company retains a constant proportion of its earnings each year, call it  $b$

$$\Rightarrow V = \frac{D_1}{E_1} \Rightarrow D_1 = (1-b)E_1 \Rightarrow V = \frac{(1-b)E_1}{k_e - g}$$

$$\text{i) Earnings multiplier} = \frac{V}{E_1} = \frac{1-b}{k_e - g} \quad (V = E_1 \cdot EM)$$

b. No growth

c. Growth phases

△ mixed flow: high growth rate  $\Rightarrow$  normal growth rate

constant growth ( $n \rightarrow \infty$ )

△ P/E Ratio:  $P = EPS \cdot (P/E)$

#### 5. Required rate of return

① YTM (Yield to Maturity) on Bonds

a.  $YTM = \text{market required rate} = RRR$

Difference: For bonds

For any security

b. Factors that influence the behavior of bond prices

security prices  $\downarrow$   
bond prices  $\uparrow$

Bond premium

Bond discount

Par Bond

② Relationship between coupon rate & market rate

## ② Interest rate

a. Interest rate ( $\uparrow \downarrow$ )  $\Rightarrow$  Market rate ( $\uparrow \downarrow$ )  $\Rightarrow$  Bond price ( $\downarrow \uparrow$ )

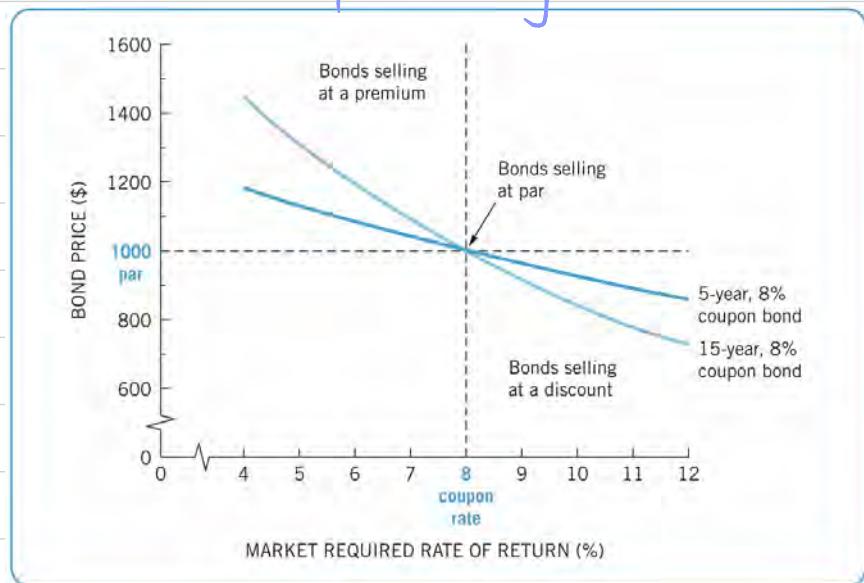
b. Interest rate ( $\uparrow \downarrow$ )  $\Rightarrow$  Bond price volatility ( $\downarrow \uparrow$ )

For a given change in market rate, interest rates ↓, return ↓, effect of time ↑, risk ↑, volatility ↑

## ③ Maturity

Maturity ↑  $\Rightarrow$  risk ↑  $\Rightarrow$  Bond price volatility ↑ (Variability / sensitivity)

Graph Summary



From this graph,

① three types

② a:  $x \uparrow, y \downarrow$



③ b:



- \* Glossary:
- ① in excess of: 超过
  - ② appreciation: 增值
  - ③ truncate: 截断, 删减
  - ④ controversy: 纠纷
  - ⑤ fashion: 方式
  - ⑥ consequently: 因此
  - ⑦ construe: 解释
  - ⑧ critical: 决定性的, 关键的

- ⑨ multiplier: 乘数
- ⑩ in terms of: 以...为基准
- ⑪ taper: 渐渐减少
- ⑫ curvilinear: 曲线
- ⑬ volatility: 波动性
- ⑭ interim: 临时的, 过渡时期的
- ⑮ coupon: 利息券
- ⑯ claim: 索赔

# ⑤ Risk and Return

## 1. One security

① Return:  $P_t(U+R) = P_t + D_t$  (We focus on one period) P<sub>t</sub> Later  
P<sub>t-1</sub> Previous

a. Types expected ← future  
actual ← past

b. D<sub>t</sub> is the cash dividend at the end of period t

c. Capital gain / Capital loss = P<sub>t</sub> - P<sub>t-1</sub> (irrespective of D)

d. ① Expected return:  $\bar{R} = E(R) = \sum_{i=1}^n R_i p_i$

② Relative return: Sharpe Ratio (SR) =  $\frac{E(R_p - R_f)}{\text{Risk}}$  (Excess Return)

③ Risk: (the variability of returns):  $\text{Risk} = \text{SD}(R) = \sqrt{\sum_{i=1}^n (R_i - \bar{R})^2 p_i}$

④ Relative risk: Coefficient of Variation (CV) =  $\frac{\text{Risk}}{E(R)}$

## 2. Portfolio

① Portfolio Return:  $\bar{R}_p = \sum_{i=1}^n w_i \bar{R}_i$

② Portfolio Risk:  $\sigma_p = \sqrt{\sum_{i=1}^n w_i^2 \sigma_i^2 + 2 w_1 w_2 \rho_{12} \sigma_1 \sigma_2}$

a. Covariance (Cov) =  $E[(R_i - E(R_i))(R_j - E(R_j))]$

$$= E(R_i R_j) - E(R_i) E(R_j)$$

$$= \sum_{s=1}^S \{(R_i(s) - E(R_i))(R_j(s) - E(R_j))\} f(s)$$

b. Correlation:  $\text{Corr}[R_i, R_j] = \rho_{ij}$  (pearson) =  $\frac{\text{Cov}[R_i, R_j]}{\sigma_i \sigma_j}$

c. The relationship between  $\sigma_p^2$  & ( $\sigma_1, \sigma_2$ ):  $\sigma_p^2 = w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \rho_{12} \sigma_1 \sigma_2$  ( $P = w_1 x_1 + w_2 x_2$ )

$$(\sigma_1, \sigma_2, \dots): \sigma_p^2 = \sum_{i=1}^n w_i^2 \sigma_i^2 + 2 \sum_{i>j} \sum_{j>i} w_i w_j \rho_{ij} \sigma_i \sigma_j$$

## 3. Attitude to Risk

① Certainty equivalent (CE) (确定性等值): an individual parameter describes the value of a security with uncertain value

② Three attitudes to risk:

a.  $CE < \text{expected value} \rightarrow \text{risk aversion}$  (风险厌恶)  $\Rightarrow$  Premise

b.  $CE = \text{expected value} \Rightarrow \text{risk indifference}$

c.  $CE > \text{expected value} \Rightarrow \text{risk preference}$

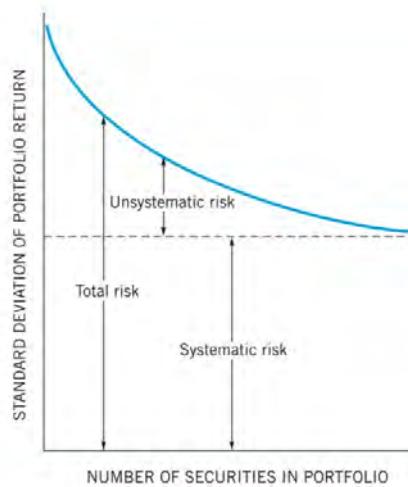
## 4. Systematic & Unsystematic Risk

① **Systematic Risk:** the risk due to risk factors that affect the overall market  Markt-Risiko

**Unsystematic Risk:** the risk unique to a particular company or industry  Betrieb-Risiko

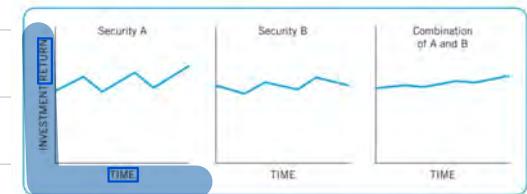
② As for stocks, **Systematic Risk  $\Rightarrow$  Can't be lowered  $\Rightarrow$  Extra compensation**

**Unsystematic Risk  $\Rightarrow$  Can be lowered  $\Rightarrow$  No extra compensation**



③ The way to lower unsystematic risk: diversification

a. Combination of cyclical security A & countercyclical security B  $\Rightarrow$  diversification  $\Rightarrow$  lower the risk (unsystematic risk)



return / risk  
x-axis  $\rightarrow$  time

## 5. The Capital-Asset Pricing Model (CAPM)

① CAPM: a. A model that describes the relationship between systematic risk and expected return

b. Principle: Expected return = risk-free rate + Premium based on the systematic risk

c. Assumptions

△ efficient capital market

△ homogeneous investor expectations risk  $\uparrow$ , return  $\uparrow$

△ certain risk-free rate

△ market portfolio containing only systematic risk

Generally, CAPM can be just used in stock market

(Because in bond market, it is difficult

to compute  $\bar{r}_m$ )

② Standard & Poor's 500 Stock Index (S&P 500 Index): S&P

A market-value-weighted index of 500 major common stocks  $\Rightarrow$  Represent the market

