

**J. Pierpont
Morgan**

1837-1913

J.P. Morgan & Co

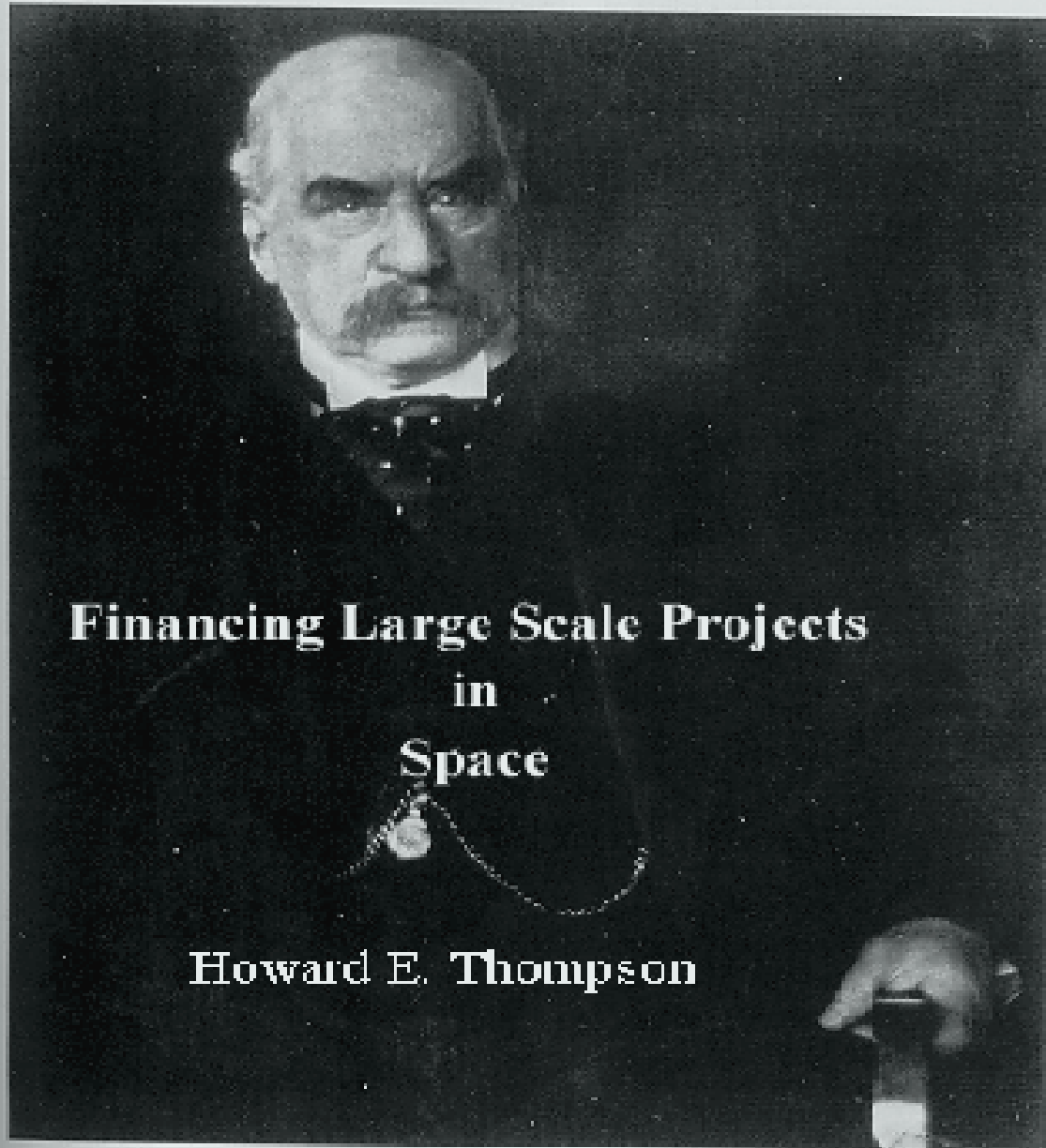
23 Wall Street

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**Financed
railroads, canals,
steel mills,
shipping lines**

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**Intermediary
between users
and suppliers of
capital**



**Financing Large Scale Projects
in
Space**

Howard E. Thompson

1. The inimitable 1908 photo of J. Pierpont Morgan by Edward Steichen. Morgan hated the photo and tore up the first print.

