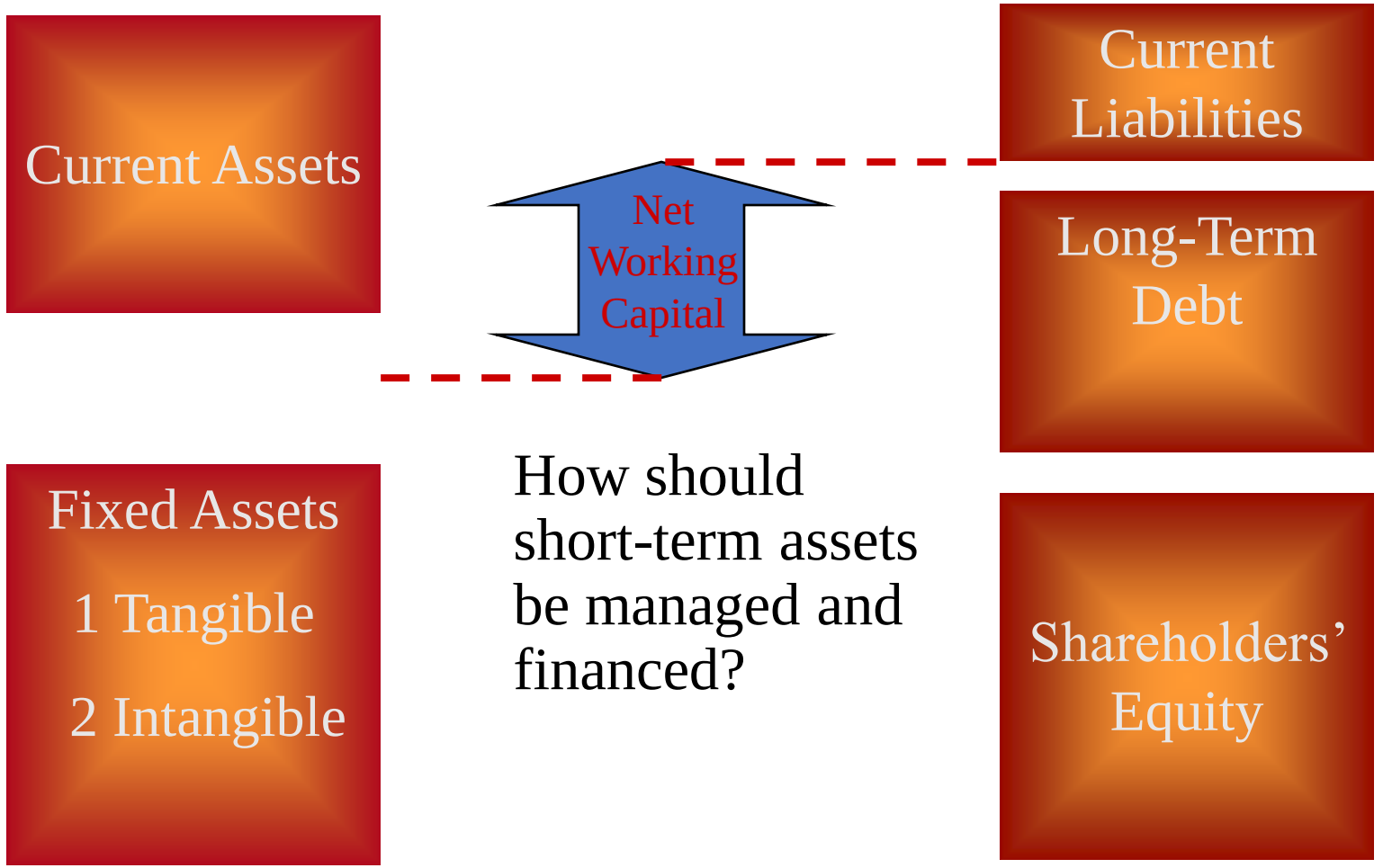
Corporate Finance, Fall 2022
Final Exam Review

- 期末考试：一共35个单选题，其中前面30个题每个3分，后面5个题每个2分，每个选择题是5选1.
- 考试范围：Chapter 1-11,13,15-19，以讲义为主
- 开卷考试，可以带任何纸质的材料，加一个简单的计算器
- 计算器一点要准备好

Chapter 1
Introduction to Corporate Finance

Short-Term Asset Management



Forms of Business Organization

- The Sole Proprietorship
- The Partnership
  - General Partnership
  - Limited Partnership
- The Corporation

The Goal of Financial Management

- What is the correct goal?
  - Maximize profit?
    - A company's important goal is to make money
    - Current profit vs. Future profit
    - Accounting profit vs. Free cash flow
  - Minimize costs?
    - To be profitable, companies must not only earn revenues, but also control costs.
  - Maximize market share?
    - Market share increases can allow a company to achieve greater scale in its operations and improve profitability.
  - **Maximize shareholder wealth?**
    - Stock Price vs. Stock Value

The Agency Problem

- Agency relationship
  - Principal hires an agent to represent his/her interest
  - Stockholders (principals) hire managers (agents) to run the company
- Agency problem
  - Conflict of interest between principal and agent

Chapter 2
Financial Statements and Cash Flow
财务报表与现金流量

2.1 The Balance Sheet （资产负债表）

- An accountant’s snapshot of the firm’s accounting value at a specific point in time
- The Balance Sheet Identity is:

  Assets ≡ Liabilities + Stockholder’s Equity

U.S. Composite Corporation Balance Sheet

U.S. CORPORATION
2011 and 2012 Balance Sheets
($ in millions)

Assets	2011	2012	Liabilities and Owners' Equity	2011	2012
Current assets			Current liabilities		
Cash	$ 104	$ 160	Accounts payable	$ 232	$ 266
Accounts receivable	455	688	Notes payable	196	123
Inventory	553	555	Total	$ 428	$ 389
Total	$1,112	$1,403			
Fixed assets					
Net plant and equipment	$1,644	$1,709	Long-term debt	$ 408	$ 454
			Owners' equity		
			Common stock and paid-in surplus	600	640
			Retained earnings	1,320	1,629
			Total	$1,920	$2,269
Total assets	$2,756	$3,112	Total liabilities and owners' equity	$2,756	$3,112

2.2 The Income Statement

- Measures financial performance over a specific period of time
- The accounting definition of income is:

$$\text{Revenue} - \text{Expenses} \equiv \text{Income}$$

Income Statement

U.S. CORPORATION 2012 Income Statement ($ in millions)		
Net sales		$1,509
Cost of goods sold		750
Depreciation		65
Earnings before interest and taxes		$ 694
Interest paid		70
Taxable income		$ 624
Taxes (34%)		212
Net income		$ 412
Dividends	$103	
Addition to retained earnings	309	

2.3 Taxes

- The one thing we can rely on with taxes is that they are always changing
- Marginal vs. average tax rates
  - Marginal – the percentage paid on the next dollar earned
  - Average – the tax bill / taxable income

Marginal versus Average Rates

- Suppose your firm earns $11 million in taxable income.
  - What is the firm's tax liability?
  - What is the average tax rate?
  - What is the marginal tax rate?
- If you are considering a project that will increase the firm's taxable income by $1 million, what tax rate should you use in your analysis?

Taxable Income	Tax Rate
$ 0– 50,000	15%
50,001– 75,000	25
75,001– 100,000	34
100,001– 335,000	39
335,001–10,000,000	34
10,000,001–15,000,000	35
15,000,001–18,333,333	38
18,333,334+	35

- Tax liability:. 15(50,000) + .25(75,000 – 50,000) + .34(100,000 – 75,000) + .39(335,000 – 100,000) + .34(10,000,000 – 335,000) + 0.35 (11,000,000 – 10,000,000) = 3750000
- Average rate: 3750000 / 11,000,000 = .3409 or 34%
  Marginal rate comes from the table, and it is 35%

2.4 Net Working Capital

- Net Working Capital = Current Assets – Current Liabilities

- Net working capital is positive when current assets are greater than current liabilities. This means the cash that will become available over the next 12 months will be greater than the cash that must be paid out.
- In addition to investing in fixed assets (i.e., capital spending), a firm can invest in net working capital. This is called the change in net working capital

2.5 Financial Cash Flow

- **Cash flow from assets** (**CF(A)**) involves three components: operating cash flow, capital spending, and change in net working capital

- **CFFA** = **Free Cash** Flow, refers to cash that the firm is free to distribute to creditors and stockholders because it is not needed for working capital or fixed asset investments

- Since there is no magic in finance, it must be the case that the cash flow received from the firm's assets must equal the cash flows to the firm's creditors and stockholders

$$CF(A) \equiv CF(B) + CF(S)$$

Example: Corporation

Balance Sheet					
Assets			**Liabiities & Owners' Equity**		
	2011	2012		2011	2012
Current Assets			Current Liabilities		
Cash	$104	$160	Accounts Payable	$232	$266
Accounts Receivable	455	688	Notes Payable	196	123
Inventory	553	555	Total	$428	$389
Total	$1,112	$1,403			
Fixed Assets					
Net Fixed assets	$1,644	$1,709	Long-term debt	$408	$454
			Owners' equity		
			Common stock and		
			paid-in surplus	600	640
			Retained earnings	1,320	1,629
			Total	$1,920	$2,269
Total assets	$2,756	$3,112	Total Liabilties & Owners Equity	$2,756	$3,112

U.S. Corporation		
Income Statement		
Net sales		$1,509
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- **CFFA = OCF – NCS - ΔNWC**

  OCF = EBIT + depreciation – taxes

  = $694 + 65 – 212 = **$547**

  NCS = ending net FA– beginning net FA + depreciation

  = $1709 – 1644 + 65 = **$130**

  ΔNWC = ending NWC – beginning NWC

  = ($1403 – 389) – ($1112 – 428) = **$330**
- **CFFA = 547 – 130 – 330 = $87**
- **Cash flow to creditor = Interest payment – Net borrowing = 70 – (454-408) = 24**
- **Cash flow to stock holder = dividend – net new equity = 103 – (640-600) = 63**

Cash Flow

I. The cash flow identity

Cash flow from assets = Cash flow to creditors (bondholders)
+ Cash flow to stockholders (owners)

II. Cash flow from assets

Cash flow from assets = Operating cash flow
− Net capital spending
− Change in net working capital (NWC)

where:

Operating cash flow = Earnings before interest and taxes (EBIT)
+ Depreciation − Taxes

Net capital spending = Ending net fixed assets − Beginning net fixed assets
+ Depreciation

Change in NWC = Ending NWC − Beginning NWC

III. Cash flow to creditors (bondholders)

Cash flow to creditors = Interest paid − Net new borrowing

IV. Cash flow to stockholders (owners)

Cash flow to stockholders = Dividends paid − Net new equity raised

Chapter 3

Financial Statements Analysis and Long-Term Planning

财务报表分析与财务模型

3.1 Financial Statements Analysis

- Common-Size Balance Sheets （共同比资产负债表）
  - Compute all accounts as a percent of total assets
- Common-Size Income Statements （共同比利润表）
  - Compute all line items as a percent of sales
- Standardized statements make it easier to compare financial information, particularly as the company grows.
- They are also useful for comparing companies of different sizes, particularly within the same industry.