Expected return on market portfolio

## ③ The characteristic Line (Deduce the systematic risk premium)

a. It is a regression line X Excess return on market portfolio  
Y Excess return on stock (individual security)  
 (the points are historical)

b. Narrower the spread  $\Rightarrow$  Higher the correlation

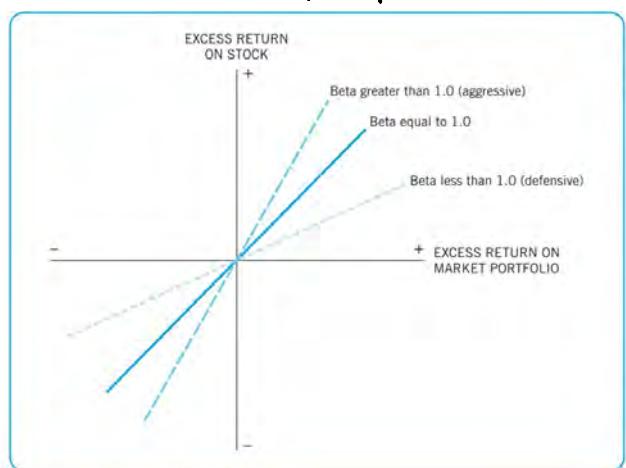
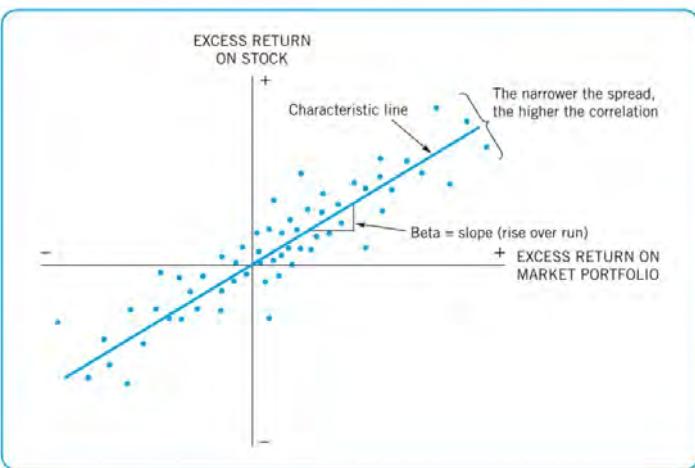
c. The slope = Beta = 
$$\frac{\text{Cov}(R_j, R_m)}{\text{Var}(R_m)} = \frac{\text{Excess } R_j}{\text{Excess } R_m} \quad (R_j)$$

Δ Excess return represents the systematic risk

Δ > 1 aggressive  
= 1  
< 1 defensive

Δ Risk-free rate = Interest rate of Treasury Bond = Interest rate for TVM

Δ Beta is a weighted average of the individual stock betas in the portfolio. ( $>1, >1, <1, \dots \Rightarrow >1$ )



## ④ Required rate of return and Security market line (SML) (Deduce the relation between)

a.  $\bar{R}_j = R_f + R_p = R_f + R_{mp} \cdot \beta_j = R_f + (\bar{R}_m - R_f) \cdot \beta_j$

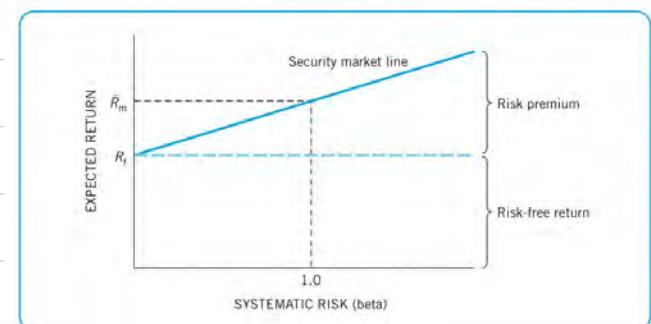
expected return & systematic risk  $\Rightarrow$  CAPM goal)

b. Security market line

Δ Linear relation X systematic risk  
Y expected return

Expected price

X variable



$\Delta$  improper priced stocks

Underpriced  
Overpriced



Return <  $E(\text{Return}) \Rightarrow$  Overpriced  
 $> E(\text{Return}) \Rightarrow$  Underpriced

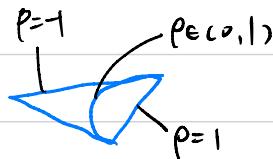
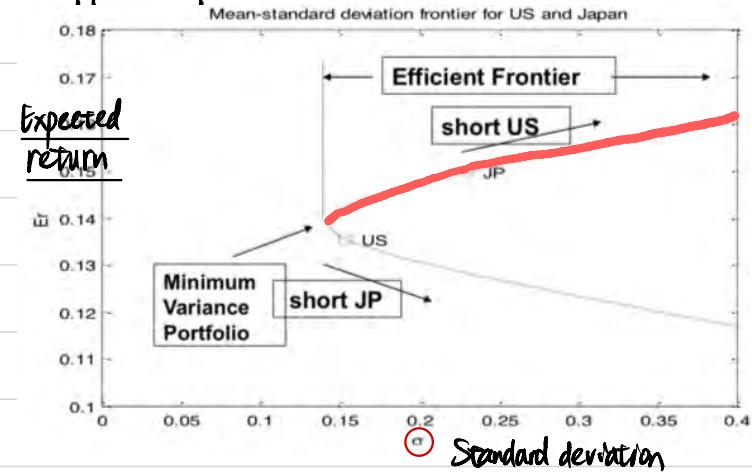
C. Two concepts

$\Delta$  Ticker symbol: The code name assigned to securities

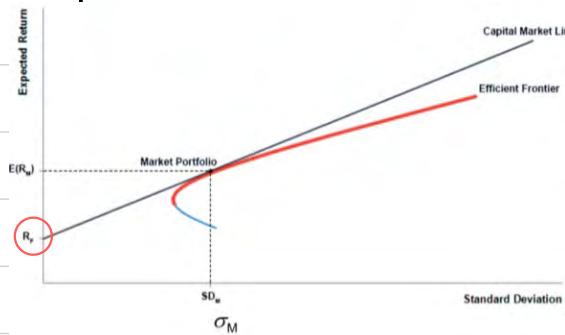
$\Delta$  Adjusted beta = measured beta (modified by historical beta)  $\cdot w_1 + \text{market beta} \cdot w_2$

⑤ Capital market line (CML)

a. Efficient frontier ( $\rho=xx$ )



b. Capital market line



## b. Efficient Financial Markets

① Efficient financial market: A financial market in which current prices fully reflect all available relevant information

② Three forms

Weak-form efficiency: Reflect historical sequence

Semistrong-form efficiency: Reflect publicly available information

Strong-form efficiency: Reflect all (public & private) information

There is no way to help investors get excess profit

\*

Glossary:

① materialize: 成形

② T-note: Treasury note

Maturity  
Bill       $\leftarrow$   
Note     $\in [1, 10]$   
Bond     $> 10$

③ belt: 钱包

④ versatile: 多才多艺的, 运用的

⑤ warp: 弯曲 (n., 使弯曲 v.)

⑥ contestant: 竞争者

⑦ cyclic: 循环的

⑧ cyclical: 周期的

⑨ counter: 对手 (n.), 反对 (v.) 相反的 (adj.)

⑩ regression line: 回归曲线

⑪ commensurate: 同量的

⑫ surrogate: 代理 (n.), 替代的 (adj.)

⑬ wieldy: 方便的

unwieldy: 不方便的

⑭ reversion: 反转

⑮ proxy: 代理人

# ⑥ Financial Statement Analysis

## 1. Financial statement

### ① Balance sheet (Statement of Financial Position) 资产负债表

ASSETS <sup>2</sup>	20X2	20X1
① Cash	\$ 178	\$ 175
② Accounts receivable <sup>3</sup>	678	740
③ Inventories, at lower of cost or market <sup>4</sup>	1,329	1,235
④ Prepaid expenses <sup>5</sup>	21	17
Accumulated tax prepayments	35	29
Current assets <sup>6</sup> (4)	\$2,241	\$2,196
Fixed assets at cost <sup>7</sup>	1,596	1,538
Less: Accumulated depreciation <sup>8</sup>	(857)	(791)
⑤ Net fixed assets	\$ 739	\$ 747
⑥ Investment, long term	65	—
⑦ Other assets, long term (3)	205	205
Total assets <sup>9</sup>	<u>\$3,250</u>	<u>\$3,148</u>

- a. Cash equivalents: high liquid, short-term marketable securities
- b. As for the asset part: ↓, liquidity ↓
- c. Current or not: <1> 1 year
- d. Ending date

LIABILITIES AND SHAREHOLDERS' EQUITY <sup>10,11</sup>	20X2	MARCH 31 20X1
Bank loans and notes payable	\$ 448	\$ 356
⑧ Accounts payable <sup>12</sup>	148	136
⑨ Accrued taxes <sup>13</sup>	36	127
Other accrued liabilities <sup>14</sup>	191	164
Current liabilities <sup>15</sup> (2)	\$ 823	\$ 783
⑩ Long-term debt <sup>16</sup> (1)	631	627
Shareholders' equity		
⑪ Common stock, \$1 par value <sup>17</sup>	421	421
Additional paid-in capital	361	361
⑫ Retained earnings <sup>18</sup> (Don't expand it)	1,014	956
Total shareholders' equity (2)	<u>\$1,796</u>	<u>\$1,738</u>
Total liabilities and shareholders' equity <sup>19</sup>	<u>\$3,250</u>	<u>\$3,148</u>

### ② Income statement (earnings statement / profit and loss statement) 损益表

	20X2	20X1
① Net sales <sup>2</sup>	\$3,992	\$3,721
Cost of goods sold <sup>3</sup>	2,680	2,500
③ Gross profit	\$1,312	\$1,221
Selling, general, and administrative expenses <sup>4</sup>	912	841
⑤ Earnings before interest and taxes <sup>5</sup> EBIT	\$ 400	\$ 380
Interest expense <sup>6</sup>	85	70
Earnings before taxes <sup>7</sup> EBT	\$ 315	\$ 310
Income taxes (federal and state)	114	112
⑥ Earnings after taxes <sup>8</sup> EAT	\$ 201	\$ 198
Cash dividends	143	130
Increase in retained earnings	<u>\$ 58</u>	<u>\$ 68</u>
Net income		

$$\text{a. COGS} = \text{Inventory (B)} + \text{Inventory (P)} - \text{Inventory (E)}$$

b. Ending date

In financing:

a. Revenue = Sales

b. COGS is included in operating costs

## 2. Analyze financial ratio

### ① Overview



### ② Financial ratio

#### Liquidity Ratio

Current Ratio	$\frac{\text{current assets}}{\text{current liabilities}}$	Shows a firm's ability to cover its current liabilities with its current assets.
Acid-Test Ratio (Quick)	$\frac{\text{Current Assets} - \text{Inv}}{\text{Current Liabilities}}$	Shows a firm's ability to meet current liabilities with its most liquid assets.