Lunar Mining Co., Inc.

Board of Directors



H.E. Thompson

Can they Raise \$123,000,000,000?

Economics of Large Scale Projects

Key question: Are large scale space projects profitable from the point of view of private enterprise?

- ◆ *Financial analysis fundamentals*
- ◆ *Project selection techniques*
- ☞ *Financing Issues*
- ◆ *Application to lunar mining of Helium-3*

Ten Maxims of Finance

- 1. The Risk-Return Tradeoff*
- 2. The Time Value of Money*
- 3. Cash is King*
- 4. Incremental Cash Flows*
- 5. The Curse of Competitive Product Markets*
- 6. Efficient Capital Markets*
- 7. The Agency Problem*
- 8. Taxes Bias Decisions*
- 9. All Risk is Not Equal*
- 10. Ethical Dilemmas are Everywhere in Finance*

✦ *From Keowon, Scott, Martin, Petty, Basic Financial Management , 7th Ed., 1996*

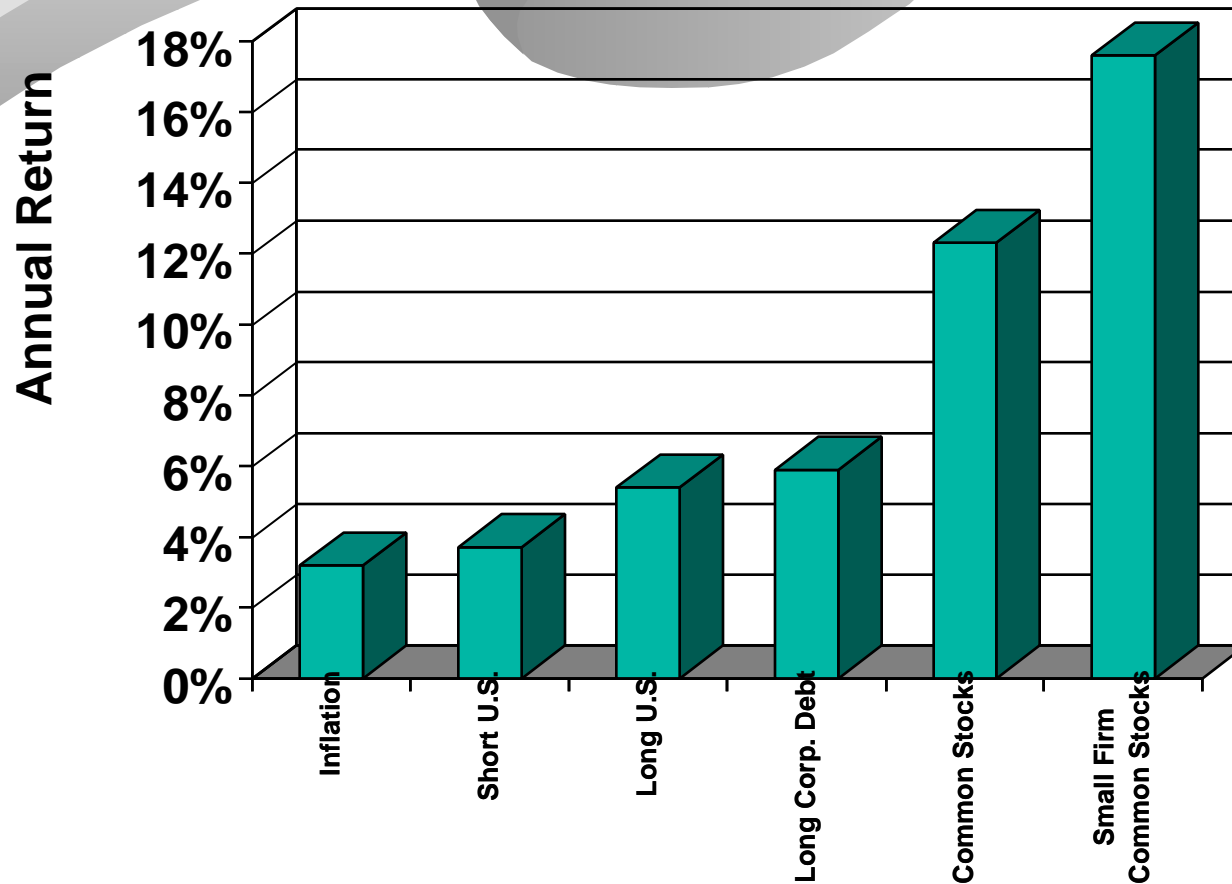