Prufrock Corporation
Balance Sheets

	2011	2012
Assets		
Current assets		
Cash	$ 84	$ 98
Accounts receivable	165	188
Inventory	393	422
Total	$ 642	$ 708
Fixed assets		
Net plant and equipment	$2,731	$2,880
Total assets	$3,373	$3,588
Liabilities and Owners' Equity		
Current liabilities		
Accounts payable	$ 312	$ 344
Notes payable	231	196
Total	$ 543	$ 540
Long-term debt	$ 531	$ 457
Owners' equity		
Common stock and paid-in surplus	$ 500	$ 550
Retained earnings	1,799	2,041
Total	$2,299	$2,591
Total liabilities and owners' equity	$3,373	$3,588

Prufrock Corporation
Common-Size Balance Sheets

84 / 3,373 = 2.5%

2.7% - 2.5% = 0.2%

	2011	2012	Change
Assets			
Current assets			
Cash	2.5%	2.7%	+ .2%
Accounts receivable	4.9	5.2	+ .3
Inventory	11.7	11.8	+ .1
Total	19.1	19.7	+ .6
Fixed assets			
Net plant and equipment	80.9	80.3	− .6
Total assets	100.0%	100.0%	.0%
Liabilities and Owners' Equity			
Current liabilities			
Accounts payable	9.2%	9.6%	+ .4%
Notes payable	6.8	5.5	− 1.3
Total	16.0	15.1	− .9
Long-term debt	15.7	12.7	− 3.0
Owners' equity			
Common stock and paid-in surplus	14.8	15.3	+ .5
Retained earnings	53.3	56.9	+ 3.6
Total	68.1	72.2	+ 4.1
Total liabilities and owners' equity	100.0%	100.0%	.0%

PRUFROCK CORPORATION
2012 Income Statement

Sales		$2,311
Cost of goods sold		1,344
Depreciation		276
Earnings before interest and taxes		$ 691
Interest paid		141
Taxable income		$ 550
Taxes (34%)		187
Net income		$ 363
Dividends	$121	
Addition to retained earnings	242	

PRUFROCK CORPORATION

Common-Size Income Statement 2012

Sales		100.0%
Cost of goods sold		58.2
Depreciation		11.9
Earnings before interest and taxes		29.9
Interest paid		6.1
Taxable income		23.8
Taxes (34%)		8.1
Net income		15.7%
Dividends	5.2%	
Addition to retained earnings	10.5	

1,344 / 2311 = 58.2%

Tells us what happened to each dollar of sales

Categories of Financial Ratios

- Short-term solvency or liquidity ratios （短期流动能力和偿债指标）
- Long-term solvency or financial leverage ratios （长期偿债能力指标）
- Asset management or turnover ratios （资产管理或资金周转指标）
- Profitability ratios （盈利性指标）
- Market value ratios （市场价值指标）

Liquidity Ratios

PRUFROCK Balance Sheet -2012					
ASSETS			Liabilities & Owners Equity		
Current Assets			Current Liabilities		
Cash	$	98	Accounts Payable	$	344
Accounts Receivable	$	188	Notes Payable	$	196
Inventory	$	422	Total	$	540
Total	$	708	Long term debt	$	457
			Owners' Equity		
			Common Stock and paid in surplus	$	550
Fixed Assets			Retained Earnings	$	2,041
Net Plant & Equipment	$	2,880	Total	$	2,591
Total Asets	$	3,588	Total Liabilties & Owners' Equity	$	3,588

- **Current Ratio （流动比率）** = CA / CL
  - 708 / 540 = 1.31 times
- **Quick Ratio （速动比率）** = (CA – Inventory) / CL
  - Acid Test Ratio
  - (708-422) / 540 = 0.53 times
- **Cash Ratio （现金比率）** = Cash / CL
  - 98/ 540 = .18 times

Financial Leverage Ratios

PRUFROCK Balance Sheet -2012							
ASSETS				Liabilities & Owners Equity			
Current Assets				Current Liabilities			
	Cash	$	98		Accounts Payable	$	344
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	Net Plant & Equipment	$	2,880		Total	$	2,591
Total Asets		$	3,588	Total Liabilties & Owners' Equity		$	3,588

- **Total Debt Ratio （负债比率）** = (TA – TE) / TA
  - (3588-2,591) / 3588 = 0.28 times
- **Debt/Equity （负债权益比）** = TD / TE
  - (0.28/0.72) = 0.39 times
- **Equity Multiplier （权益乘数）** = TA/TE = 1 + D/E
  - ($1 /0.72) = 1.39

Financial Leverage Ratios

PRUFROCK Income Statement - 2012		
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Addition to RE	$	242

- **Times Interest Earned （利息倍数）** = EBIT / Interest
  - 691/141 = 4.9 times
- **Cash Coverage （现金对利息的保障倍数）** = (EBIT + Deprec) / Interest
  - (691 + 276) / 141 = 6.9 times

Asset Management: Inventory Ratios

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- **Inventory Turnover （库存周转率）** = COGS / Inventory
  - 1344/422 = 3.2 times
- **Days' Sales in Inventory （库存周转天数）**

  = 365 / Inventory Turnover = 365 / 3.2= 114 days

Asset Management: Receivables Ratios

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- **Receivables Turnover （应收账款周转率）** = Sales / Accounts Receivable = 2311/188 = 12.3 times
- **Days' Sales in Receivables （应收账款周转天数）**

  = 365 / Receivables Turnover = 365 / 12.3 = 30 days

Asset Management: Asset Turnover Ratios

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- **Total Asset Turnover （总资产周转率）**

  = Sales / Total Assets = 2311/3588 = 0.64 times

Profitability Measures 盈利性指标

PRUFROCK
Balance Sheet -2012

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- **Profit Margin （销售利率率）** = NI / Sales
  - 363/2311 = 15.7%
- **Return on Assets (ROA) 资产收益率** = NI / TA
  - 363/3588 = 10.12%
- **Return on Equity (ROE) 权益收益率** = NI / TE
  - 363 / 2591 = 14.01%
- **EBITDA Margin 息税、折旧及摊销前利润率** = EBITDA / Sales
  - 967 / 2311 = 41.8%

Market Value Measures 市场价值的度量指标

- Market Price = $88 per share = PPS
- Shares outstanding = 33 million

- **Earnings per Share** = EPS = 363/33 = $11
- **PE Ratio (price-earnings ratio, 市盈率)** = PPS / EPS
  - $88 / $11 = 8 times
- **Price/Sales Ratio** = PPS/Sales per share
  - $88/($2,311/33) = 1.26
- **Market-to-book ratio (市值账面比，市净率）**

  = PPS / Book value per share
  - Book value per share = Total Equity/shares outstanding

    = $2,591/33 = $78.52
  - Market-to-Book = $88/78.52 = 1.12 times

3.3 The DuPont Identity 杜邦恒等式

- **ROE = NI / TE** = Basic Formula

  权益收益率 = 净利润/总权益
- **ROE = PM * TAT * EM** = Dupont Identity
  - PM = Net Income / Sales
  - TAT = Sales / Total Assets
  - EM = Total Assets / Total Equity

$$\text{ROE} = \left(\frac{\text{NI}}{\text{Sales}}\right) \times \left(\frac{\text{Sales}}{\text{TA}}\right) \times \left(\frac{\text{TA}}{\text{TE}}\right) = \frac{\text{NI}}{\text{TE}}$$

ROE = Profit Margin * Total Asset Turnover * Equity Multiplier

权益收益率 = 销售利润率*总资产周转率*权益乘数

Using the Du Pont Identity

- **ROE = PM * TAT * EM**
  - **Profit margin**
    - Measures firm's operating efficiency
    - How well does it control costs
  - **Total asset turnover**
    - Measures the firm's asset use efficiency
    - How well does it manage its assets
  - **Equity multiplier**
    - Measures the firm's financial leverage
    - EM = TA/TE = 1+D/E ratio

Chapter 4

Discounted Cash Flow Valuation

Compound interest

- The general formula for the future value of an investment over many periods can be written as:

$$FV = C_0 \times (1 + r)^T$$

Where

C_0 is cash flow at date 0,

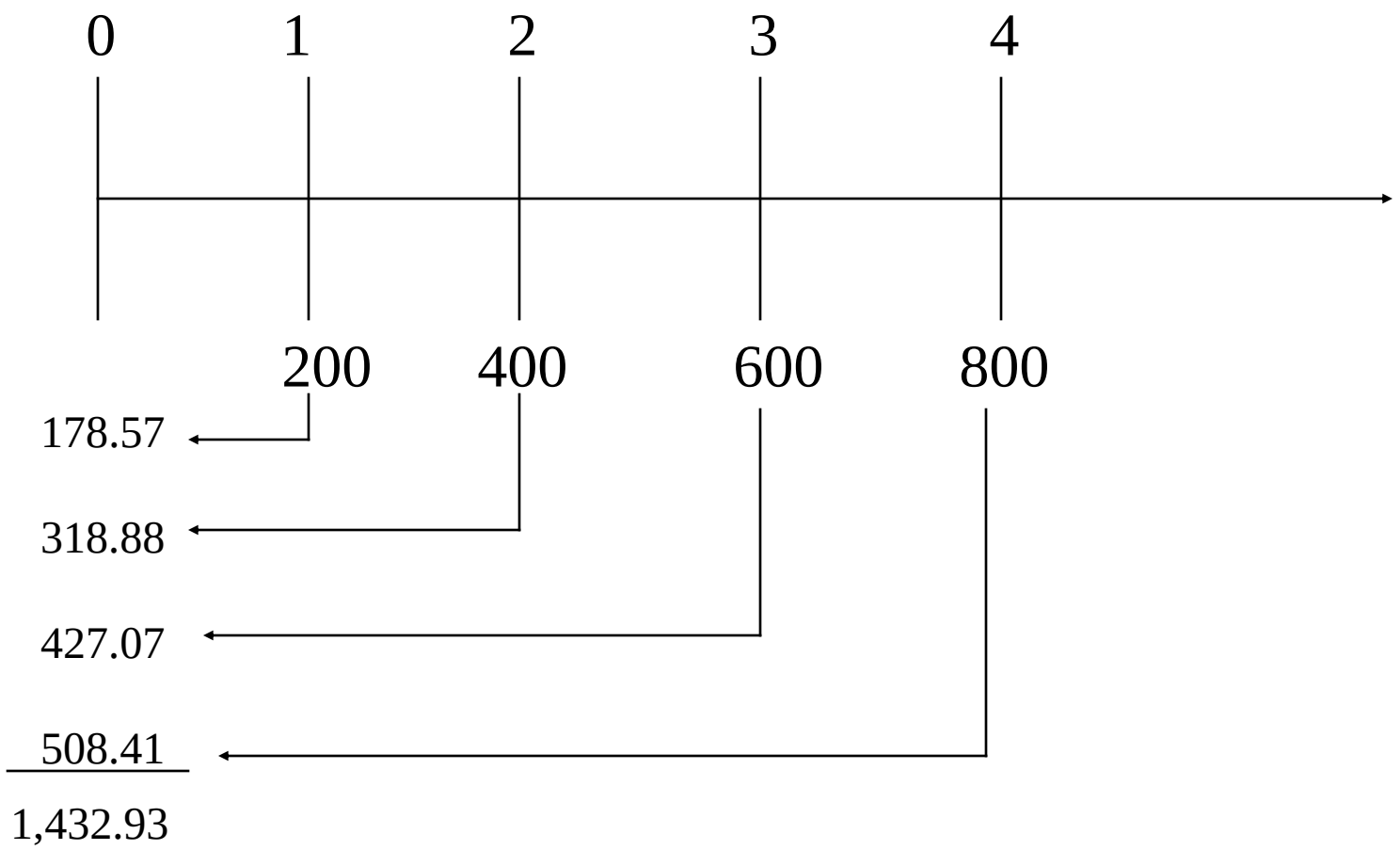
r is the appropriate interest rate, and

T is the number of periods over which the cash is invested.

Multiple Cash Flows

- Consider an investment that pays $200 one year from now, with cash flows increasing by $200 per year through year 4. If the interest rate is 12%, what is the present value of this stream of cash flows?
- If the issuer offers this investment for $1,500, should you purchase it?

Multiple Cash Flows



Present Value < Cost → Do Not Purchase

4.3 Compounding Periods

Compounding an investment m times a year for T years provides for future value of wealth:

$$FV = C_0 \times \left(1 + \frac{r}{m}\right)^{m \times T}$$

Effective Annual Rates of Interest

- Find the Effective Annual Rate (EAR) of an 18% APR loan that is compounded monthly.
- What we have is a loan with a monthly interest rate rate of 1½%.
- This is equivalent to a loan with an annual interest rate of 19.56%.

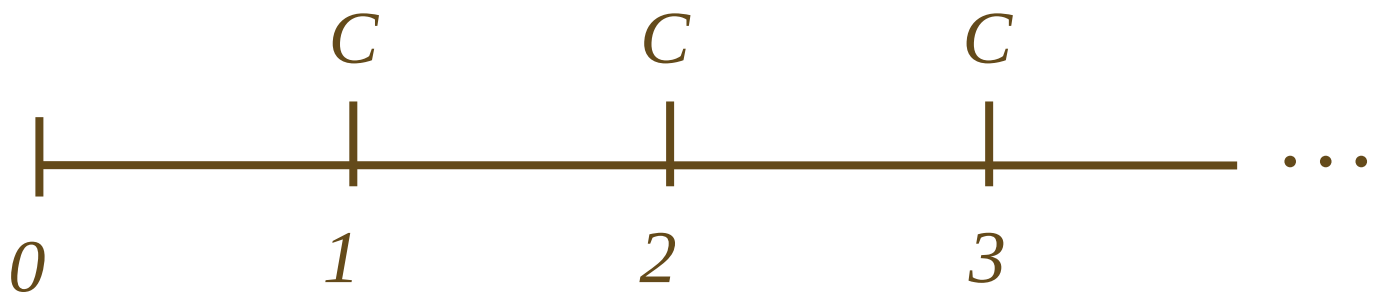
$$\left(1+\frac{r}{m}\right)^{m} = \left(1+\frac{.18}{12}\right)^{12} = (1.015)^{12} = 1.1956$$

4.4 Simplifications

- Perpetuity
  - A constant stream of cash flows that lasts forever
- Growing perpetuity
  - A stream of cash flows that grows at a constant rate forever
- Annuity
  - A stream of constant cash flows that lasts for a fixed number of periods
- Growing annuity
  - A stream of cash flows that grows at a constant rate for a fixed number of periods