#### Financial Leverage Ratios (Debt Ratio)

Debt-to-Equity Ratio	$\frac{\text{Total Debt}}{\text{Shareholders' Equity}}$	Shows the extent to which the firm is financed by debt.
Debt-to-Total-Asset Ratio	$\frac{\text{Total Debt}}{\text{Total Assets}}$	Shows the percentage of the firm's assets that are supported by debt financing.
Total Capitalization Ratio	$\frac{\text{Long-term Debt}}{\text{Total Capitalization}}$	Shows the relative importance of long-term debt to the financing of the firm.

Capitalization = financing

#### Coverage Ratio

Interest Coverage	$\frac{\text{EBIT}}{\text{Interest Charges}}$	Indicate a firm's ability to cover interest charges.
-------------------	---	--

#### Activity Ratios

Receivable Turnover	$\frac{\text{Annual Net Credit Sales}}{\text{Accounts Receivables}}$ <u>(365/360)</u>	Indicates quality of receivables and how successful the firm is in its collections.
Avg Collection Period	$\frac{\text{Days in the Year}}{\text{Receivable Turnover}}$	Average number of days that receivables are outstanding.
Payable Turnover	$\frac{\text{Annual Credit Purchases}}{\text{Accounts Payable}}$	Indicates the promptness of payment to suppliers by the firm.
PT in Days	$\frac{\text{Days in the Year}}{\text{Payable Turnover}}$	Average number of days that payables are outstanding.
Inventory Turnover	$\frac{\text{Cost of Goods Sold}}{\text{Inventory}}$	Indicate the effectiveness of the inventory management practices of the firm.
Total Asset Turnover	$\frac{\text{Net Sales}}{\text{Total Assets}}$	Indicates the overall effectiveness of the firm in utilizing its assets to

#### Profitability Ratios

Gross Profit Margin	$\frac{\text{Gross Profit}}{\text{Net Sales}}$	Indicates the efficiency of operations and firm pricing policies.
Net Profit Margin	$\frac{\text{Net Profit after Taxes}}{\text{Net Sales}}$	Indicates the firm's profitability after taking account of all expenses and income taxes.
Return on Investment	$\frac{\text{Net Profit after Taxes}}{\text{Total Assets}}$	Indicates the profitability on the assets of the firm
Return on Equity	$\frac{\text{Net Profit after Taxes}}{\text{Shareholders' Equity}}$	Indicates the profitability to the shareholders of the firm

"profit" in financial management

$$ROE = \text{Net profit margin} \times \text{Total asset turnover}$$

$$ROE = ROI \times \text{Equity Multiplier} = \frac{\text{Total Assets}}{\text{Shareholders' equity}}$$

### 3. Trend analysis, Common-Size analysis and Index analysis

① Trend analysis: compare the financial ratio of different periods

	20X0	20X1	20X2	INDUSTRY MEDIAN
<i>Liquidity</i>				
Current ratio	2.95	2.80	2.72	2.10
Acid-test ratio	1.30	1.23	1.11	1.10
<i>Leverage</i>				
Debt-to-equity ratio	0.76	0.81	0.81	0.80
Total-debt-to-total-assets ratio	0.43	0.45	0.45	0.44
<i>Coverage</i>				
Interest coverage ratio	5.95	5.43	4.71	4.00
<i>Activity</i>				
Average collection period <sup>a</sup>	55 days	73 days	62 days	45 days
Inventory turnover in days <sup>a</sup>	136 days	180 days	181 days	
Total asset turnover <sup>a</sup>	1.25	1.18	1.23	1.66
<i>Profitability</i>				
Gross profit margin	30.6%	32.8%	32.9%	23.8%
Net profit margin	4.90%	5.32%	5.04%	4.70%
Return on investment <sup>a</sup>	6.13%	6.29%	6.19%	7.80%
Return on equity <sup>a</sup>	10.78%	11.36%	11.19%	14.04%

② Common-Size analysis: compute the percentage of each item

a. in balance sheet:  $\div$  (Total asset)

in income statement:  $\div$  (Net sales)

#### Common-Size Analysis:

Assets	Regular (thousands of \$)			Common-Size (%)		
	2005	2006	2007	2005	2006	2007
Cash	148	100	90	12.10	4.89	4.15
AR	283	410	394	23.14	20.06	18.17
Inv	322	616	696	26.33	30.14	32.09
Other CA	10	14	15	0.82	0.68	0.69
Tot CA	763	1,140	1,195	62.39	55.77	55.09
Net FA	349	631	701	28.54	30.87	32.32
LT Inv	0	50	50	0.00	2.45	2.31
Other LT	111	223	223	9.08	10.91	10.28
Tot Assets	1,223	2,044	2,169	100.0	100.0	100.0

③ Index analysis: Compare each item of different periods

#### Index Analysis:

	Regular (thousands of \$)			Indexed (%)		
	2005	2006	2007	2005	2006	2007
Net Sales	1,235	2,106	2,211	100.0	170.5	179.0
COGS	849	1,501	1,599	100.0	176.8	188.3
Gross Profit	386	605	612	100.0	156.7	158.5
Adm.	180	383	402	100.0	212.8	223.3
EBIT	206	222	210	100.0	107.8	101.9
Int Exp	20	51	59	100.0	255.0	295.0
EBT	186	171	151	100.0	91.9	81.2
EAT	112	103	91	100.0	92.0	81.3
Cash Div	50	50	50	100.0	100.0	100.0

### 4. Application

Internal

Trade Creditors: Focus on the liquidity

External

Bondholders: Focus on the long-term cash flow

Shareholders: Focus on the profitability and long-term health

\*

Glossary:

① snapshot: 人物照

② wear and tear: 磨损

③ collective: 共同的

④ stockout: 缺乏库存

## ⑦ Funds Analysis, Cash-Flow Analysis & Cash-Flow budget

## 1. Funds Analysis

## ① Concepts

### a. Funds: Investment + Claims

## Investment Asset

Claims = Liabilities + Equity

b. Flows of Funds Statement (Sources and uses of funds statement) : Summary of changes in financial position

Balance sheet = Stock of funds

Changes in balance sheet items = "Net" flow of funds

SOURCES		USES	
Funds provided by operations			
Net profit	\$201	Dividends	\$143
Depreciation	112	Additions to fixed assets	104
Decrease, accounts receivable	62	Increase, inventories	94
Increase, bank loans	92	Increase, prepaid expenses	4
Increase, accounts payable	12	Increase, tax prepayments	6
Increase, other accruals	27	Increase, long-term investment	65
Increase, long-term debt	4	Decrease, accrued taxes	91
		<b>Increase, cash</b>	<b>3</b>
	<u>\$510</u>		<u>\$510</u>

## ② Sources & Uses (Basically)

a. Sources: Asset  $\downarrow$  / Claim  $\uparrow$

$\Rightarrow$  Sources = Users

Users = Asset↑ / Claim↓ (Cash↑, is "a use")

b. Changing Amount  $\Rightarrow \Delta$

ASSETS	MARCH 31		DIRECTION OF CHANGE	CHANGES	
	20X2	20X1		SOURCES	USES
Cash	\$ 178	\$ 175	+		\$ 3
Accounts receivable	<u>678</u>	740	-	\$ 62	
Inventories, at lower of cost or market	<u>1,329</u>	1,235	+		94
Prepaid expenses	21	17	+		4
Accumulated tax prepayments	<u>35</u>	<u>29</u>	+		6
Current assets	<u>\$2,241</u>	\$2,196		N/A	
Fixed assets at cost	<u>1,596</u>	1,538		N/A	
Less: Accumulated depreciation	<u>(857)</u>	<u>(791)</u>		N/A	
Net fixed assets	<u>\$ 739</u>	\$ 747	-	8	
Investment, long term	<u>65</u>	-	+		65
Other assets, long term	<u>205</u>	<u>205</u>		-	-
Total assets	<u><u>\$3,250</u></u>	<u><u>\$3,148</u></u>			
<b>LIABILITIES AND SHAREHOLDERS' EQUITY</b>					
Bank loans and notes payable	\$ 448	\$ 356	+	92	
Accounts payable	<u>148</u>	136	+	12	
Accrued taxes	<u>36</u>	127	-		91
Other accrued liabilities	<u>191</u>	<u>164</u>	+	27	
Current liabilities	<u>\$ 823</u>	\$ 783		N/A	
Long-term debt	<u>631</u>	627	+	4	
Shareholders' equity					
Common stock, \$1 par value	421	421		-	-
Additional paid-in capital	<u>361</u>	361		-	-
Retained earnings	<u>1,014</u>	<u>956</u>	+	58	
Total shareholders' equity	<u><u>\$1,796</u></u>	<u><u>\$1,738</u></u>		N/A	
Total liabilities and shareholders' equity	<u><u>\$3,250</u></u>	<u><u>\$3,148</u></u>		<u><u>\$263</u></u>	<u><u>\$263</u></u>