Maxim 1

The Risk-Return Tradeoff

*Investment alternatives have different
risks and expected returns*

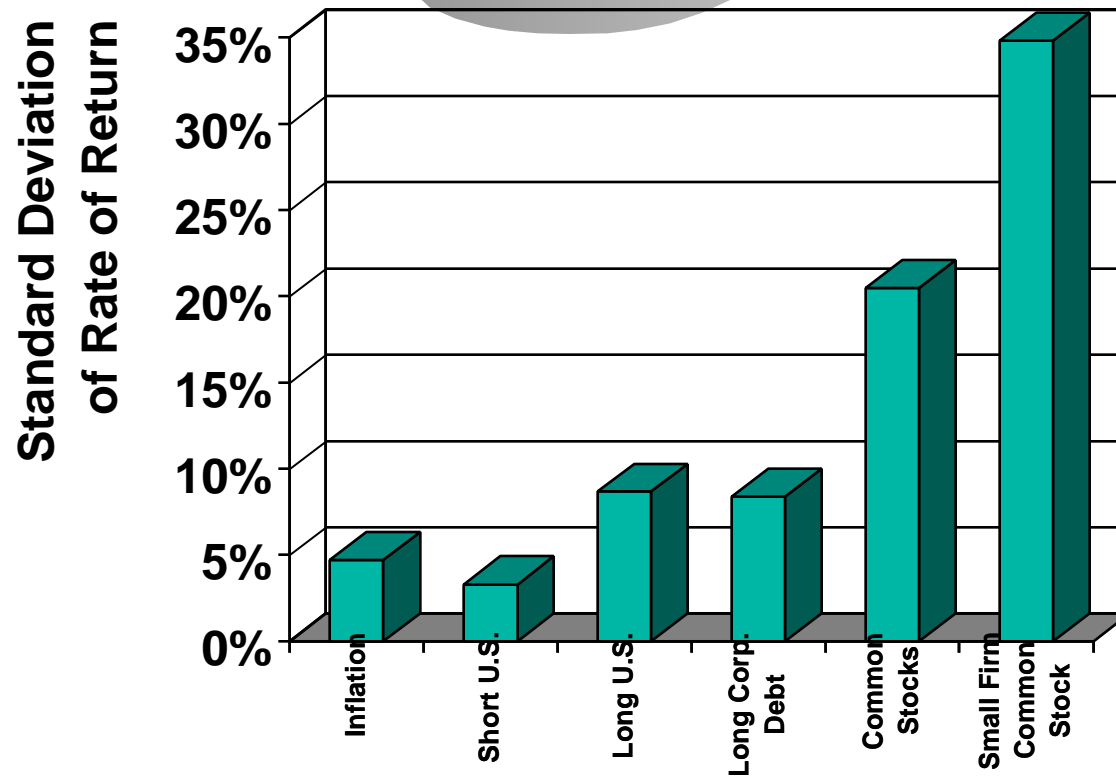
- The more risk in an investment the more and investor will demand in expected return*
- The expected return on a junk bond is greater than on a treasury because the risk is greater*

Average Comparable Returns 1926-1993



Ibbotson & Sinquefeld *Stocks, Bonds, Bills and Inflation*, Dow Jones-Irwin, 1994

Risks of Comparable Returns 1926-1993



Maxim 2

The Time Value of Money

*A Dollar today is worth more than a dollar
in the future*

- Opportunity cost of earning “interest”*
- Current wealth is the present value of future cash*
- An investment decision compares the value of wealth in different forms (cash today or an asset that provides cash tomorrow)*