Perpetuity

A constant stream of cash flows that lasts forever

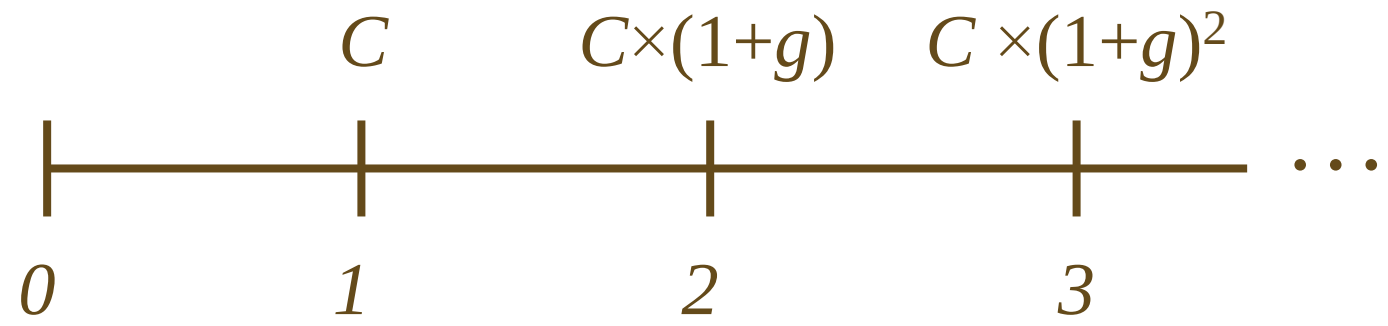


$$PV = \frac{C}{(1+r)} + \frac{C}{(1+r)^2} + \frac{C}{(1+r)^3} + \cdots$$

$$PV = \frac{C}{r}$$

Growing Perpetuity

A growing stream of cash flows that lasts forever

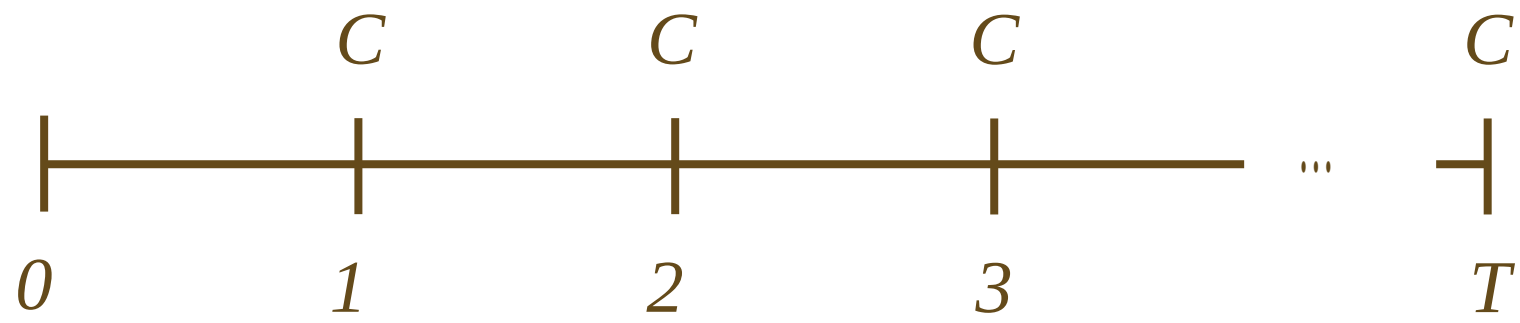


$$PV = \frac{C}{(1+r)} + \frac{C \times (1+g)}{(1+r)^2} + \frac{C \times (1+g)^2}{(1+r)^3} + \cdots$$

$$PV = \frac{C}{r-g}$$

Annuity

A constant stream of cash flows with a fixed maturity

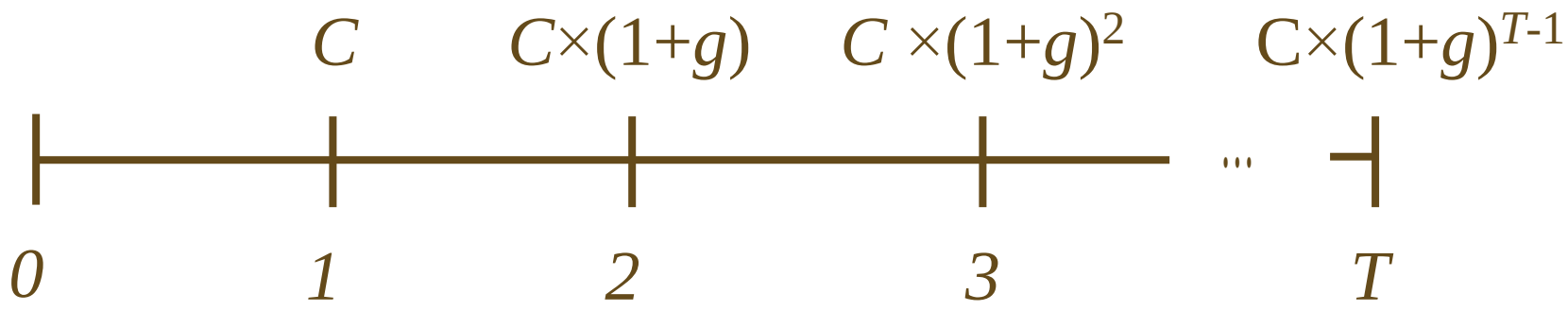


$$PV = \frac{C}{(1+r)} + \frac{C}{(1+r)^2} + \frac{C}{(1+r)^3} + \cdots \frac{C}{(1+r)^T}$$

$$PV = \frac{C}{r}\left[1 - \frac{1}{(1+r)^T}\right]$$

Growing Annuity

A growing stream of cash flows with a fixed maturity



$$PV = \frac{C}{(1+r)} + \frac{C \times (1+g)}{(1+r)^2} + \cdots + \frac{C \times (1+g)^{T-1}}{(1+r)^T}$$

$$PV = \frac{C}{r-g}\left[1 - \left(\frac{1+g}{(1+r)}\right)^T\right]$$

Chapter 5

Net Present Value and Other Investment Rules

5.1 The Net Present Value (NPV) Rule

- Net Present Value (NPV) =

  Total PV of future CF’s - Initial Investment

- Estimating NPV:
  1. Estimate future cash flows: how much? and when?
  2. Estimate discount rate
  3. Estimate initial costs
- Minimum Acceptance Criteria: Accept if NPV > 0
- Ranking Criteria: Choose the highest NPV

Net Present Value

Sum of the PVs of all cash flows

$$NPV = \sum_{t=0}^{n} \frac{CF_t}{(1+R)^t}$$

NOTE: t=0

Initial cost often is CF_0 and is an outflow.

$$NPV = \sum_{t=1}^{n} \frac{CF_t}{(1+R)^t} - CF_0$$

5.2 The Payback Period Method

- How long does it take the project to “pay back” its initial investment?
- Payback Period = number of years to recover initial costs
- Minimum Acceptance Criteria:
  - Set by management
- Ranking Criteria:
  - Set by management

Computing Payback for the Project

Capital Budgeting Project

Year	CF	Cum. CFs
0	$ (165,000)	$ (165,000)
1	$ 63,120	$ (101,880)
2	$ 70,800	$ (31,080)
3	$ 91,080	$ 60,000

Payback = year 2 +
+ (31080/91080)

Payback = 2.34 years

- ***Do we accept or reject the project?***

5.3 The Discounted Payback Period

- How long does it take the project to “pay back” its initial investment, taking the time value of money into account?
- Decision rule: Accept the project if it pays back on a discounted basis within the specified time.
- By the time you have discounted the cash flows, you might as well calculate the NPV.

5.4 The Internal Rate of Return

- IRR: the discount rate that sets NPV to zero
- Minimum Acceptance Criteria:
  - Accept if the IRR exceeds the required return
- Ranking Criteria:
  - Select alternative with the highest IRR
- Reinvestment assumption:
  - All future cash flows are assumed to be reinvested at the IRR

Mutually Exclusive vs. Independent

- Mutually Exclusive Projects: only ONE of several potential projects can be chosen, e.g., acquiring an accounting system.
  - RANK all alternatives, and select the best one.

- Independent Projects: accepting or rejecting one project does not affect the decision of the other projects.
  - Must exceed a MINIMUM acceptance criteria

IRR & Non-Conventional Cash Flows

- “Non-conventional”
  - Cash flows change sign more than once
  - Most common:
    - Initial cost (negative CF)
    - A stream of positive CFs
    - Negative cash flow to close project.
    - For example, nuclear power plant
  - More than one IRR ….
  - Which one do you use to make your decision?

5.6 The Profitability Index (PI)

$$PI = \frac{\text{Total PV of Future Cash Flows}}{\text{Initial Investent}}$$

- Minimum Acceptance Criteria:
  - Accept if PI > 1

- Ranking Criteria:
  - Select alternative with highest PI

Chapter 6

Making Capital Investment Decisions
投资决策

Relevant Cash Flows

- Include only cash flows that will only occur if the project is accepted
- Incremental cash flows 增量现金流量
  - These cash flows are the changes in the firm's cash flows that occur as a direct consequence of accepting the project
- The *stand-alone principle* allows us to analyze each project in isolation from the firm simply by focusing on incremental cash flows

Relevant Cash Flows:
Incremental Cash Flow for a Project

Corporate cash flow with the project

Minus

Corporate cash flow without the project

Relevant Cash Flows

- "Sunk" Costs 沉没成本…… N
  - A cost that has already been incurred and cannot be removed and therefore should not be considered in an investment decision.
- Opportunity Costs 机会成本…… Y
  - The most valuable alternative that is given up if a particular investment is undertaken.
- Side Effects副效应……Y
  - Positive side effects (Synergy) 协同效应 – benefits to other projects (a new product increases the sales and, hence, the cash flows of existing products)
  - Negative side effects (Erosion) 侵蚀效应 – costs to other projects (a new project reduces the cash flows of existing projects)

Relevant Cash Flows

- Net Working Capital 净营运资本……. Y
  - The firm supplies working capital at the beginning and recovers it toward the end.
- Financing Costs 融资成本……. N
  - We generally don't include the cash flows associated with interest payments or principal on debt, dividends, or other financing costs in computing cash flows. Financing costs are reflected in the discount rate used to discount the project cash flows.
- Tax Effects 税收效应……. Y

Pro Forma Statements and Cash Flow

- Pro Forma Financial Statements

  Projects future operations

- Operating Cash Flow:

  OCF = EBIT + Depr – Taxes

  OCF = NI + Depr, if no interest expense

  OCF = (Sales – Costs)(1 – T) + Depreciation*T, if no interest expense

- Cash Flow From Assets:

  CFFA = OCF – NCS –ΔNWC

  NCS = Net capital spending

Depreciation & Capital Budgeting

- Use the schedule required by the IRS for tax purposes
- Depreciation = non-cash expense
  - Only relevant due to tax affects
- Depreciation tax shield 税盾= DT
  - D = depreciation expense
  - T = marginal tax rate

Computing Depreciation

- Straight-line depreciation 直线折旧法

  D = (Initial cost – salvage) / number of years

  Straight Line $\rightarrow$ Salvage Value

- MACRS (Modified accelerated cost recovery system) 加速折旧法

  Depreciate $\rightarrow$ 0

  Recovery Period = Class Life

  Multiply percentage in table by the initial cost

MACRS schedule

MACRS Depreciation Table			
Year	3-Year	5-Year	7-Year
1	33.33%	20.00%	14.29%
2	44.44%	32.00%	24.29%
3	14.82%	19.20%	17.49%
4	7.41%	11.52%	12.49%
5		11.52%	8.93%
6		5.76%	8.93%
7			8.93%
8			4.45%

MACRS schedule
(initial cost is $110,000)

Year	MACRS percent	Depreciation per year
1	.3333	.3333(110,000) D_1= $36,663
2	.4445	.4445(110,000) D_2= $48,895
3	.1481	.1481(110,000) D_3= $16,291
4	.0741	.0741(110,000) D_4= $8,151

After-Tax Salvage

- If the salvage value is different from the book value of the asset, then there is a tax effect
- Book value = initial cost – accumulated depreciation
- After-tax salvage = salvage – T(salvage – book value)

Tax Effect on Salvage

Net Salvage Cash Flow
= SP - (SP-BV)(T)

Where:

SP = Selling Price
BV = Book Value
T = Corporate tax rate

Chapter 7

Risk Analysis, Real Options, and Capital Budgeting

How To Handle Uncertainty

- **Sensitivity Analysis（敏感分析）** – What happens if certain variables are forecasted incorrectly?
- **Scenario Analysis （场景分析）** – What happens if a logical set of variables are forecasted incorrectly?
- **Simulation Analysis （蒙特卡罗模拟）** – Alternative results when a large number of different scenarios are proposed.
- **Break Even Analysis （盈亏平衡）** – What is the minimum level of sales (prices, costs) which still allows the project a non-negative NPV

Scenario Analysis

- What happens to the NPV under different cash flow scenarios?
- At the very least, look at:
  - Best case – high revenues, low costs
  - Worst case – low revenues, high costs
  - Then measure the range of possible outcomes
- Best case and worst case are not necessarily probable, but they can still be possible