SOURCES		USES
Increase, retained earnings	\$ 58	
Decrease, net fixed assets	8	
Decrease, accounts receivable	62	Increase, inventories \$ 94
Increase, bank loans	92	Increase, prepaid expenses 4
Increase, accounts payable	12	Increase, tax prepayments 6
Increase, other accruals	27	Increase, long-term investment 65
Increase, long-term debt	4	Decrease, accrued taxes 91
		<b>Increase, cash</b> 3
	<b>\$263</b>	<b>\$263</b>

## ④ Adjustments

### a. Profits & Dividends

Retained earnings Show more details ↗   
 Source: Net profit (Net profit = EAT = Net income)  
 Use: Cash dividends

### b. Depreciation & Gross Change in Fixed Assets

Net fixed assets Show more details ↗   
 Source: Depreciation  
 Use: Addition to fixed assets

#### Overview

#### Before add:

SOURCES	USES
① Increase, retained earnings	\$ 58
② Decrease, net fixed assets	8
Decrease, accounts receivable	62
Increase, bank loans	92
Increase, accounts payable	12
Increase, other accruals	27
Increase, long-term debt	4
	<u>\$263</u>

(+/-) on each side,

the sums can be changed



#### After add:

SOURCES	USES
Funds provided by operations	
① Net profit	\$143
② Depreciation	104
Decrease, accounts receivable	62
Increase, bank loans	92
Increase, accounts payable	12
Increase, other accruals	27
Increase, long-term debt	4
	<u>\$510</u>

## 2. Cash Flow Analysis

① Concept: Income statement + Statement of financial position  $\Rightarrow$  Statement of Cash Flows

② Two methods of making statement

a. Indirect Method (The difference occurs only in Operating part)

[The transactions that are not defined as investing / financing (including: ① Interest ② Dividend income)]

Dividend paid is about financing

$$\begin{cases} \text{Operating} & = \text{Net income} + \text{Dep./Amo. exp} - \Delta \text{Current Assets} + \Delta \text{Current Liabilities} \\ \text{Investing} & = -\Delta \text{Non-current Assets} \\ \text{Financing} & = +\Delta \text{Non-current Liabilities} + \Delta \text{Share capital} + \Delta \text{Retained Earnings} \end{cases}$$

(except CASH) Funds source

not investing

### b. Direct Method

Cash Flow from operating = Cash received from customers - Cash paid to suppliers & employees - Interest paid - Taxes paid



$\Delta +$  Cash received from customers = Sales -  $\Delta$  Accounts Receivable

$\Delta -$  Cash paid to suppliers & employees = COGS +  $\Delta$  Inventory -  $\Delta$  Accounts Payable + Operating Exp. +  $\Delta$  Prepaid Exp. -  $\Delta$  Accrued exp

$\Delta -$  Interest paid

= Interest Exp.  $\rightarrow$   $\Delta \sim$  prepayment -  $\Delta \sim$  Accrued exp

$\Delta -$  Taxes paid

= Taxes Exp.  $\rightarrow$  Liability

DIRECT METHOD		INDIRECT METHOD	
FRAME A	ALDINE MANUFACTURING COMPANY STATEMENT OF CASH FLOWS FOR THE YEAR ENDED MARCH 31, 20X2 (IN THOUSANDS)	FRAME B	ALDINE MANUFACTURING COMPANY STATEMENT OF CASH FLOWS FOR THE YEAR ENDED MARCH 31, 20X2 (IN THOUSANDS)
<b>CASH FLOW FROM OPERATING ACTIVITIES</b>			
Cash received from customers <sup>a</sup>	\$ 4,054	Net income	\$ 201
Cash paid to suppliers and employees <sup>b</sup>	(3,539)	Depreciation	112
Interest paid	(85)	Cash provided (used) by current assets and operating-related liabilities	
Taxes paid <sup>c</sup>	(211)	Decrease, accounts receivable	62
Net cash provided (used) by operating activities	\$ 219	Increase, inventories	(94)
<b>CASH FLOW FROM INVESTING ACTIVITIES</b>			
Additions to fixed assets	\$ (104)	Increase, prepaid expenses	(4)
Payment for long-term investment	(65)	Increase, tax prepayments	(6)
Net cash provided (used) by investing activities	\$ (169)	Increase, accounts payable	12
<b>CASH FLOW FROM FINANCING ACTIVITIES</b>			
Increase in short-term borrowings	\$ 92	Decrease, accrued taxes	(91)
Additions to long-term borrowing	4	Increase, other accrued liabilities	27
Dividends paid	(143)	Net cash provided (used) by operating activities	\$ 219
Net cash provided (used) by financing activities	\$ (47)	<b>CASH FLOW FROM INVESTING ACTIVITIES</b>	
Increase (decrease) in cash	\$ 3	Additions to fixed assets	\$ (104)
Cash, March 31, 20X1	175	Payment for long-term investment	(65)
Cash, March 31, 20X2	\$ 178	Net cash provided (used) by investing activities	\$ (169)
<b>Supplementary Schedule: A reconciliation of net income to net cash provided by operating activities</b>			
Net income	\$ 201	<b>CASH FLOW FROM FINANCING ACTIVITIES</b>	
Depreciation	112	Increase in short-term borrowings	\$ 92
Cash provided (used) by current assets and operating-related current liabilities		Additions to long-term borrowing	4
Decrease, accounts receivable	62	Dividends paid	\$ (143)
Increase, inventories	(94)	Net cash provided (used) by financing activities	\$ (47)
Increase, prepaid expenses	(4)	Increase (decrease) in cash	\$ 3
Increase, tax prepayments	(6)	Cash, March 31, 20X1	175
Increase, accounts payable	12	Cash, March 31, 20X2	\$ 178
Decrease, accrued taxes	(91)	<b>Supplemental cash-flow disclosures</b>	
Increase, other accrued liabilities	27	Interest paid	\$ 85
Net cash provided (used) by operating activities	\$ 219	Taxes paid <sup>c</sup>	211

③ For a healthy and growing firm:

Cash flows from O(+), I(-), F(+/-)  $\rightarrow$  fluctuate

④ Cash-Flow Forecast (Historical data  $\Rightarrow$  Future cash flow)

① Process

a. The sales forecast

Internal: Sales representatives project sales  $\Rightarrow$  Sales projection

External: Economists project economic and business trends  $\Rightarrow$  Expected market share

## b. Cash collections (receipts)

	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE
Frame A: Sales								
Credit sales, 90% (x)	\$270.0	\$315.0	\$225.0	\$180.0	\$225.0	\$270.0	\$315.0	\$342.0
Cash sales, 10%	30.0	35.0	25.0	20.0	25.0	30.0	35.0	38.0
Total sales, 100%	\$300.0	\$350.0	\$250.0	\$200.0	\$250.0	\$300.0	\$350.0	\$380.0
Frame B: Cash Collections								
Cash sales, this month			\$ 25.0	\$ 20.0	\$ 25.0	\$ 30.0	\$ 35.0	\$ 38.0
90% of last month's credit sales			283.5	202.5	162.0	202.5	243.0	283.5
10% of 2-month-old credit sales			27.0	31.5	22.5	18.0	22.5	27.0
Total sales receipts			\$355.5	\$254.0	\$209.5	\$250.5	\$300.5	\$348.5

Nov. Dec  $\Rightarrow$  Estimated Rate (r)

Estimated Sale  $\times r$   $\rightarrow$  Credit Sales  
Sales forecast  $\uparrow$  Cash Sales

Total sales receipts

= Cash sales +  $w_1 \cdot$  Credit sales (1m)  
+  $w_2 \cdot$  Credit sales (2m)  
(Weighted sum of credit sales)

## c. Cash disbursement

	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE
Frame A: Purchases	\$100	\$ 80	\$100	\$120	\$140	\$150	\$150
Frame B: Cash Disbursements for Purchases and Operating Expenses							
100% of last month's purchases	\$100	\$ 80	\$100	\$120	\$140	\$150	\$150
Wages paid	80	80	90	90	95	100	
Other expenses paid	50	50	50	50	50	50	
Total disbursements for purchases and operating expenses	\$230	\$210	\$240	\$260	\$285	\$300	

Total disbursements for Pur & Oper

= Last month's purchase

+ Wages payment (stable)

+ Other expense to be paid in cash  
(predictable in short run)



	JAN.	FEB.	MAR.	APR.	MAY	JUNE
Total disbursements for purchases and operating expenses	\$230	\$210	\$240	\$260	\$285	\$300
Capital expenditures		150	50			
Dividend payments			20			20
Income taxes	30			30		
Total cash disbursements	\$260	\$360	\$310	\$290	\$285	\$320

Total cash disbursement

= Total disbursement for Pur & Oper

+ Capital expenditures (investing)

+ Dividend payments (financing)

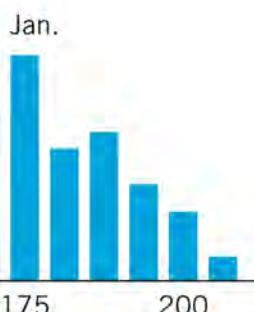
+ Income taxes (Income is estimated)

## d. Net cash flow and cash balance

Beginning cash balance + Net cash flows = Ending cash balance

### ② Range of Cash-Flow Estimates

Single point  $\Rightarrow$  Range (more reasonable)



## 4. Forecasting Financial Statements (estimate each item $\Rightarrow$ estimate the whole statement)

① Forecast income statement

② Forecast statement of financial position

\* Glossary: ① appraise = 评估、鉴定

② claim = 声称

③ conform = 遵循

④ portray = 描绘

⑤ consolidate = 合并

⑥ dismay = 失望

⑦ projection = 预测

⑧ market share = 市场份额

⑨ magnify = 放大

⑩ outlay = 支出

# 12 Capital Budgeting ①

## 1. Capital Budgeting

① Definition of Capital budgeting: The process of identifying, analyzing and selecting non-current investment.

识别识别 资本分析 选择

### ② Process (Overview)

- ★ Generating investment project proposals identifying → ch12
- ★ Estimating after-tax incremental cash flows (each year) analyzing
- ★ Evaluating after-tax incremental cash flows (whole period)
- ★ Selecting projects selecting → ch13
- ★ Reevaluating projects continually and performing postaudits

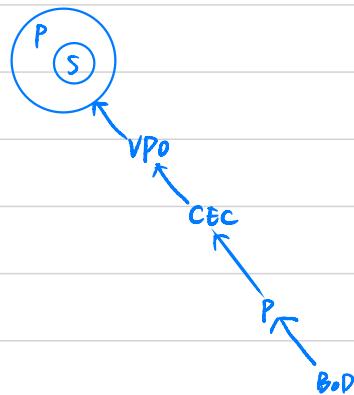
## 2. Generating Investment Project Proposals

### ① Categories:

- a Expansion (from marketing department)
- b Replacement (from production department)
- c Research and development (R & D)
- d Exploration
- e Others (such as safety-related or pollution-control devices)  
without direct relation with production

### ② Screening process

- a. section chiefs
- b. plant managers
- c. vice president for operation
- d. capital expenditures committee
- e. president
- f. board of directors



## 3. Estimating Project After-Tax Incremental Operating Cash Flows

### ① Concepts

#### a. Basic characteristics of Project flows

△ after-tax

control the variable

★ incremental: we analyse the difference of cash flows between with and without the project

△ operating: CF from operating ( $CCF = \text{Net income} + \text{Dep. exp.} - (\Delta \text{Current assets} + \Delta \text{Current Liabilities}) / -\text{NWC}$ )

★ cash (central benefit)

## b. Principles in estimating

Δ ignore sunk costs (don't influence the incremental cash flows)  $\text{Sunk cost} \rightarrow \text{project} \times$

Δ include opportunity costs

Δ include project-driven changes in working capital  $\text{NWC} = \text{CA} - \text{CL}$

Δ include effects of inflation

$$\text{(NWC)} \quad \text{A net working capital} = \text{current assets} - \text{current liabilities}$$

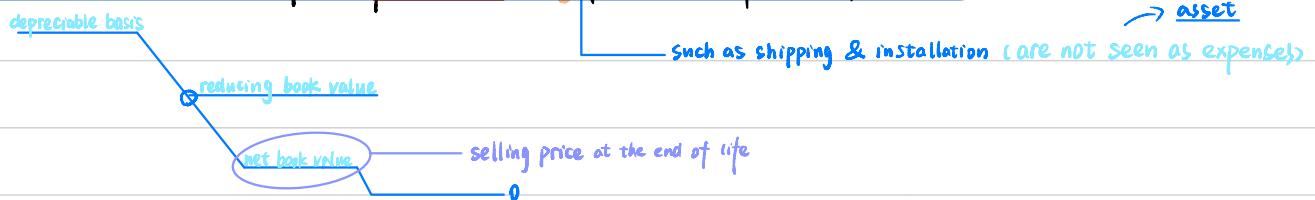
↓

+ cash outflow  
-, cash inflow

## c. Tax consideration

Δ depreciation  $\Rightarrow$  write off

Δ depreciable basis = cost of the fixed asset + (capitalized expenditures)  $\rightarrow$  different from capital expenditure



Δ Capital gain: Salvage value (practical selling price) > net book value (estimated selling price)

$\rightarrow$  Amount = Δ

Capital loss: Salvage value (practical selling price) < net book value (estimated selling price)

## ② Calculating the incremental cash flows

### a. Categories of project cash flows based on timing

Δ Initial cash outflow

- |          |   |                              |
|----------|---|------------------------------|
| (a)      | Cost of "new" asset(s)  | ① depreciable basis (buy)    |
| (b) +    | Capitalized expenditures (for example, installation costs, shipping expenses, etc.)*              |                              |
| (c) +(-) | Increased (decreased) level of "net" working capital**  | ② NWC                        |
| (d) -    | Net proceeds from sale of "old" asset(s) if the investment is a replacement decision              |                              |
| (e) +(-) | Taxes (tax savings) due to the sale of "old" asset(s) if the investment is a replacement decision | ③ about the old asset (sell) |
| (f) =    | <u>Initial cash outflow</u>   |                              |

Δ Interim incremental net cash flows

- |          |  |                    |
|----------|--|--------------------|
| (a)      | Net increase (decrease) in operating revenue less (plus) any net increase (decrease) in operating expenses, excluding depreciation | ④ EBIT             |
| (b) -(+) | Net increase (decrease) in tax depreciation charges <u>including interest</u> <u>consider the old one</u>                          |                    |
| (c) =    | Net change in income before taxes  | ⑤ EAT (net income) |
| (d) -(+) | Net increase (decrease) in taxes   |                    |
| (e) =    | Net change in income after taxes   | ⑥ CCF              |
| (f) +(-) | Net increase (decrease) in tax depreciation charges  |                    |
| (g) =    | <u>Incremental net cash flow for the period</u>  |                    |

① depreciation charges = depreciation ; ② NWC occurs when purchasing & selling accumulated depreciation = counter asset

### 3 Terminal-year incremental net cash flow

- (a) Net increase (decrease) in operating revenue less (plus) any net increase (decrease) in operating expenses, excluding depreciation
- (b)  $-(+)$  Net increase (decrease) in tax depreciation charges
- (c)  $=$  Net change in income before taxes
- (d)  $-(+)$  Net increase (decrease) in taxes
- (e)  $=$  Net change in income after taxes
- (f)  $+(-)$  Net increase (decrease) in tax depreciation charges
- (g)  $=$  Incremental cash flow for the terminal year before project windup considerations
- (h)  $+(-)$  Final salvage value (disposal/reclamation costs) of "new" asset(s)
- (i)  $-(+)$  Taxes (tax savings) due to sale or disposal of "new" asset(s)
- (j)  $+(-)$  Decreased (increased) level of "net" working capital\*
- (k)  $=$  Terminal year incremental net cash flow

Summary to the project CF (a conversion from operating CF) machine

$$CF = (\text{Revenue} - \text{Operating costs} - \text{Dep.})(1 - T_{\text{inc}}) + \text{Dep.} - \Delta \text{NWC} - \text{Purchase} + \text{Salvage price} - \text{Capital Gain} \cdot T_{\text{ca}}$$



$\Delta$  (except "purchase")

Corporate income tax  
Capital tax

### Some remarks on "tax savings"

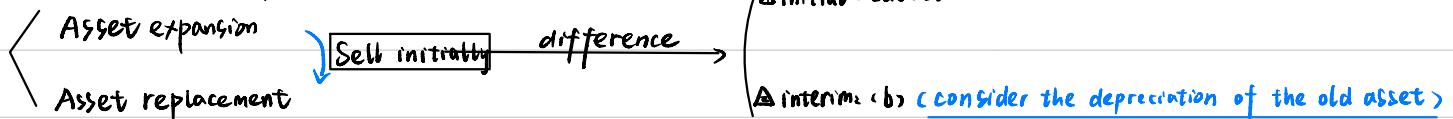


For example, suppose that corporate income tax rate is 15% and capital tax is 20%. Also, today we sold two machines whose net book value was 100 each. If the first machine we sold was at \$200 and the second one was sold at 50, this means that we gain 100 from the first and made loss of 50. On the net, we made 50 from sales of these two machines; hence we just apply 20% on capital gain of \$50; we get cash inflow of 250 from sales (200+50) and cash outflow of 10 (20% of \$50) as tax payment.



In practice, I believe that if the total capital loss is negative for a company, it can apply for carryback in the following year. As for our analysis, we were looking at the incremental cashflow of the project, meaning that if we have some capital gains from other existing projects which involve selling machines, we will use some of these positive capital gains to deduct tax on capital gains

### 4 Application examples



### Glossary

① incremental : 增加的

① erroneous : 错误的

② continual = continuous

② utilize : 利用

③ originate : 起源

③ windup = 结局, 结束的

④ screen : 屏幕

④ reclamation : 回收

⑤ plant : 工厂

⑤ postaudit : 后审计

# (13) Capital Budgeting Techniques ②

## 1. Evaluation the project flows

### ① Alternative methods / techniques (Overview)

a. Payback period (PBP)

b. Internal rate of return (IRR)

c. Net present value (NPV)

d. Profitability index (PI)



### ② Payback period

a. Definition: the period of time required for the cumulative expected cash flows to equal the initial cash outflow

#### b. Computation

0	1	2	3 (a)	4	5
-40 K (-b)	10 K	12 K	15 K	10 K (d)	7 K
Cumulative Inflows	10 K	22 K	37 K (c)	47 K	54 K

PBP =  $a + (b - c) / d$   
=  $3 + (40 - 37) / 10$   
=  $3 + (3) / 10$   
= 3.3 Years

see it as uniform distribution

#### c. Acceptance criterion

Calculated PBP < Maximum PBP

#### d. Strengths & Weaknesses

Strengths: ▲ Easy to use and understand ▲ A measure of liquidity ▲ Easier to forecast short-term than long-term flows  
Weaknesses: ▲ Doesn't account for TVM ▲ Doesn't consider CF beyond PBP ▲ Cutoff period is subjective  
so we focus on the next three techniques

→ Maturity

→ TVM →

Cutoff period = Maximum PBP

### ③ Internal rate of return

a. Definition: a kind of discount rate

#### b. Computation

$$ICO = \frac{CF_1}{(1+IRR)^1} + \frac{CF_2}{(1+IRR)^2} + \dots + \frac{CF_n}{(1+IRR)^n}$$

initial cash outflow

#### c. Acceptance criterion

IRR > Hurdle rate → Minimum of required rate of return

#### d. Strengths & Weaknesses

Strengths: ▲ Accounts for TVM ▲ Considers all cash flows ▲ Less subjectivity ▲ Allows comparison of different-scale projects  
Weaknesses: ▲ Assumes all cash flows reinvested at the IRR ▲ Difficulties with ranking multiple IRRs