Scenario Analysis

	Base	Lower	Upper
Unit Sales	6000	5500	6500
Price per unit	80	75	85
VC per unit	60	62	58
FC per year	50000	55000	45000
Sales	480000	412500	552500
VC	360000	341000	377000
FC	50000	55000	45000
Depreciation	40000	40000	40000
EBIT	30000	-23500	90500
Taxes	10200	-7990	30770
NI	19800	-15510	59730
OCF	59800	24490	99730

Sensitivity Analysis

- What happens to NPV when we change one variable at a time?
- This is a subset of scenario analysis where we are looking at the effect of specific variables on NPV
- The greater the volatility in NPV in relation to a specific variable, the larger the forecasting risk associated with that variable, and the more attention we want to pay to its estimation

Sensitivity Analysis

	Base	Lower	Upper
Unit Sales	6000	5500	6500
Price per unit	80	80	80
VC per unit	60	60	60
FC per year	50000	50000	50000
Sales	480000	440000	520000
VC	360000	330000	390000
FC	50000	50000	50000
Depreciation	40000	40000	40000
EBIT	30000	20000	40000
Taxes	10200	6800	13600
NI	19800	13200	26400
OCF	59800	53200	66400

Simulation Analysis

- Simulation is really just an expanded sensitivity and scenario analysis
- Monte Carlo simulation can estimate thousands of possible outcomes based on conditional probability distributions and constraints for each of the variables

Break-Even Analysis

- A common tool for analyzing the relationship between sales volume and profitability
- There are three common break-even measures:
  - Accounting break-even:

    sales volume at which NI = 0
  - Cash break-even:

    sales volume at which OCF = 0
  - Financial break-even:

    sales volume at which NPV = 0

Real Options

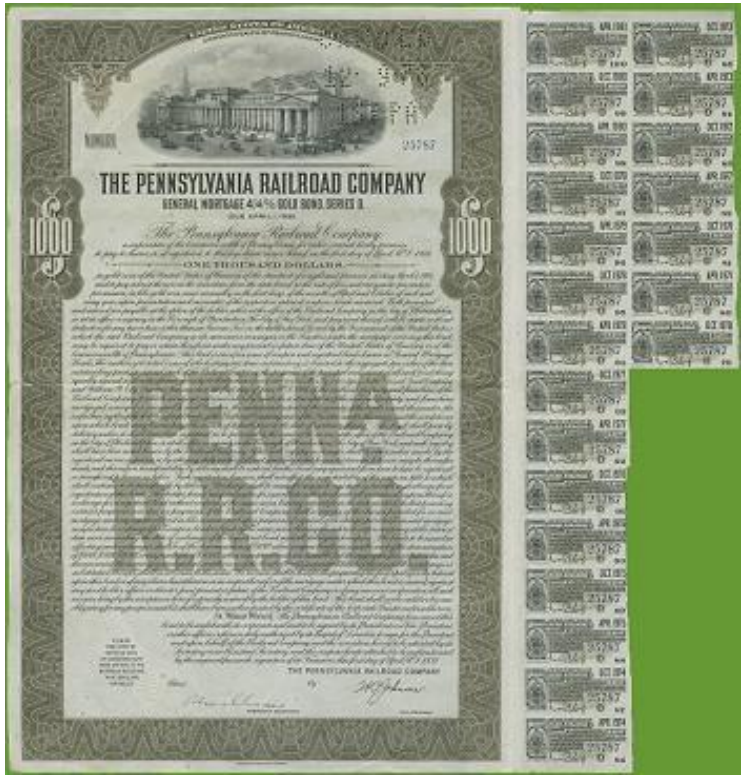
- The Option to Expand
  - Has value if demand turns out to be higher than expected
- The Option to Abandon
  - Has value if demand turns out to be lower than expected
- The Option to Delay
  - Has value if the underlying variables are changing with a favorable trend

Chapter 8

Interest Rates and Bond Valuation
利率与债券估值

8.1 Bonds and Bond Valuation

- A bond is a legally binding agreement between a borrower and a lender that specifies the:
  - Par (face) value 面值
  - Coupon rate 息票利率
  - Coupon payment 利息
  - Maturity Date 到期日
  - The yield to maturity (YTM) is the required market interest rate on the bond 到期收益率



Bond Valuation

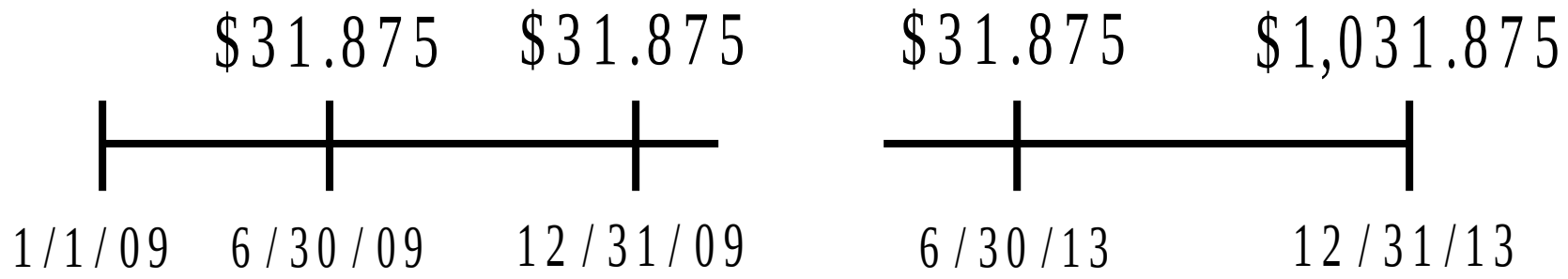
- Primary Principle:
  - Value of financial securities = PV of expected future cash flows
- Bond value is, therefore, determined by the present value of the coupon payments and par value.
- Interest rates are inversely related to present (i.e., bond) values.

The Bond-Pricing Equation

$$\text{Bond Value} = C\left[\frac{1 - \frac{1}{(1+r)^{T}}}{r}\right] + \frac{F}{(1+r)^{T}}$$

Bond Example

- Consider a U.S. government bond with as 6 3/8% coupon that expires in December 2013.
  - The *Par Value* of the bond is $1,000.
  - *Coupon payments* are made semiannually (June 30 and December 31 for this particular bond).
  - Since the *coupon rate* is 6 3/8%, the payment is $31.875.
  - On January 1, 2009 the size and timing of cash flows are:



Interest Rate Risk

- Price Risk
  - Change in price due to changes in interest rates
  - Long-term bonds have more price risk than short-term bonds
  - Low coupon rate bonds have more price risk than high coupon rate bonds.
- Reinvestment Rate Risk
  - Uncertainty concerning rates at which cash flows can be reinvested
  - High coupon rate bonds have more reinvestment rate risk than low coupon rate bonds.

After-tax Yields

- A taxable bond has a yield of 8%, and a municipal bond has a yield of 6%.
  - If you are in a 40% tax bracket, which bond do you prefer?
    - 8%(1 - .4) = 4.8%
    - The after-tax return on the corporate bond is 4.8%, compared to a 6% return on the municipal
  - At what tax rate would you be indifferent between the two bonds?
    - 8%(1 – T) = 6%
    - T = 25%

Bond Ratings – Investment Quality

- High Grade
  - Moody's Aaa and S&P AAA – capacity to pay is extremely strong
  - Moody's Aa and S&P AA – capacity to pay is very strong
- Medium Grade
  - Moody's A and S&P A – capacity to pay is strong, but more susceptible to changes in circumstances
  - Moody's Baa and S&P BBB – capacity to pay is adequate, adverse conditions will have more impact on the firm's ability to pay

8.3 Inflation and Interest Rates 通货膨胀与利率

- Real rate of interest – change in purchasing power
- Nominal rate of interest – quoted rate of interest, change in purchasing power and inflation
- The *ex ante* nominal rate of interest includes our desired real rate of return plus an adjustment for expected inflation.

Real versus Nominal Rates

- $(1 + R) = (1 + r)(1 + h)$, where
  - R = nominal rate
  - r = real rate
  - h = expected inflation rate
- Approximation
  - $R = r + h$

The Fisher Effect: Example

- If we require a 10% real return and we expect inflation to be 8%, what is the nominal rate?
- R = (1.1)(1.08) – 1 = .188 = 18.8%
- Approximation: R = 10% + 8% = 18%
- Because the real return and expected inflation are relatively high, there is a significant difference between the actual Fisher Effect and the approximation.

Chapter 9

Stock Valuation
股票估值

Stock Value = PV of Dividends

$$\hat{P}_0 = \frac{D_1}{(1+R)^1} + \frac{D_2}{(1+R)^2} + \frac{D_3}{(1+R)^3} + \ldots + \frac{D_\infty}{(1+R)^\infty}$$

$$\hat{P}_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+R)^t}$$

How can we estimate all future dividend payments?

Estimating Dividends: 3 Special Cases

- Zero Growth 零增长
  - Firm will pay a constant dividend forever
  - Like preferred stock
  - Price is computed using the perpetuity formula
- Constant dividend growth 固定增长
  - Firm will increase the dividend by a constant *percent* every period
- Nonconstant growth 变动增长
  - Dividend growth is not consistent initially, but settles down to constant growth eventually

Case 1: Zero Growth

- Assume that dividends will remain at the same level forever

$$\mathrm{Div}_1 = \mathrm{Div}_2 = \mathrm{Div}_3 = \cdots$$

  - Since future cash flows are constant, the value of a zero growth stock is the present value of a perpetuity:

$$P_0 = \frac{\mathrm{Div}_1}{(1+R)^1} + \frac{\mathrm{Div}_2}{(1+R)^2} + \frac{\mathrm{Div}_3}{(1+R)^3} + \cdots$$

$$P_0 = \frac{\mathrm{Div}}{R}$$

Case 2: Constant Growth

Assume that dividends will grow at a constant rate, g, forever, *i.e.*,

$$\mathrm{Div}_1 = \mathrm{Div}_0(1+g)$$

$$\mathrm{Div}_2 = \mathrm{Div}_1(1+g) = \mathrm{Div}_0(1+g)^2$$

$$\mathrm{Div}_3 = \mathrm{Div}_2(1+g) = \mathrm{Div}_0(1+g)^3$$

$$\vdots$$

Since future cash flows grow at a constant rate forever, the value of a constant growth stock is the present value of a growing perpetuity:

$$P_0 = \frac{\mathrm{Div}_1}{R-g}$$

Case 3: Differential Growth

- Assume that dividends will grow at different rates in the foreseeable future and then will grow at a constant rate thereafter.
- To value a Differential Growth Stock, we need to:
  - Estimate future dividends in the foreseeable future.
  - Estimate the future stock price when the stock becomes a Constant Growth Stock.
  - Compute the total present value of the estimated future dividends and future stock price at the appropriate discount rate.

Case 3: Differential Growth

We can value this as the sum of:

- a T-year annuity growing at rate g_1

$$P_A = \frac{C}{R - g_1}\left[1 - \frac{(1+g_1)^T}{(1+R)^T}\right]$$

- plus the discounted value of a perpetuity growing at rate g_2 that starts in year T+1

$$P_B = \frac{\left(\frac{\text{Div}_{T+1}}{R - g_2}\right)}{(1+R)^T}$$

Case 3: Differential Growth

Consolidating gives:

$$P = \frac{C}{R - g_1}\left[1 - \frac{(1+g_1)^T}{(1+R)^T}\right] + \frac{\left(\frac{\text{Div}_{T+1}}{R - g_2}\right)}{(1+R)^T}$$

Or, we can “cash flow” it out.