(namely, discount rate is assumed to be changeless)

(# of potential IRRs = # of sign changes)

## ④ Net present value

a. Definition:  $NPV = PV(CF) - ICo$

b. Computation

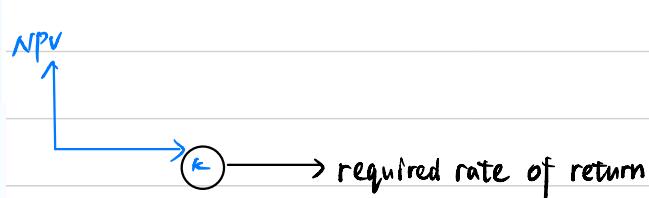
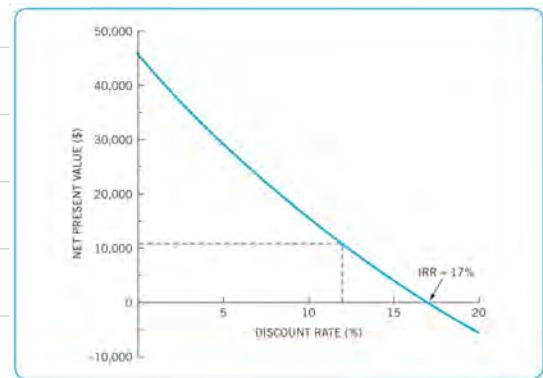
$$NPV = \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \dots + \frac{CF_n}{(1+k)^n} - ICo$$

$PV(CF)$   
required rate of return

(When  $NPV=0$ ,  $k = IRR$ )

$IRR$ : a computation result  
 $RRR$ : existing market required rate  
Risk is assumed changeless → RRR is assumed changeless.

c. Profile



d. Acceptance criterion

$$NPV > 0$$

e. Strengths & Weaknesses

Strengths: △ Cash flows are assumed to be reinvested at the discount rate △ Accounts for TVM △ Considers all cash flows

Weaknesses: △ May not include managerial options embedded in the project.

## ⑤ Profitability Index

a. Computation

$$PI = \frac{\frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \dots + \frac{CF_n}{(1+k)^n}}{ICo}$$

b. Acceptance criterion

$$PI > 1$$

c. Strengths & Weaknesses

Strengths: △ Cash flows are assumed to be reinvested at the discount rate △ Accounts for TVM

△ Considers all cash flows △ Allows comparison of different-scale projects

Weaknesses: △ May not include managerial options embedded in the project △ Provides only relative profitability △ Potential ranking problems

## Project relationships

Independent

Dependent / Contingent

Mutually exclusive

## 2. Project selecting

### ① Ranking problems (Select one)

when projects are mutually exclusive, there are three problems,

a. Scale of investment differs  $\rightarrow$  NPV  $\curvearrowright$  pursue the higher absolute return

b. Cash flow pattern differs (increasing method & decreasing method)  $\rightarrow$  NPV

**Scale** compare the projects  
**Select** select the projects

Calculate the IRR, NPV@10%, and PI@10%.

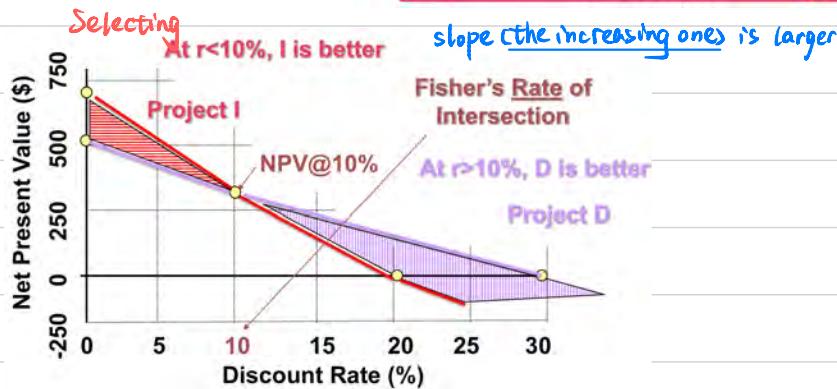
### Estimating

END OF YEAR	NET CASH FLOWS	
	Project D	Project I
0	-\$1,200	-\$1,200
1	1,100	100
2	500	500
3	121	1,331

### Evaluating

**Which project is preferred?**

Project	IRR	NPV	PI
D	29.7%	\$304	1.25
I	20.0%	\$304	1.25



c. Project life (useful life) differs  $\rightarrow$  NPV

### ② Capital rationing (Select a portfolio)

a. Definition: constraint (budget ceiling) on the capital expenditures

b. Principles:

$\Delta$  Try to fully use the budget

$\Delta$  Rank the projects by PI (BCD is limited, maximize PI  $\rightarrow$  maximize the cash inflows)

1.4 & 2.3  $\rightarrow$  Compare then select

### 3. Reevaluation and Postaudit

#### ① Reevaluation — Sensitivity analysis

a. Definition: A "what if" analysis: change variables / assumptions from a base case (original estimates)  $\Rightarrow$  impact on measured results (such as NPV, IRR)

theory: after perform the projects, we get the actual relationship between estimated data & practical data, so we can reimport different estimated data, to observe the relative impacts on the practical data. (point  $\rightarrow$  range)

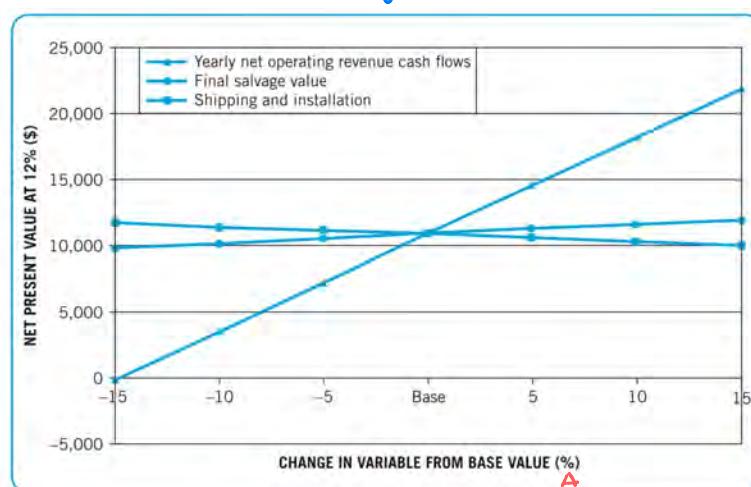
#### b. Examples

##### $\Delta$ Change one variable

VARIABLE	CHANGE IN ORIGINAL VARIABLE VALUE						
	-15%	-10%	-5%	Base	+5%	+10%	+15%
Shipping and installation	\$11,785	\$11,447	\$11,107	\$10,768	\$10,429	\$10,089	\$ 9,751
Final salvage value	9,824	10,139	10,453	10,768	11,083	11,398	11,713
Yearly net operating revenue cash flows	(78)	3,539	7,154	10,768	14,382	17,997	21,614

the items in the estimation

NPV



NPV Sensitivity Graph

##### $\Delta$ Change two variables (take their relationships into account)

CHANGE IN YEARLY NET OPERATING REVENUE CASH FLOWS	CHANGE IN FINAL SALVAGE VALUE						
	-15%	-10%	-5%	Base	+5%	+10%	+15%
-15%	(\$ 1,022)	(\$ 707)	(\$ 393)	(\$ 78)	\$ 237	\$ 552	\$ 867
-10%	2,595	2,910	3,224	3,539	3,854	4,169	4,484
-5%	6,218	6,525	6,839	7,154	7,469	7,784	8,099
Base	9,824	10,139	10,453	10,768	11,083	11,398	11,713
+5%	13,438	13,753	14,067	14,382	14,697	15,012	15,327
+10%	17,053	17,368	17,682	17,997	18,312	18,627	18,942
+15%	20,670	20,985	21,299	21,614	21,929	22,244	22,559

matrix

#### ② Postaudit

a. Definition: Comparison of actual costs and benefits of a project with original estimates (revenue)

b. Process:

$\Delta$  Identify any project weaknesses

Historically

$\Delta$  Develop a possible set of corrective actions

in the Future

$\Delta$  Provide appropriate feedback

# 14 Risk and Managerial (Real) Options in Capital Budgeting

## 1. Project risk

① Definition: The variability of cash flow from expected one

② Distribution of states in a period/years

a. Discrete type

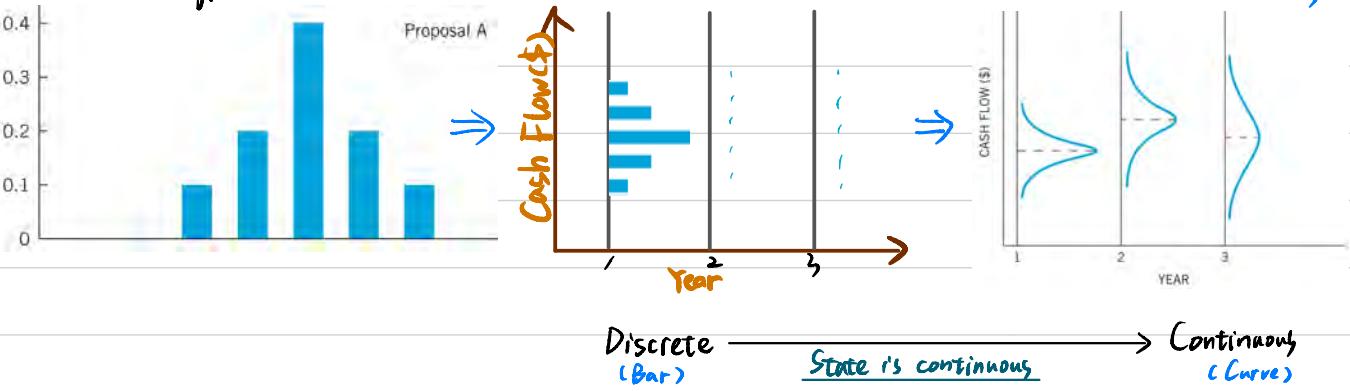
$$\text{Expected value: } \bar{CFT} = \sum_{x=1}^n (CF_{xt})P_{xt} \quad (t \text{ represents the year})$$