9.2 Estimates of Parameters

- The value of a firm depends upon its growth rate, *g*, and its discount rate, *R*.
  - Where does *g* come from?

g = Retention ratio × Return on retained earnings

$$\begin{array}{ccccccc} \text{Earnings next year} & = & \text{Earnings this year} & + & \text{Retained earnings this year} & \times & \text{Return on retained earnings} \\ & & & & \text{Increase in earnings} & & \end{array}$$

$$\frac{\text{Earnings next year}}{\text{Earnings this year}} = \frac{\text{Earnings this year}}{\text{Earnings this year}} + \left(\frac{\text{Retained earnings this year}}{\text{Earnings this year}}\right) \times \text{Return on retained earnings}$$

$$1 + g = 1 + \text{Retention ratio} \times \text{Return on retained earnings}$$

Estimating the Dividend Growth Rate

Another method for estimating the growth rate is to use the historical average:

Year	Dividend	Percent Change
2005	1.23	
2006	1.3	(1.30 – 1.23) / 1.23 = 5.7%
2007	1.36	(1.36 – 1.30) / 1.30 = 4.6%
2008	1.43	(1.43 – 1.36) / 1.36 = 5.1%
2009	1.5	(1.50 – 1.43) / 1.43 = 4.9%

Average = (5.7 + 4.6 + 5.1 + 4.9) / 4 = 5.1%

9.3 Growth Opportunities

- Growth opportunities are opportunities to invest in positive NPV projects.
- The value of a firm can be conceptualized as the sum of the value of a firm that pays out 100% of its earnings as dividends plus the net present value of the growth opportunities.

$$P = \frac{EPS}{R} + NPVGO$$

PE and NPVGO

- Recall, $$P = \frac{EPS}{R} + NPVGO$$
- Dividing every term by EPS provides the following description of the PE ratio:

$$PE = \frac{1}{R} + \frac{NPVGO}{EPS}$$

- So, a firm's PE ratio is positively related to growth opportunities and negatively related to risk (R)

Chapter 10

Risk and Return: Lessons from Market History
风险与收益：历史的启示

Stock Return

Return = Dividend + Change in Market Value

$$\text{percentage return} = \frac{\text{return}}{\text{beginning market value}}$$

$$= \frac{\text{dividend} + \text{change in market value}}{\text{beginning market value}}$$

$$= \text{dividend yield} + \text{capital gains yield}$$

Return Statistics

- The history of capital market returns can be summarized by describing the
  - average return

$$\overline{R} = \frac{(R_1 + \cdots + R_T)}{T}$$

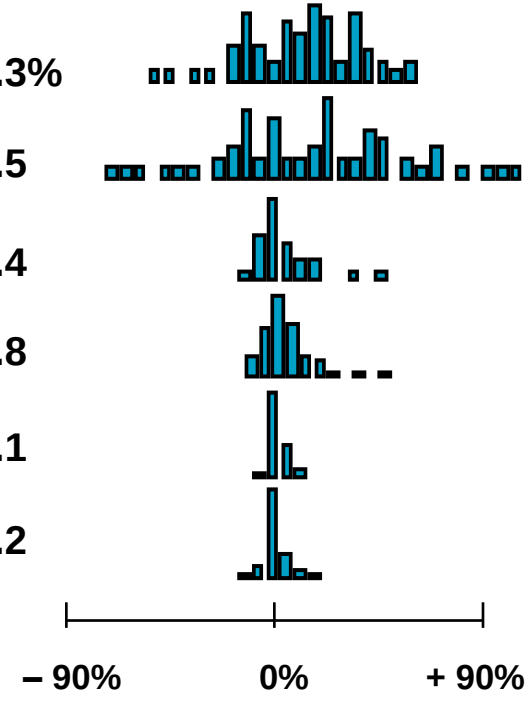
  - the standard deviation of those returns

$$SD = \sqrt{VAR} = \sqrt{\frac{(R_1 - \overline{R})^2 + (R_2 - \overline{R})^2 + \cdots (R_T - \overline{R})^2}{T - 1}}$$

  - the frequency distribution of the returns.

Historical Returns, 1926-2011

Series	Average Annual Return	Standard Deviation	Distribution
Large Company Stocks	11.8%	20.3%	
Small Company Stocks	16.5	32.5	
Long-Term Corporate Bonds	6.4	8.4	
Long-Term Government Bonds	6.1	9.8	
U.S. Treasury Bills	3.6	3.1	
Inflation	3.1	4.2	



Source: Global Financial Data (www.globalfinddata.com) copyright 2012.

Risk Premiums

- Risk-free rate:
  - Rate of return on a riskless investment
  - Treasury Bills are considered risk-free

- Risk premium:
  - Excess return on a risky asset over the risk-free rate
  - Reward for bearing risk

Return Variability:

The Statistical Tools for Historical Returns

- Return variance: ("T" =number of returns)

$$VAR(R) = \sigma^2 = \frac{\sum_{i=1}^{T} (R_i - \bar{R})^2}{T - 1}$$

- Standard Deviation:

$$SD(R) = \sigma = \sqrt{VAR(R)}$$

Chapter 11

Return and Risk: The Capital Asset Pricing Model (CAPM)

收益与风险：资本资产定价模型

Expected Returns

- The Expected return, E(R), is a weighted average of outcomes in different states

$$E(R) = \sum_{i=1}^{n} p_i R_i$$

Variance

- Variance, σ^2, is measured different from before
- It is now the assets weighted average squared deviation from the expected return
- As before, the larger the variance, the wider the spread of possible returns

Variance

$$\sigma^2 = \sum_{i=1}^{n} p_i (R_i - E(R))^2$$

11.3 The Return and Risk for Portfolios

Scenario	Stock Fund Rate of Return	Stock Fund Squared Deviation	Bond Fund Rate of Return	Bond Fund Squared Deviation
Recession	-7%	0.0324	17%	0.0100
Normal	12%	0.0001	7%	0.0000
Boom	28%	0.0289	-3%	0.0100
Expected return	11.00%		7.00%	
Variance	0.0205		0.0067	
Standard Deviation	14.3%		8.2%	

Note that stocks have a higher expected return than bonds and higher risk. Let us turn now to the risk-return tradeoff of a portfolio that is 50% invested in bonds and 50% invested in stocks.

Portfolios

	Rate of Return			
Scenario	*Stock fund*	*Bond fund*	*Portfolio*	*squared deviation*
Recession	-7%	17%	5.0%	0.0016
Normal	12%	7%	9.5%	0.0000
Boom	28%	-3%	12.5%	0.0012
Expected return	11.00%	7.00%	9.0%	
Variance	0.0205	0.0067	0.0010	
Standard Deviation	14.31%	8.16%	3.08%	

The *expected* rate of return on the portfolio is a weighted average of the *expected* returns on the securities in the portfolio.

$$E(r_P) = w_B E(r_B) + w_S E(r_S)$$

$$9\% = 50\% \times (11\%) + 50\% \times (7\%)$$

Portfolios

	Rate of Return			
Scenario	*Stock fund*	*Bond fund*	*Portfolio*	*squared deviation*
Recession	-7%	17%	5.0%	0.0016
Normal	12%	7%	9.5%	0.0000
Boom	28%	-3%	12.5%	0.0012
Expected return	11.00%	7.00%	9.0%	
Variance	0.0205	0.0067	0.0010	
Standard Deviation	14.31%	8.16%	3.08%	

The variance of a portfolio is **NOT** the weighted average of the variances of the individual assets

Computing a Portfolio's Variance and Volatility

- For a two security portfolio:

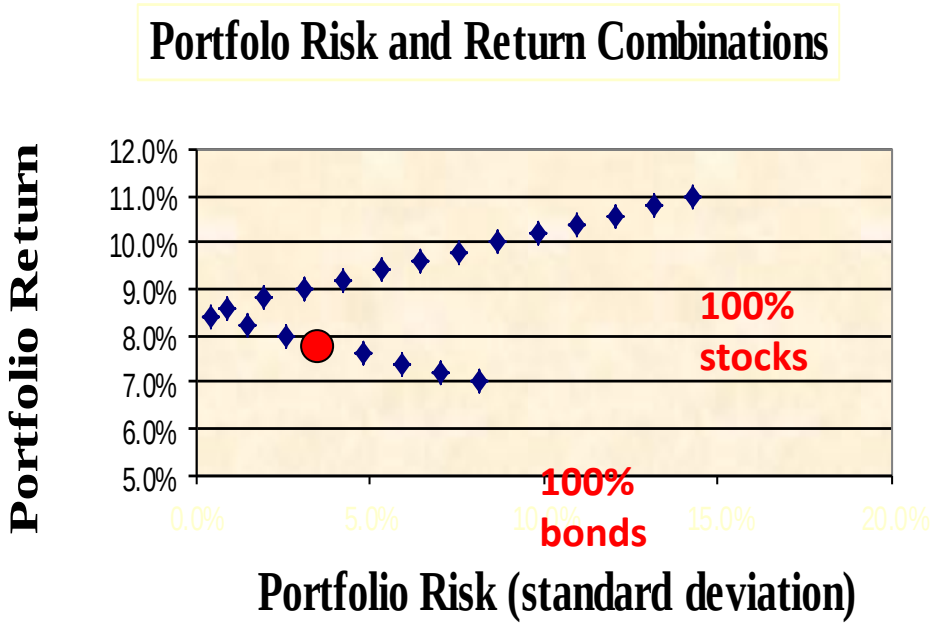
$$\begin{aligned} Var(R_P) &= Cov(R_P, R_P) \\ &= Cov(x_1R_1 + x_2R_2, x_1R_1 + x_2R_2) \\ &= x_1x_1Cov(R_1,R_1) + x_1x_2Cov(R_1,R_2) + x_2x_1Cov(R_2,R_1) + x_2x_2Cov(R_2,R_2) \end{aligned}$$

- The Variance of a Two-Stock Portfolio

$$Var(R_P) = x_1^2Var(R_1) + x_2^2Var(R_2) + 2x_1x_2Cov(R_1,R_2)$$

11.4 The Efficient Set for Two Assets

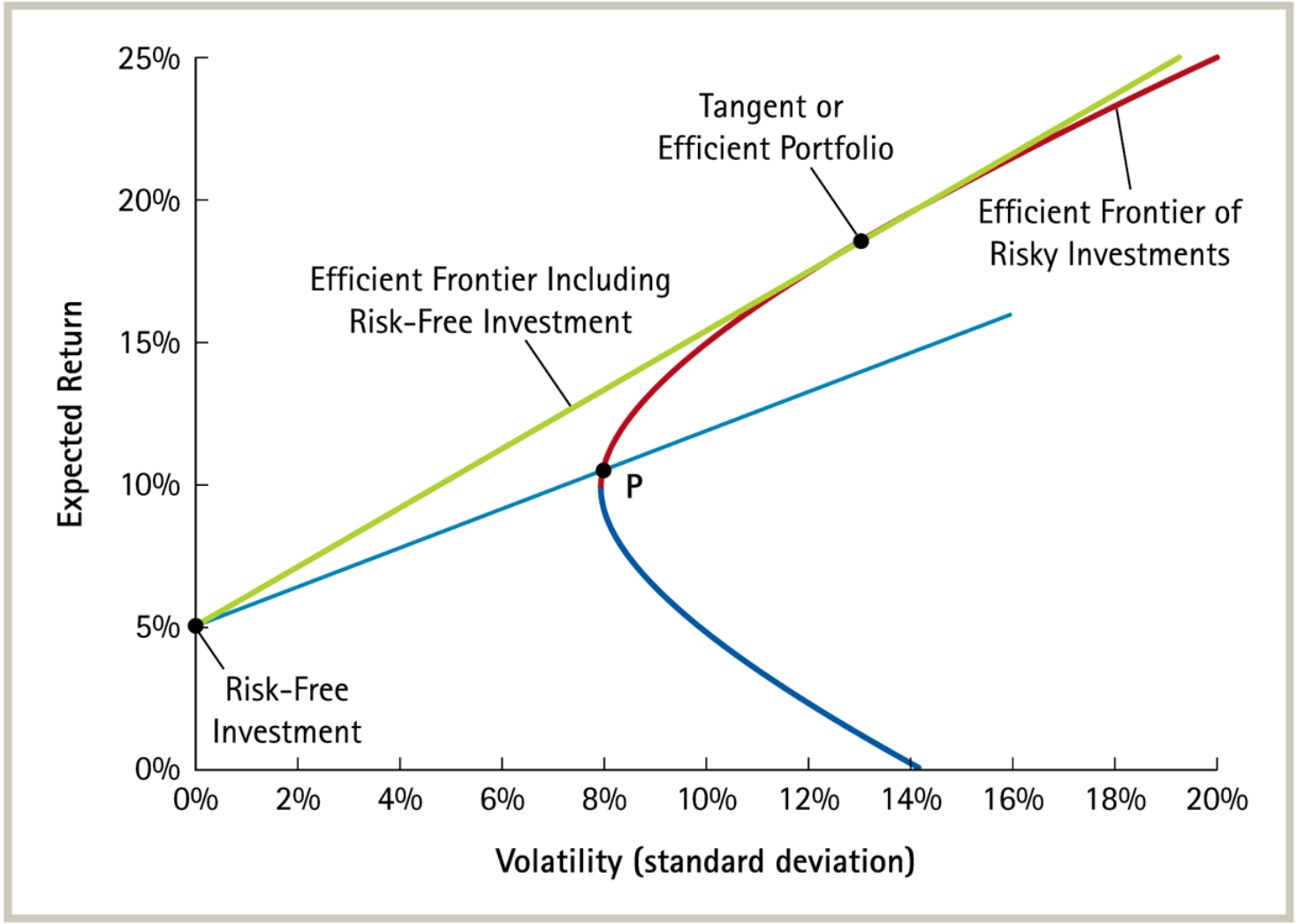
% in stocks	Risk	Return
0%	8.2%	7.0%
5%	7.0%	7.2%
10%	5.9%	7.4%
15%	4.8%	7.6%
20%	3.7%	7.8%
25%	2.6%	8.0%
30%	1.4%	8.2%
35%	0.4%	8.4%
40%	0.9%	8.6%
45%	2.0%	8.8%
50.00%	**3.08%**	**9.00%**
55%	4.2%	9.2%
60%	5.3%	9.4%
65%	6.4%	9.6%
70%	7.6%	9.8%
75%	8.7%	10.0%
80%	9.8%	10.2%
85%	10.9%	10.4%
90%	12.1%	10.6%
95%	13.2%	10.8%
100%	14.3%	11.0%



We can consider other portfolio weights besides 50% in stocks and 50% in bonds.