$$\text{Standard deviation: } \sigma_t = \sqrt{\sum_{x=1}^n (CF_{xt} - \bar{CFT})^2 P_{xt}}$$

$$\text{Coefficient of variation (CV): } CV = \frac{\sigma_t}{\bar{CFT}}$$

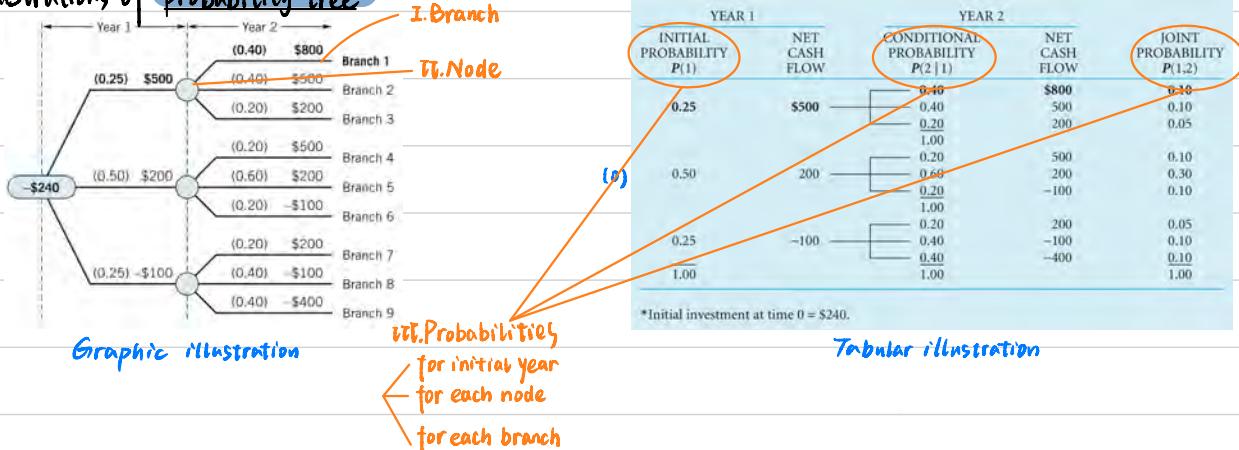
STATE OF THE ECONOMY	PROPOSAL A		PROPOSAL B	
	PROBABILITY	CASH FLOW	PROBABILITY	CASH FLOW
Deep recession	0.10	\$3,000	0.10	\$2,000
Mild recession	0.20	3,500	0.20	3,000
Normal	0.40	4,000	0.40	4,000
Minor boom	0.20	4,500	0.20	5,000
Major boom	0.10	5,000	0.10	6,000
	1.00		1.00	

b. Continuous type (more accurate)



③ Probability tree approach (P → CF → Stat)

a. Two illustrations of probability tree



b. Computations

$$NPVi = \frac{CF_1}{c/(k+r)} + \frac{CF_2}{c/(k+r)^2} + \dots + \frac{CF_n}{c/(k+r)^n} - I \quad k \text{ is risk-free rate}$$

K is risk-free rate avoid double counting

$$\overline{NPV} = \sum_{i=1}^z (NPVi)P_i$$

$$\sigma = \sqrt{\sum_{i=1}^z (NPVi - \overline{NPV})^2 P_i}$$

## ④ Simulation approach (Factor $\rightarrow$ TRR $\rightarrow$ P $\rightarrow$ Stats)

a. Overview: Each factor distribution  $\xrightarrow{\text{combine}} \xrightarrow{\text{independently}}$  TRR distribution  $\Rightarrow$  Analysis with return & risk (Factor  $\rightarrow$  P) (TTR  $\rightarrow$  P)

### b Factors types

#### Market analysis

$\Delta$  Market size

$\Delta$  Selling price

$\Delta$  Market growth rate

$\Delta$  Share of market

#### Investment cost analysis

$\Delta$  Investment required

$\Delta$  Useful life of facilities

$\Delta$  Residual value of investment

#### Operating and fixed costs

$\Delta$  Operating costs

$\Delta$  Fixed costs

multivariate in STA2001

## 2. Project-portfolio risk

### ① Computations

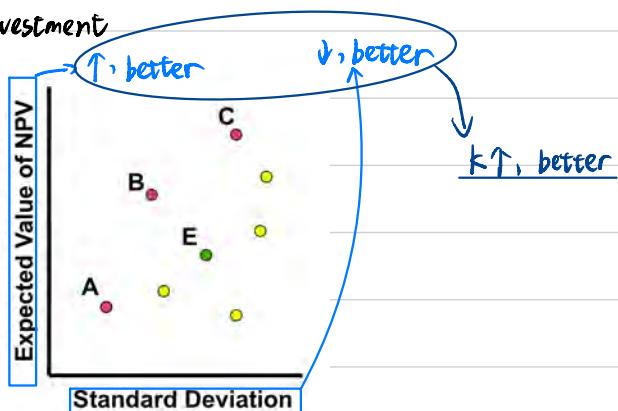
### ② Combinations of risky investment

#### E: Existing Projects

##### 8 Combinations

E	E + 1	E + 1 + 2
E + 1	E + 1 + 2	E + 1 + 3
E + 2	E + 1 + 3	E + 2 + 3
E + 3	E + 2 + 3	
<b>E + 1 + 2 + 3</b>		

A, B, and C are dominating combinations from the eight possible.



## 3. Managerial (Real) Options

### ① Definition: The management rights to adjust the original project decision.

### ② Option value

without option

$$\text{Project worth} = \text{NPV} + \text{Option value}$$

the uncertainty of project ↑, the option value ↑  
risk

with option

### ③ Types

#### a. Expand / Contract

Conditions become  
favorable  $\Rightarrow$  expand  
unfavorable  $\Rightarrow$  contract

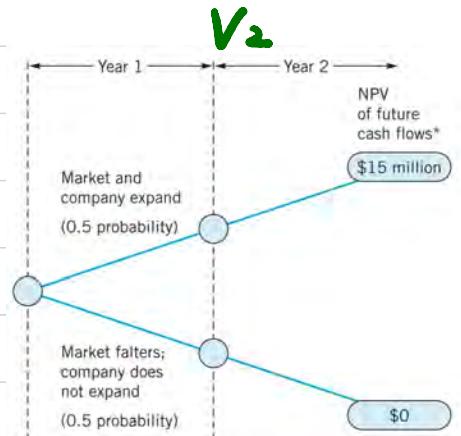
Have a chance to enlarge the market



$-V_1 + V_2 > -V_1$

use the expansion option

LOSS  $V_1$  +



\*NPV is calculated as of the end of year 2.

With option using =  $-V_1$

Without option using =  $(-V_1 + V_2)$

Option value =  $V_2$

### b. Abandon

Terminate the project early with an abandonment value (get)

YEAR 1		YEAR 2		
INITIAL PROBABILITY P(1)	CASH FLOW (IN MILLIONS)	CONDITIONAL PROBABILITY P(2 1)	CASH FLOW (IN MILLIONS)	JOINT PROBABILITY P(1,2)
0.25	\$1.0	0.25	\$0.0	0.0625
		0.50	1.0	0.1250
		1.00	2.0	0.0625
0.50	2.0	0.25	1.0	0.1250
		0.50	2.0	0.2500
		1.00	3.0	0.1250
0.25	3.0	0.25	2.0	0.0625
		0.50	3.0	0.1250
		0.25	3.5	0.0625
1.00	1.00			1.0000
Abandonment Value = 1.5				

If CF. =  $\$1.0$



Ab. value > PV(Node 1) →  
use the abandonment option

YEAR 1		YEAR 2			JOINT PROBABILITY P(1,2)
INITIAL PROBABILITY P(1)	CASH FLOW (IN MILLIONS)	CONDITIONAL PROBABILITY P(2 1)	CASH FLOW (IN MILLIONS)		
0.25	\$2.5 <sup>b</sup>	1.00	\$0.0	0.2500	0.2500
0.50	2.0	0.25	1.0	0.1250	0.1250
		0.50	2.0	0.2500	0.2500
		0.25	3.0	0.1250	0.1250
0.25	3.0	0.25	2.0	0.0625	0.0625
		0.50	3.0	0.1250	0.1250
		0.25	3.5	0.0625	0.0625
1.00	1.00			1.0000	1.0000

With option using =  $V_1$

Without option using =  $V_2$

Option value =  $V_2 - V_1$

### c. Postpone

Delay undertaking the project (Reduce risk via new information)

#### 4. Futures & Options

① **Futures:** A contract about future = Buy sth on a certain date at a certain price ;

buyer: obligation  
seller: obligation

② **Options:** An option right: Perform the futures with some rights .