Opportunity set （机会集）/feasible set （可行集）

The Tangent or Efficient Portfolio



Assumptions

- Assumption 1
  - Investors can buy and sell all securities at competitive market prices (without incurring taxes or transactions costs) and can borrow and lend at the risk-free interest rate.
- Assumption 2
  - Investors hold only efficient portfolios of traded securities—portfolios that yield the maximum expected return for a given level of volatility.
- Assumption 3
  - Investors have **homogeneous expectations** regarding the volatilities, correlations, and expected returns of securities.

Security Demand Must Equal Supply

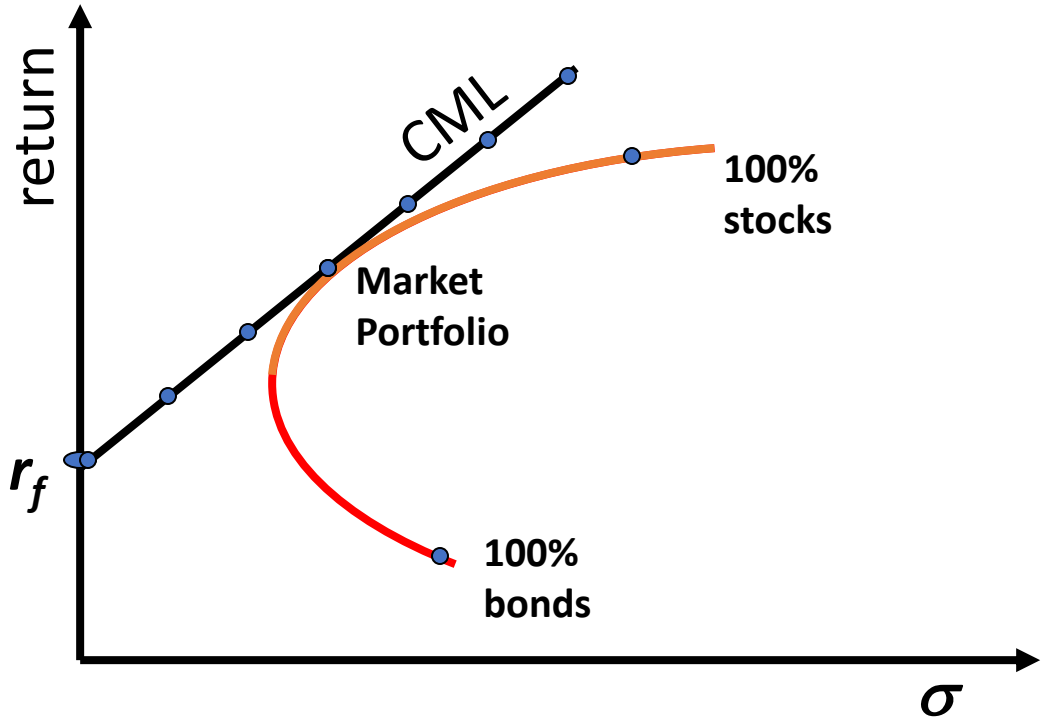
- Given homogeneous expectations, all investors will demand the same efficient portfolio of risky securities.
- The combined portfolio of risky securities of all investors must equal the efficient portfolio.
- Thus, if all investors demand the efficient portfolio, and the supply of securities is the market portfolio, the demand for market portfolio must equal the supply of the market portfolio.

The Capital Market Line (CML)

- In equilibrium, the market portfolio is the tangency portfolio.
- The CML gives the risk-return combinations achieved by forming portfolios from the risk-free security and the market portfolio:

$$E(R_P) = R_f + \frac{[E(R_M) - R_f]}{\sigma_M}\sigma_P$$

Market Equilibrium



•Where the investor chooses along the Capital Market Line（资本市场线） depends on her risk tolerance. The big point is that all investors have the same CML.

Risk: Systematic and Unsystematic

- A *systematic risk* is any risk that affects a large number of assets, each to a greater or lesser degree.
- An *unsystematic risk* is a risk that specifically affects a single asset or small group of assets.
- Unsystematic risk can be diversified away.
- Examples of systematic risk include uncertainty about general economic conditions, such as GNP, interest rates or inflation.
- On the other hand, announcements specific to a single company are examples of unsystematic risk.

Breaking down sources of risk

Total risk = Systematic risk + Firm Specific Risk

- Systematic risk – portion of a security's stand-alone risk that cannot be eliminated through diversification. Measured by beta.
- Firm Specific Risk – portion of a security's stand-alone risk that can be eliminated through proper diversification.

Measuring Systematic Risk (cont'd)

- Beta (β)
  - The expected percent change in the excess return of a security for a 1% change in the excess return of the market portfolio.
    - Beta differs from volatility. Volatility measures total risk (systematic plus unsystematic risk), while beta is a measure of only systematic risk.
  - Measures a stock’s market risk, and shows a stock’s volatility relative to the market.
  - Indicates how risky a stock is if the stock is held in a well-diversified portfolio.

Measuring Systematic Risk

$$\beta_i = Cov(R_i, R_M)/Var(R_M)$$

- A beta of 1 implies the asset has the same systematic risk as the overall market
- A beta < 1 implies the asset has less systematic risk than the overall market
- A beta > 1 implies the asset has more systematic risk than the overall market

Estimating the Risk Premium

- Market Risk Premium
  - The market risk premium is the reward investors expect to earn for holding a portfolio with a beta of 1.

$$\text{Market Risk Premium} = E\left[R_{Mkt}\right] - r_f$$

Market Equilibrium

In equilibrium, all assets and portfolios must have the same reward-to-risk ratio, and they all must equal the reward-to-risk ratio for the market

$$\frac{E(R_i) - R_f}{\beta_i} = \frac{E(R_M - R_f)}{\beta_M} = \frac{E(R_M - R_f)}{1}$$

Estimating the Risk Premium (cont'd)

- Estimating a Traded Security's Expected Return from Its Beta

$$E\left[R\right] = \text{Risk-Free Interest Rate} + \text{Risk Premium}$$

$$= r_f + \beta \times (E\left[R_{Mkt}\right] - r_f)$$

Capital Asset Pricing Model (CAPM)

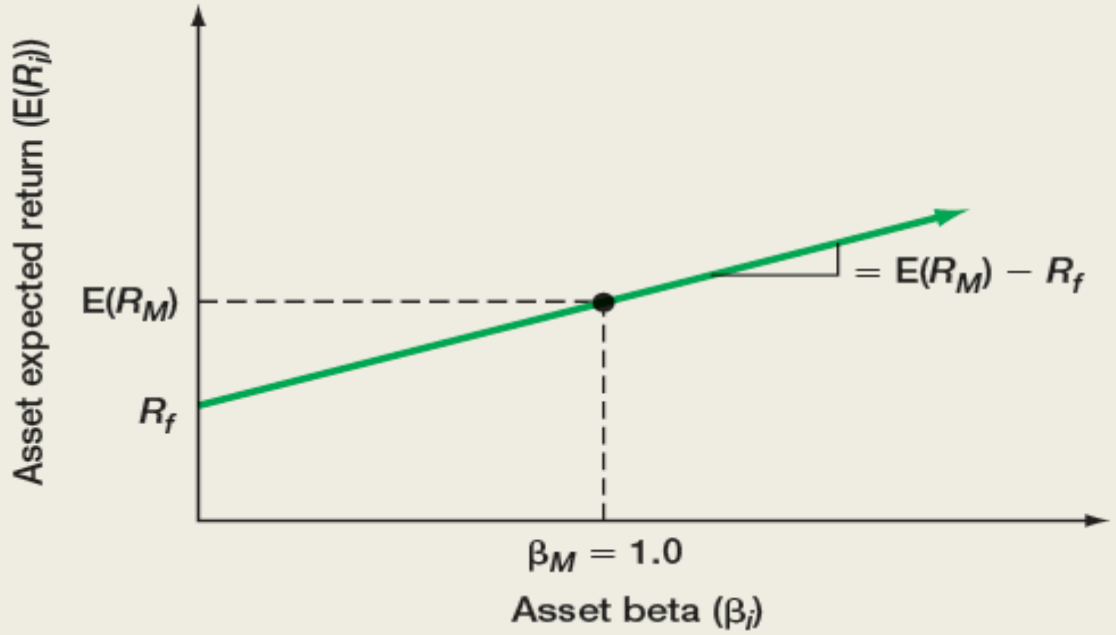
- This can be rewritten as the capital asset pricing model:

$$\mathbf{E(R_i) = R_f + \beta_i(E(R_M) - R_f)}$$

- If we know an asset's systematic risk, we can use the CAPM to determine its expected return

Security Market Line (SML)

- A positively sloped straight line displaying the relationship between expected return and beta



The slope of the security market line is equal to the market risk premium—that is, the reward for bearing an average amount of systematic risk. The equation describing the SML can be written:

$$E(R_i) = R_f + [E(R_M) - R_f] \times \beta_i$$

which is the capital asset pricing model (CAPM).

Chapter 13

Risk, Cost of Capital, and Capital Budgeting
风险、资本成本和资本预算

Assets	Debt Preferred Stock Common Stock

Determinants of Beta

- Business Risk
  - Cyclicality of Revenues 收入的周期性
    - Because beta measures the responsiveness of a stock's return to the market's return, it is not surprising that highly cyclical stocks have high betas.
  - Operating Leverage 经营杠杆
- Financial Risk
  - Financial Leverage 财务杠杆

Cost of Debt 债务资本成本

- Method 1 = Compute the yield to maturity on existing debt
- Method 2 = Use estimates of current rates based on the bond rating expected on new debt
- The cost of debt is NOT the coupon rate
- Adjust for the tax deductibility of interest expense

Cost of Preferred Stock 优先股资本成本

- Preferred stock is a perpetuity, so its price is equal to the coupon paid divided by the current required return.
- Rearranging, the cost of preferred stock is:
  - $R_P = C / PV$

The Weighted Average Cost of Capital 加权资本成本

$$WACC = (E/V) * R_E + (P/V) * R_P + (D/V) \times R_D \times (1 - T_C)$$

Where:

Weights

- **(E/V) = % of common equity in capital structure**
- **(P/V) = % of preferred equity in capital structure**
- **(D/V) = % of debt in capital structure**

Component costs

- **R_E = firm's cost of common equity**
- **R_F = firm's cost of preferred equity**
- **R_D = firm's cost of debt**

T_C = firm's corporate tax rate

Risk-Adjusted WACC

- A firm's WACC reflects the risk of an **<u>average</u>** project undertaken by the firm
  - "Average" ➡ risk = the firm's current operations
- Different divisions/projects may have different risks
  - The division's or project's WACC should be adjusted to reflect the appropriate risk and capital structure

Pure Play Approach

- Find one or more companies that specialize in the product or service being considered
- Compute the beta for each company
- Take an average
- Use that beta along with the CAPM to find the appropriate return for a project of that risk
- Pure play companies difficult to find

Subjective Approach

- Consider the project's risk relative to the firm overall
  - If the project is riskier than the firm, use a discount rate greater than the WACC
  - If the project is less risky than the firm, use a discount rate less than the WACC

Flotation Costs

- Flotation costs represent the expenses incurred upon the issue, or float, of new bonds or stocks.
- These are incremental cash flows of the project, which typically reduce the NPV since they increase the initial project cost (i.e., CF_0).

  Amount Raised = Necessary Proceeds / (1-% flotation cost)

- The % flotation cost is a weighted average based on the average cost of issuance for each funding source and the firm's target capital structure:

$$f_A = (E/V)* f_E + (D/V)* f_D$$

Chapter 15

Long-Term Financing: An Introduction

长期融资：　简介

Features of Common Stock 普通股特征

- Voting rights (Cumulative vs. Straight)
  - Shareholders control the corporation through the right to elect the directors
  - Cumulative voting 累计投票制:
    - the directors are elected all at once and the top N vote getters will be the new directors
    - the total number of votes that each shareholder may cast is calculated as the number of shares multiplied by the number of directors to be elected (N)
    - A shareholder can distribute votes however she wishes
    - if there are N directors up for election, then 1/(N+1) percent of the stock plus one share will guarantee you a seat
    - The effect of cumulative voting is to permit minority participation
  - straight voting 多数投票制:
    - the directors are elected one at a time
    - the only way to guarantee a seat is to own 50 percent plus one share
    - all or nothing

Features of Common Stock

- Proxy voting 委托代理投票权
  - A proxy is the grant of authority by a shareholder to someone else to vote her shares.
- Classes of stock
  - the classes are created with unequal voting rights
  - Google has two classes of common stock, A and B. The Class A shares are held by the public, and each share has one vote. The Class B shares are held by company insiders, with each Class B share having 10 votes.
- Other rights
  - Share proportionally in declared dividends
  - Share proportionally in remaining assets during liquidation
  - Preemptive right – first shot at new stock issue to maintain proportional ownership if desired

Features of Preferred Stock 优先股

- Dividends
  - Stated dividend must be paid before dividends can be paid to common stockholders.
  - Dividends are not a liability of the firm, and preferred dividends can be deferred indefinitely.
  - Most preferred dividends are cumulative – any missed preferred dividends have to be paid before common dividends can be paid.
- Preferred stock generally does not carry voting rights.

The Bond Indenture

- Contract between the company and the bondholders that includes:
  - The basic terms of the bonds
  - The total amount of bonds issued
  - A description of property used as security, if applicable
  - Seniority 优先级: senior > junior > subordinated
    - Seniority means the order of repayment in the event of a sale or bankruptcy of the respective institution
    - in the event of default, holders of subordinated debt must give preference to other specified creditors
  - Call provisions 赎回条款
    - A call provision allows the company to repurchase, or "call," part or all of the bond issue at stated prices over a specific period.
    - The difference between the call price and the stated value is the call premium.
    - deferred call provision, call protected
  - Details of protective covenants 保护性条款
    - A negative covenant limits or prohibits actions that the company might take.
    - A positive covenant specifies an action that the company must take or a condition that the company must abide by.

Bond Classifications

- Registered vs. Bearer Forms
  - Registered: the company has a registrar who will record the initial ownership of each bond, as well as any changes in ownership.
  - Bearer: the certificate is the basic evidence of ownership, and the corporation will “pay the bearer.”
- Security
  - Collateral – secured by financial securities
  - Mortgage – secured by real property, normally land or buildings
  - Debentures – unsecured
  - Notes – unsecured debt with original maturity less than 10 years

Required Yields

- The coupon rate depends on the risk characteristics of the bond when issued.
- Which bonds will have the higher coupon, all else equal?
  - Secured vs. non-secured debt
  - Subordinated debenture versus senior debt
  - A callable bond versus a non-callable bond

Chapter 16

Capital Structure: Basic Concepts

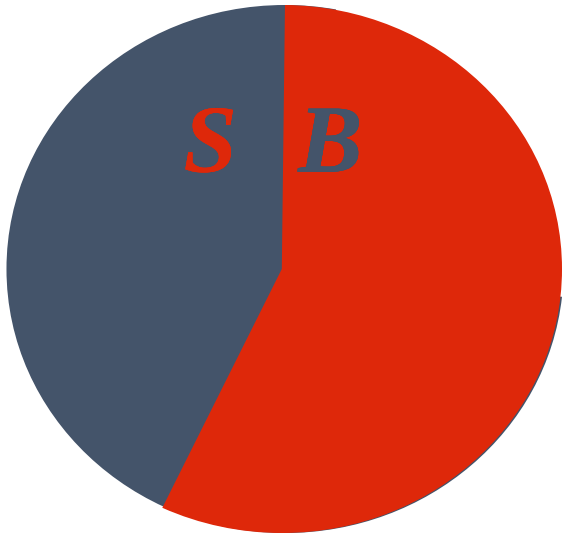
资本结构：基本概念

Capital Structure and the Pie

- The value of a firm is defined to be the sum of the value of the firm's debt and the firm's equity.

  $V = B + S$

- If the goal of the firm's management is to make the firm as valuable as possible, then the firm should pick the debt-equity ratio that makes the pie as big as possible.



Value of the Firm

Assumptions of the M&M Model

- The Modigliani–Miller theorem (of Franco Modigliani, Merton Miller) is a theorem on capital structure, arguably forming the basis for modern thinking on capital structure.

- M&M Model without taxes
  - Firms and investors can borrow/lend at the same rate
  - No transaction costs
  - No taxes

- M&M Model with taxes
  - Corporations are taxed at the rate t, on earnings after interest
  - No transaction costs
  - Firms and investors can borrow/lend at the same rate

Homemade Leverage: An Example

	Recession	Expected	Expansion
EPS of Unlevered Firm	*$2.50*	*$5.00*	*$7.50*
Earnings for 40 shares	$100	$200	$300
Less interest on $800 (8%)	$64	$64	$64
Net Profits	$36	$136	$236
ROE (Net Profits / $1,200)	3.0%	11.3%	19.7%

We are buying 40 shares of a $50 stock, using $800 in margin.
We get the same ROE as if we bought into a levered firm.

Our personal debt-equity ratio is: $\frac{B}{S} = \frac{\$800}{\$1{,}200} = 2/3$

Homemade (Un)Leverage: An Example

	Recession	Expected	Expansion
EPS of Levered Firm	*$1.50*	*$5.67*	*$9.83*
Earnings for 24 shares	$36	$136	$236
Plus interest on $800 (8%)	$64	$64	$64
Net Profits	$100	$200	$300
ROE (Net Profits / $2,000)	5%	10%	15%

Buying 24 shares of an otherwise identical levered firm along with some of the firm's debt gets us to the ROE of the unlevered firm.

This is the fundamental insight of M&M

MM Proposition I (No Taxes)

- We can create a levered or unlevered position by adjusting the trading in our own account.
- This homemade leverage suggests that capital structure is irrelevant in determining the value of the firm:

$$V_L = V_U$$

MM Proposition II (No Taxes)

- Proposition II
  - Leverage increases the risk and return to stockholders

$$R_s = R_0 + (B / S_L)\,(R_0 - R_B)$$

R_B is the interest rate (cost of debt)
R_s is the return on (levered) equity (cost of equity)
R_0 is the return on unlevered equity (cost of capital)
B is the value of debt
S_L is the value of levered equity

MM Propositions I & II (With Taxes)

- Proposition I (with Corporate Taxes)
  - Firm value increases with leverage

$$V_L = V_U + T_C B$$

- Proposition II (with Corporate Taxes)
  - Some of the increase in equity risk and return is offset by the interest tax shield

$$R_S = R_0 + (B/S) \times (1-T_C) \times (R_0 - R_B)$$

R_B is the interest rate (cost of debt)
R_S is the return on equity (cost of equity)
R_0 is the return on unlevered equity (cost of capital)
B is the value of debt
S is the value of levered equity

Chapter 17

Capital Structure: Limits to the Use of Debt
资本结构：债务运用的制约因素

Key Concepts and Skills

- Define the costs associated with bankruptcy
- Understand the theories that address the level of debt a firm carries
  - Tradeoff
  - Signaling
  - Agency Cost
  - Pecking Order
- Know real world factors that affect the debt to equity ratio

Costs of Financial Distress

- Bankruptcy risk versus bankruptcy cost 破产风险vs破产成本
- The possibility of bankruptcy has a negative effect on the value of the firm.
- However, it is not the risk of bankruptcy itself that lowers value.
- Rather, it is the costs associated with bankruptcy.
- It is the stockholders who bear these costs.

Costs of Financial Distress

	Knight Corporation		Day Corporation	
	Boom Times (prob. 50%)	Recession (prob. 50%)	Boom Times (prob. 50%)	Recession (prob. 50%)
Cash flow	$100	$50	$100	$50
Payment of interest and principal on debt	49	49	60	50
Distribution to stockholders	$ 51	$ 1	$ 40	$ 0

Day Corporation		
	Boom Times (prob. 50%)	Recession (prob. 50%)
Earnings	$100	$50
Debt repayment	60	35
Distribution to stockholders	$ 40	$ 0

Bankruptcy cost $15

Leverage increases the likelihood of bankruptcy. However, bankruptcy does not, by itself, lower the cash flows to investors. Rather, it is the costs associated with bankruptcy that lower cash flows.

Description of Financial Distress Costs

- Direct Costs
  - Legal and administrative costs
  - “Accountants pore over fiscal ledgers at $325 an hour. Lawyers toil into the night—at $385 an hour. Financial advisers from one of the nation’s most prominent investment houses labor for the taxpayers at $150,000 a month. Clerks stand by the photocopy machines, running up bills that sometimes exceed $3,000.”-- *Los Angeles Times*
- Indirect Costs
  - Sales are frequently lost because of both fear of impaired service and loss of trust
  - “75 percent of Americans would not purchase an automobile from a bankrupt company because the company might not honor the warranty, and it might be difficult to obtain replacement parts.”
  - Though these costs clearly exist, it is quite difficult to measure them.

Agency Costs 代理成本

- When a firm has debt, conflicts of interest arise between stockholders and bondholders. Because of this, stockholders are tempted to pursue selfish strategies
- These conflicts of interest, which are magnified when financial distress is incurred, impose agency costs on the firm
  - Selfish Strategy 1: Incentive to take large risks 冒高风险的动机
  - Selfish Strategy 2: Incentive toward underinvestment 投资不足的动机
  - Selfish Strategy 3: Milking the property 撇脂
- These strategies are costly because they will lower the market value of the whole firm.

Can Costs of Debt Be Reduced? 能够降低债务成本吗？

Protective Covenants 保护性条款

- A negative covenant limits or prohibits actions that the company may take. Here are some typical negative covenants:

1. Limitations are placed on the amount of dividends a company may pay.
2. The firm may not pledge any of its assets to other lenders.
3. The firm may not merge with another firm.
4. The firm may not sell or lease its major assets without approval by the lender.
5. The firm may not issue additional long-term debt.

- A positive covenant specifies an action that the company agrees to take or a condition the company must abide by. Here are some examples:

1. The company agrees to maintain its working capital at a minimum level.
2. The company must furnish periodic financial statements to the lender.

Debt Consolidation 债务合并:

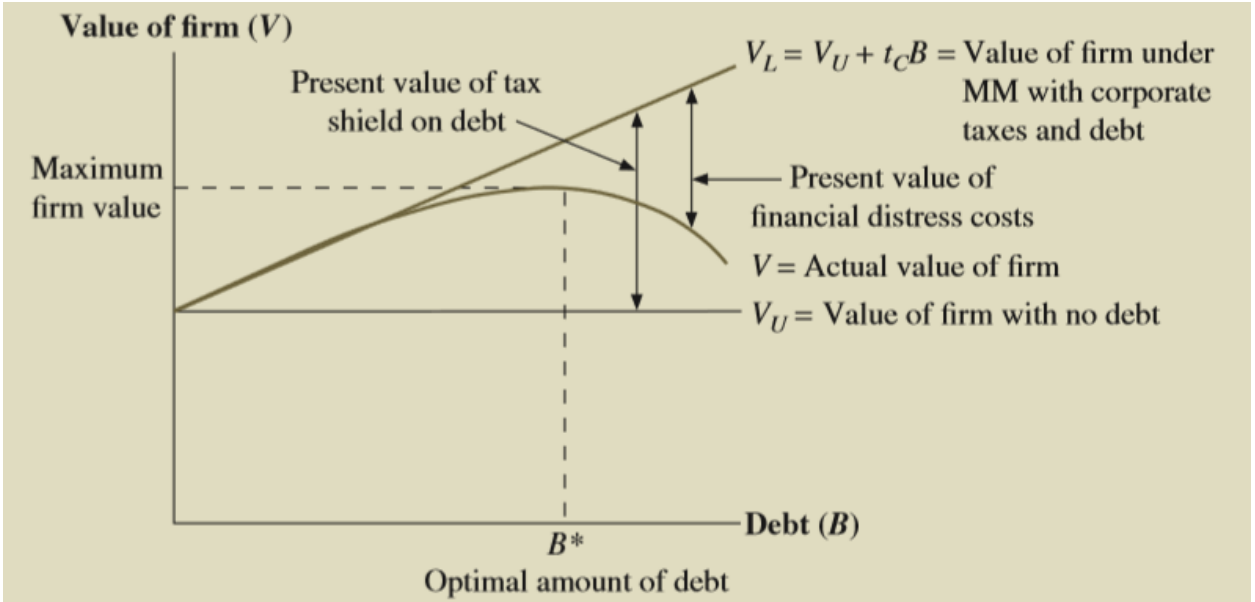
- If we minimize the number of parties, contracting costs fall

- Bond covenants, even if they reduce flexibility, can increase the value of the firm

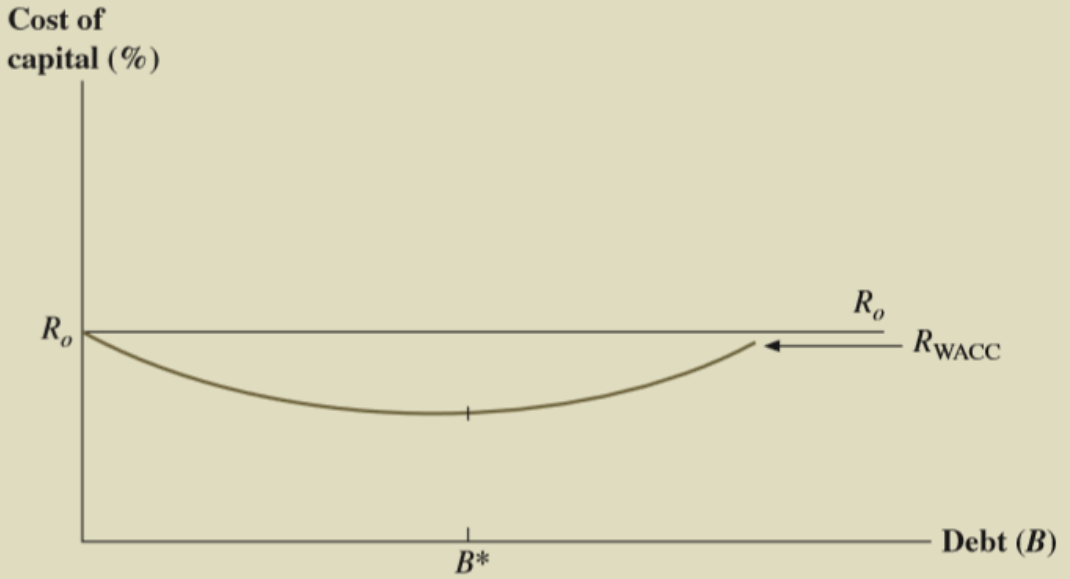
Tax Effects and Financial Distress

- There is a trade-off between the tax advantage of debt and the costs of financial distress.
- The implication is that there is an optimal amount of debt for any individual firm.
- It is difficult to express this with a precise and rigorous formula.