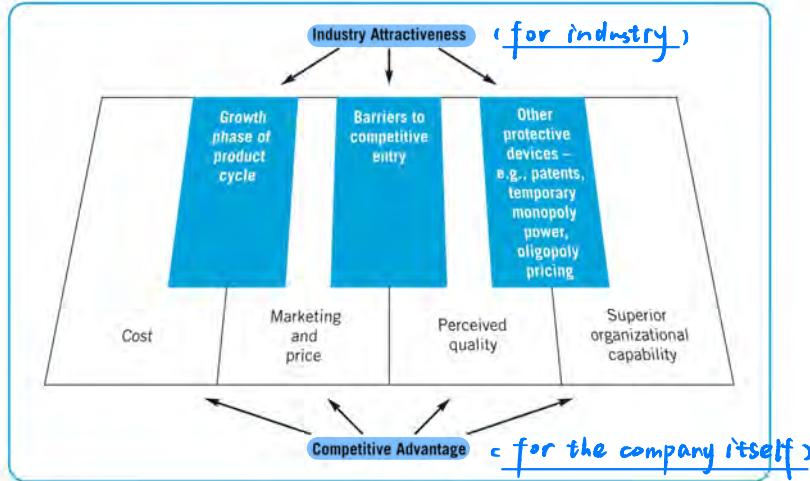
buyer: right  
seller: obligation

# (15) Required Return & the Cost of Capital

## 1. Creation of value

① Definition: excess return (the return on a project exceeds market required return)

② Sources: Industry attractiveness & Competitive advantage



## 2. Cost of capital

① Definition: the required rate of return (it is a weighted average)

Cost of capital is a kind of opportunity cost, not a practical investment cost. Here, we consider the required rate of return as the opportunity cost of capital.

### ② Computation:

$$WACC = W_d \cdot r_d \cdot (1-T) + W_p \cdot r_p + W_e \cdot r_e$$

weight: relative current market price proportion

Weighted Average Cost of Capital      Debt <sub>actual cost</sub>      Preferred Stock      Common Stock

#### a. Cost of debt

$$\Delta P_0 = \sum_{t=1}^n \frac{I_t}{(1+r_d)^t} + \frac{P_n}{(1+r_d)^n}$$

$P_0$ : Current market price when issuing ;  $I_t$  = Interest PMT in period  $t$  ;  $P_t$  = Principal in period  $t$

#### b. Cost of preferred stock

$$P_0 = \frac{\text{Div}}{r_p}$$

#### c. Cost of equity

##### △ Dividend discount model

$$\text{Constant growth: } P_0 = \frac{\text{Div}}{r_e - g}$$

$$\text{Growth phases: } P_0 = \sum P_{0p}$$

##### △ CAPM

$$r_e - r_f = \beta(r_m - r_f)$$

① They are estimates  
② They may not agree

D<sub>t</sub> future dividends

CAPM  $\left\{ \begin{array}{l} P \\ r_m \end{array} \right. \begin{array}{l} \text{historical data} \rightarrow \text{regression analysis} \\ \text{need to estimate} \end{array}$

#### d. Equivalent NPV

$$\Delta NPV = \sum_{t=0}^{\infty} \frac{CF_t}{(1+r_{WACC})^t}$$

$t=0$  include ICO  
 $t=1$  exclude TCD

$\Delta CF_t$ : Free cash flows to firm & FCF = Operating CF - Capital expenditure → the real benefit to shareholders

$$\Delta EBITDA = \text{Gross profit} - \text{operating cost} - \underline{\text{depreciation}} - \underline{\text{amortization}}$$

$$EBITDA = \text{Gross profit} - \text{operating cost}$$

#### ③ Limitations (WACC is based on ESTIMATION)

(r)      (w)

a. the project has the same risk & same capital structure as the firm's current operations; (project & firm)

b. the company maintains the capital structure. (firm itself)

#### ④ Adjustment: project-specific cost of capital

Capital Structure 不一样 → β不一样

#### a. Pure-play method: Find a different company with similar business risk as a benchmark

单项目

McDonald's has \$200M of debt and \$200M of equity in market value terms, the cost of debt is 5%, the cost of equity is 10%, and the tax rate is 20%. It wants to make a real investment of opening up new branches, which costs \$1M. It will finance \$500K by debt and \$500K by equity.

Instead of opening up new branches, McDonald's wants to start a new project of producing cars, which costs \$1M.

Start new project

use "cost's of another company return rates

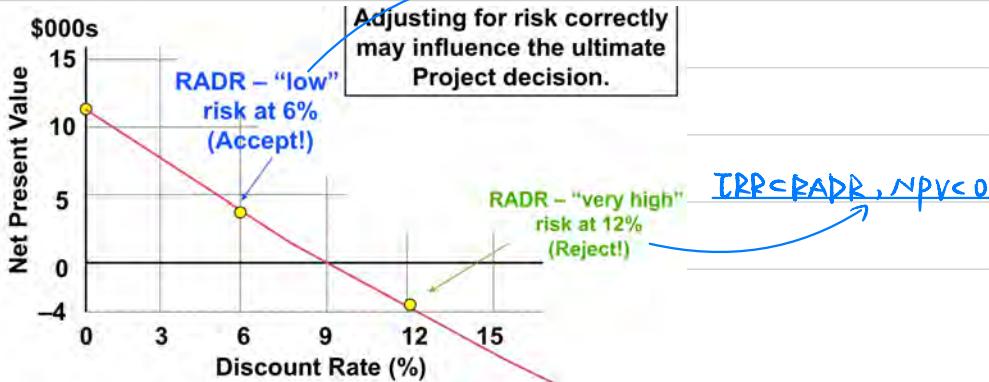
Tesla in the car industry has \$1000M of debt and \$1000M of equity in market value terms. According to estimation, its cost of debt is 4%, and its historical beta is 1.5. Current risk free rate is 2%, and market risk premium is expected to be 8%.

#### b. Subjective adjustment: Adjust the WACC to risk-adjusted discount rate RADR

Risk Level of Project	Discount Rate
Very Low Risk	WACC - 5%
Low Risk	WACC - 1%
Same Risk as Firm	WACC
High Risk	WACC + 3%
Very High Risk	WACC + 5%

#### Risk-Adjusted Discount Rate Approach

$\Delta RADR \& NPV$



### C. Adjustment to Initial Outlay (AOI) (Capital structure)

△ Definition: the costs associated with issuing securities (firm → project)

△ Computation:

$$NPV = \sum_{t=0}^n \frac{CF_t}{(1+k_{WACC})^t} - (ICO + F) \quad \text{Flotation cost} \rightarrow \text{op. fin. inv } R^2!$$

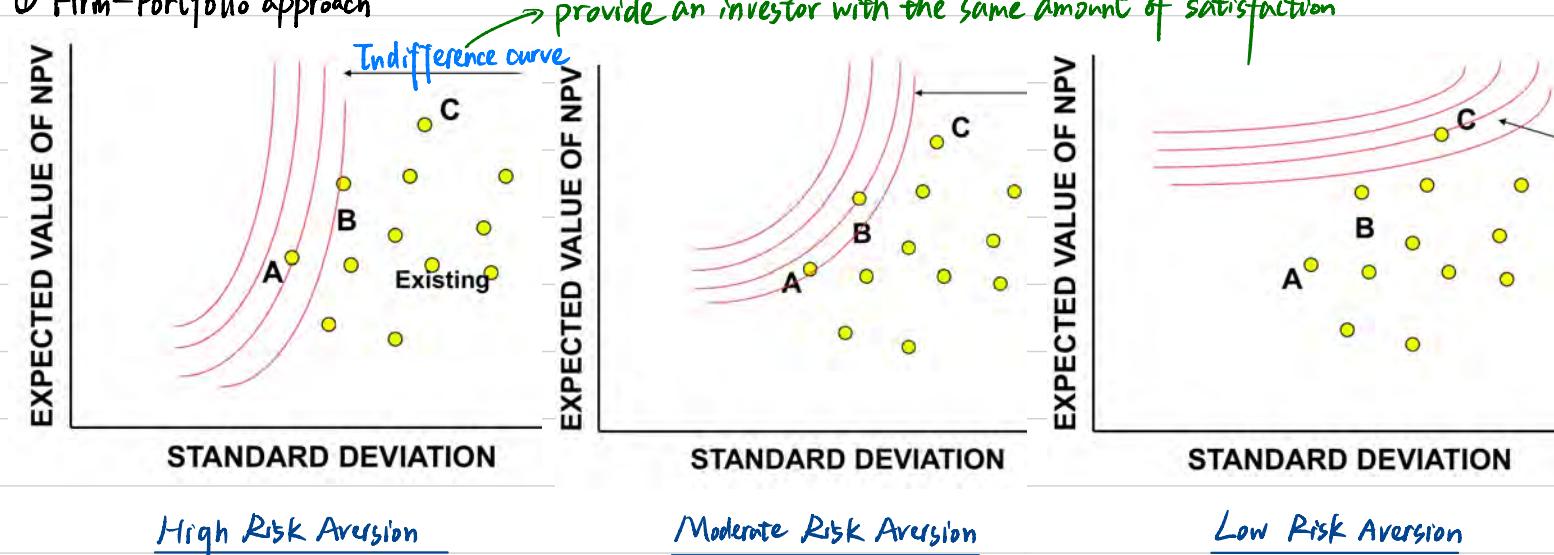
### d. Beta adjustment (Capital structure changes)

$$P_j = P_{ju} [1 + (D/E)(1 - T_c)] \quad \text{STEP: ① Unlever ② Relever}$$

$P_j$ : levered Beta;  $P_{ju}$ : unlevered Beta; D/E: Debt-to-Equity ratio;  $T_c$ : Corporate tax rate

### 3. Project evaluation based on total risk

#### ① Firm-Portfolio approach



#### 4. Appendix: Adjusted present value

① Two methods to evaluate projects considering the risk

WACC  
APV

② APV = Unlevered project value + Value of project financing

$$= (NPV \text{ from operation}) + (PV \text{ of tax shield} - \text{Flotation Cost})$$

$$= \left[ \sum_{t=1}^n \frac{CF_t}{(1+k_{WACC})^t} - ICO \right] + \left[ \sum_{t=1}^n \frac{T_c}{(1+k_d)^t} \cdot T_{inc} - F \right]$$

unlevered RRR  
After-tax CF

op + inv

fin