Tax Effects and Financial Distress



The tax shield increases the value of the levered firm. Financial distress costs lower the value of the levered firm. The two offsetting factors produce an optimal amount of debt at B^*.



Signaling

- The firm’s capital structure is optimized where the marginal subsidy to debt equals the marginal cost.
- Investors view debt as a signal of firm value.
  - Firms with low anticipated profits will take on a low level of debt.
  - Firms with high anticipated profits will take on a high level of debt.
- Rational investors are likely to infer a higher firm value from a higher debt level. Thus, these investors are likely to bid up a firm’s stock price after the firm has issued debt.
- A manager that takes on more debt than is optimal in order to fool investors will pay the cost in the long run.

Agency Cost of Equity

- An individual will work harder for a firm if she is one of its owners than if she is just an employee. In addition, the individual will work harder if she owns a large percentage of the company than if she owns a small percentage
- Ms. Pagell is an owner–entrepreneur running a computer services firm worth $1 million. She currently owns 100 percent of the firm. Because of the need to expand, she must raise another $2 million. She can either issue $2 million of debt at 12 percent interest or issue $2 million in stock

	Debt Issue				Stock Issue			
Work Intensity	Cash Flow	Interest	Cash Flow to Equity	Cash Flow to Ms. Pagell (100% of equity)	Cash Flow	Interest	Cash Flow to Equity	Cash Flow to Ms. Pagell (33 1/3% of equity)
6-hour days	$300,000	$240,000	$ 60,000	$ 60,000	$300,000	0	$300,000	$100,000
10-hour days	400,000	240,000	160,000	160,000	400,000	0	400,000	133,333

1. tive
2. She is likely to obtain more perquisites (a big office, a company car, more expense account meals) if she issues stock. If she is a one-third stockholder, two-thirds of these costs are paid for by the other stockholders
3. Finally, she is more likely to take on capital budgeting projects with negative net present values. Managerial salaries generally rise with firm size

Agency Cost of Equity

- While managers may have motive to partake in perquisites, they also need opportunity. Free cash flow provides this opportunity.
- The *free cash flow hypothesis* says that an increase in dividends should benefit the stockholders by reducing the ability of managers to pursue wasteful activities.
- The *free cash flow hypothesis* also argues that an increase in debt will reduce the ability of managers to pursue wasteful activities more effectively than dividend increases.

The Pecking-Order Theory

- Asymmetric information: the manager must know more about his firm’s prospects than does the typical investor.
- Theory stating that firms prefer to issue debt rather than equity if internal financing is insufficient.
  - Rule 1
    - Use internal financing first
  - Rule 2
    - Issue debt next, new equity last
- The pecking-order theory is at odds with the tradeoff theory:
  - There is no target D/E ratio
  - Profitable firms use less debt
  - Companies like financial slack
    - Because firms know that they will have to fund profitable projects at various times in the future, they accumulate cash today. They are then not forced to go to the capital markets when a project comes up.

Factors in Target D/E Ratio

- Taxes
  - Since interest is tax deductible, highly profitable firms should use more debt (i.e., greater tax benefit).
- Types of Assets
  - The costs of financial distress depend on the types of assets the firm has.
- Uncertainty of Operating Income
  - Even without debt, firms with uncertain operating income have a high probability of experiencing financial distress.
- Pecking Order and Financial Slack
  - Theory stating that firms prefer to issue debt rather than equity if internal financing is insufficient.

Chapter 18

Valuation and Capital Budgeting for the Levered Firm
杠杆企业的估值与资本预算

Adjusted Present Value Approach
调整净现值法

$$APV = NPV + NPVF$$

- The value of a project to the firm can be thought of as the value of the project to an unlevered firm (*NPV*) plus the present value of the financing side effects (*NPVF*).
- There are four side effects of financing:
  - The Tax Subsidy to Debt
  - The Costs of Issuing New Securities
  - The Costs of Financial Distress
  - Subsidies to Debt Financing

APV Example

Consider a project of the P. B. Singer Co. with the following characteristics:

Cash inflows: $500,000 per year for the indefinite future.

Cash costs: 72% of sales.

Initial investment: $475,000.

$t_C = 34\%$

$R_0 = 20\%$, where R_0 is the cost of capital for a project of an all-equity firm.

If both the project and the firm are financed with only equity, the project's cash flow is as follows:

Cash inflows	$500,000
Cash costs	−360,000
Operating income	140,000
Corporate tax (34% tax rate)	−47,600
Unlevered cash flow (UCF)	$ 92,400

APV Example

- Debt is $126,229.50, so that the remaining investment of $348,770.50 is financed with equity. The net present value of the project under leverage, which we call the adjusted present value, or the APV, is:

$$\begin{aligned} \text{APV} &= \text{NPV} + t_C \times B \\ \$29{,}918 &= -\$13{,}000 + .34 \times \$126{,}229.50 \end{aligned}$$

Flow to Equity Approach

- Discount the cash flow from the project to the equity holders of the levered firm at the cost of levered equity capital, R_S.
- There are three steps in the FTE Approach:
  - Step One: Calculate the levered cash flows (LCFs)
  - Step Two: Calculate R_S.
  - Step Three: Value the levered cash flows at R_S.

Step One: Levered Cash Flows

- Assuming an interest rate of 10 percent, the perpetual cash flow to equity holders in our P. B. Singer Co. example is:

Cash inflows	$500,000.00
Cash costs	−360,000.00
Interest (10% × $126,229.50)	−12,622.95
Income after interest	127,377.05
Corporate tax (34% tax rate)	−43,308.20
Levered cash flow (LCF)	$ 84,068.85

Step Two: Calculate R_S

$$R_S = R_0 + \frac{B}{S}(1 - T_C)(R_0 - R_B)$$

- The discount rate on unlevered equity, R_0 , is .20.
- The target debt-to-value ratio of 1/4 implies a target debt-to-equity ratio of 1/3.
- Assuming an interest rate of 10 percent

$$R_S = .222 = .20 + \frac{1}{3}(.66)(.20 - .10)$$

Step Three: Valuation

- The present value of the project's LCF is:

$$\frac{\text{LCF}}{R_S} = \frac{\$84{,}068.85}{.222} = \$378{,}688.50$$

- The initial investment is $475,000 and $126,229.50 is borrowed, the firm must advance the project $348,770.50 out of its own cash reserves.

- NPV = $378,688.50 - $348,770.50 = $29,918

WACC Method

$$R_{WACC} = \frac{S}{S+B} R_S + \frac{B}{S+B} R_B (1 - T_C)$$

- To find the value of the project, discount the unlevered cash flows at the weighted average cost of capital.
- The weight for equity, S /(S+B), and the weight for debt, B /(S+B), are target ratios. Target ratios are generally expressed in terms of market values, not accounting values.

$$\sum_{t=1}^{\infty} \frac{\text{UCF}_t}{(1 + R_{\text{WACC}})^t} - \text{Initial investment}$$

WACC Method

$$R_{\text{WACC}} = \frac{3}{4} \times .222 + \frac{1}{4} \times .10 \times .66 = .183$$

- the UCF of the project to be $92,400, implying that the present value of the project is:

$$\frac{\$92{,}400}{.183} = \$504{,}918$$

- the NPV of the project is:

$$\$504{,}918 - \$475{,}000 = \$29{,}918$$

Chapter 19
Dividends and Other Payouts

Different Types of Dividends

- Many companies pay a **regular cash dividend**.
  - Public companies often pay quarterly.
  - Sometimes firms will throw in an extra cash dividend.
  - The extreme case would be a liquidating dividend.
- Often companies will declare **stock dividends.**
  - No cash leaves the firm.
  - The firm increases the number of shares outstanding.
- Some companies declare a **dividend in kind**.
  - Wrigley’s Gum sends around a box of chewing gum.
  - Dundee Crematoria offers shareholders discounted cremations.

Standard Method of Cash Dividend Payment

- Declaration Date（股利宣布日）– Board declares the dividend and it becomes a liability of the firm
- Ex-dividend Date （除息日）
  - Occurs two business days before date of record
  - If you buy stock on or after this date, you will not receive the upcoming dividend
  - Stock price generally drops by approximately the amount of the dividend
- Date of Record （股权登记日）– holders of record are determined, and they will receive the dividend payment
- Date of Payment (股利支付日) – checks are mailed

Does Dividend Policy Matter?

- Dividends matter
  - Bird-in-the-Hand Theory. Investors might think dividends (i.e., the-bird-in-the-hand) are less risky than potential future capital gains.
  - Agency problem. High payouts help reduce agency costs by depriving managers of cash to waste and causing managers to have more scrutiny by going to the external capital markets more often.
  - Tax. Low payouts mean higher capital gains. Capital gains taxes are deferred until they are realized, so they are taxed at a lower effective rate than dividends.
  - Information content. Investors view dividend changes as signals of management's view of the future. Managers hate to cut dividends, so won't raise dividends unless they think raise is sustainable.

Clientele Effect

- Empirical evidence suggests that a firm's dividend policy tends to attract different groups of investors (different *clienteles*), depending upon how these investors wish to receive their total rate of return on their investment in the company's stock.
- Specifically, those investors who want high current investment income and expect to forego anticipated long-term capital gains would buy the stocks of firms with a record of high dividend payouts. Conversely, those investors who are in their prime earning and savings years might elect to own the stocks of firms with a record of low (or zero) dividend payouts.
- Firm’s past dividend policy determines its current clientele of investors.
- Clientele effects impede changing dividend policy. Taxes & brokerage costs hurt investors who have to switch companies due to a change in payout policy.

Repurchase of Stock

- Instead of declaring cash dividends, firms can rid itself of excess cash through buying shares of their own stock.
- Recently share repurchase has become an important way of distributing earnings to shareholders.

Stock Repurchase

- Company buys back shares of its own stock
  - Open market = company buys its own stock in the open market
  - Tender offer = company states a purchase price and a desired number of shares to be bought
  - Targeted repurchase = firm repurchases shares from specific individual shareholders
- Repurchase vs. cash dividend:
  - Repurchase returns cash from the firm to the stockholders
  - Same as cash dividend in the absence of taxes and transactions costs

Stock Repurchase versus Dividend

Consider a firm that wishes to distribute $100,000 to its shareholders.

A. Original balance sheet

Assets		***Liabilities & Equity***	
Cash	$150,000	Debt	0
Other assets	850,000	Equity	1,000,000
Value of Firm	1,000,000	Value of Firm	1,000,000

Shares outstanding = 100,000

Price per share = $1,000,000 /100,000 = $10

Stock Repurchase versus Dividend

If they distribute the $100,000 as cash dividend, the balance sheet will look like this:

Assets ***Liabilities & Equity***

B. After $1 per share cash dividend

Cash	$50,000	Debt	0
Other assets	850,000	Equity	900,000
Value of Firm	900,000	Value of Firm	900,000

Shares outstanding = 100,000

Price per share = $900,000/100,000 = $9

Stock Repurchase versus Dividend

If they distribute the $100,000 through a stock repurchase, the balance sheet will look like this:

Assets ***Liabilities & Equity***

C. After stock repurchase

Cash	$50,000	Debt	0
Other assets	850,000	Equity	900,000
Value of Firm	900,000	Value of Firm	900,000

Shares outstanding = 90,000

Price per share = $900,000 / 90,000 = $10

Stock Dividends

- Distribute additional shares of stock instead of cash
- Increases the number of outstanding shares
- Small stock dividend
  - Less than 20 to 25%
  - If you own 100 shares and the company declared a 10% stock dividend, you would receive an additional 10 shares
- Large stock dividend – more than 20 to 25%

Irrelevance of Stock Dividends: Example

Shimano USA has 2 million shares currently outstanding at $15 per share. The company declares a 50% stock dividend. How many shares will be outstanding after the dividend is paid?

A 50% stock dividend will increase the number of shares by 50%:

$$2 \text{ million} \times 1.5 = 3 \text{ million shares}$$

After the stock dividend what is the new price per share and what is the new value of the firm?

The value of the firm was $2m × $15 per share = $30 m. After the dividend, the value will remain the same.

Price per share = $30m/ 3m shares = $10 per share

Stock Splits

- Essentially the same as a stock dividend except expressed as a ratio
  - For example, a 2-for-1 stock split is the same as a 100% stock dividend
- Stock price is reduced when the stock splits
- Common explanation for split is to return price to a “more desirable trading range”