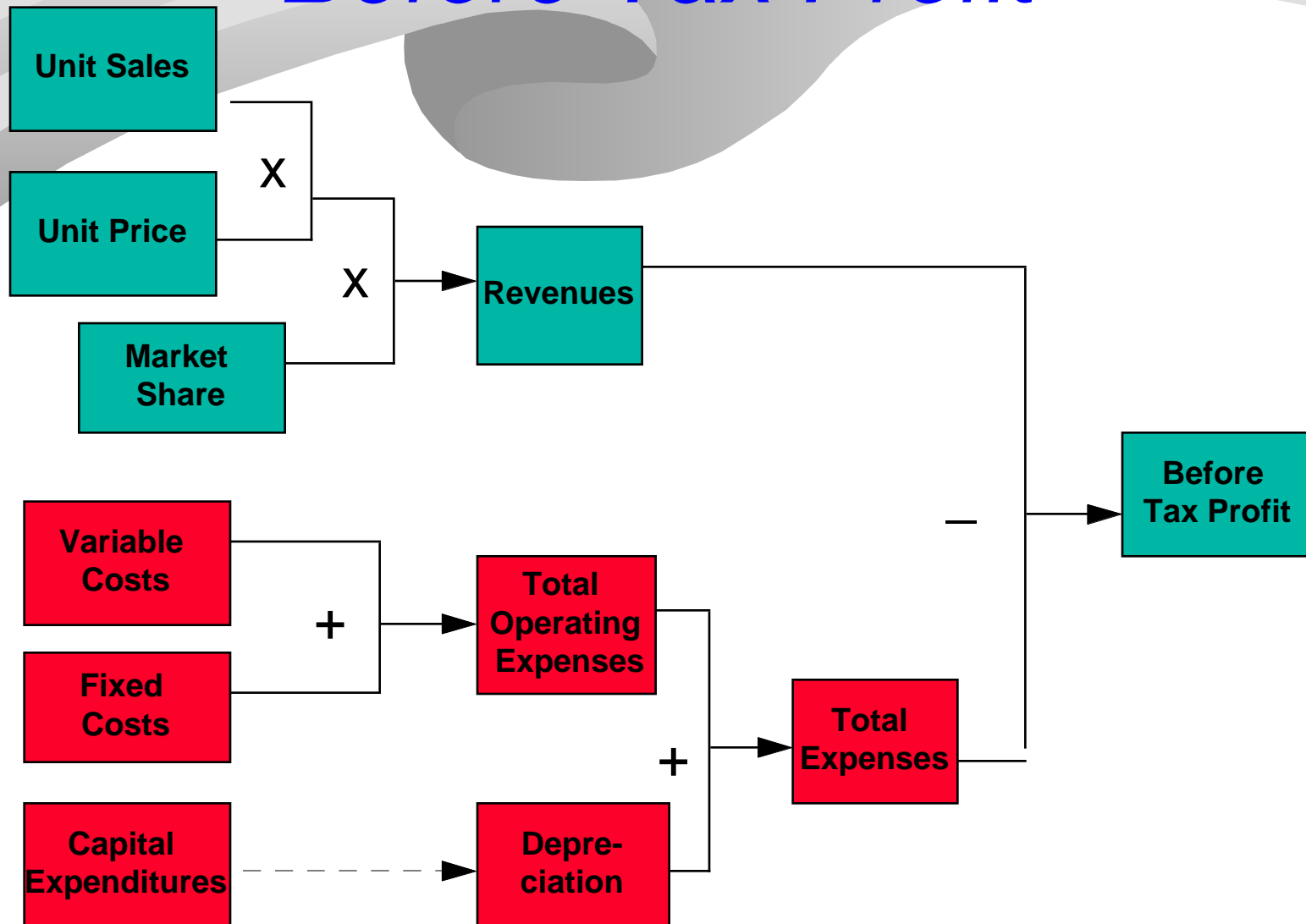
Maxim 3

Cash is King

Wealth depends on cash flows not profits

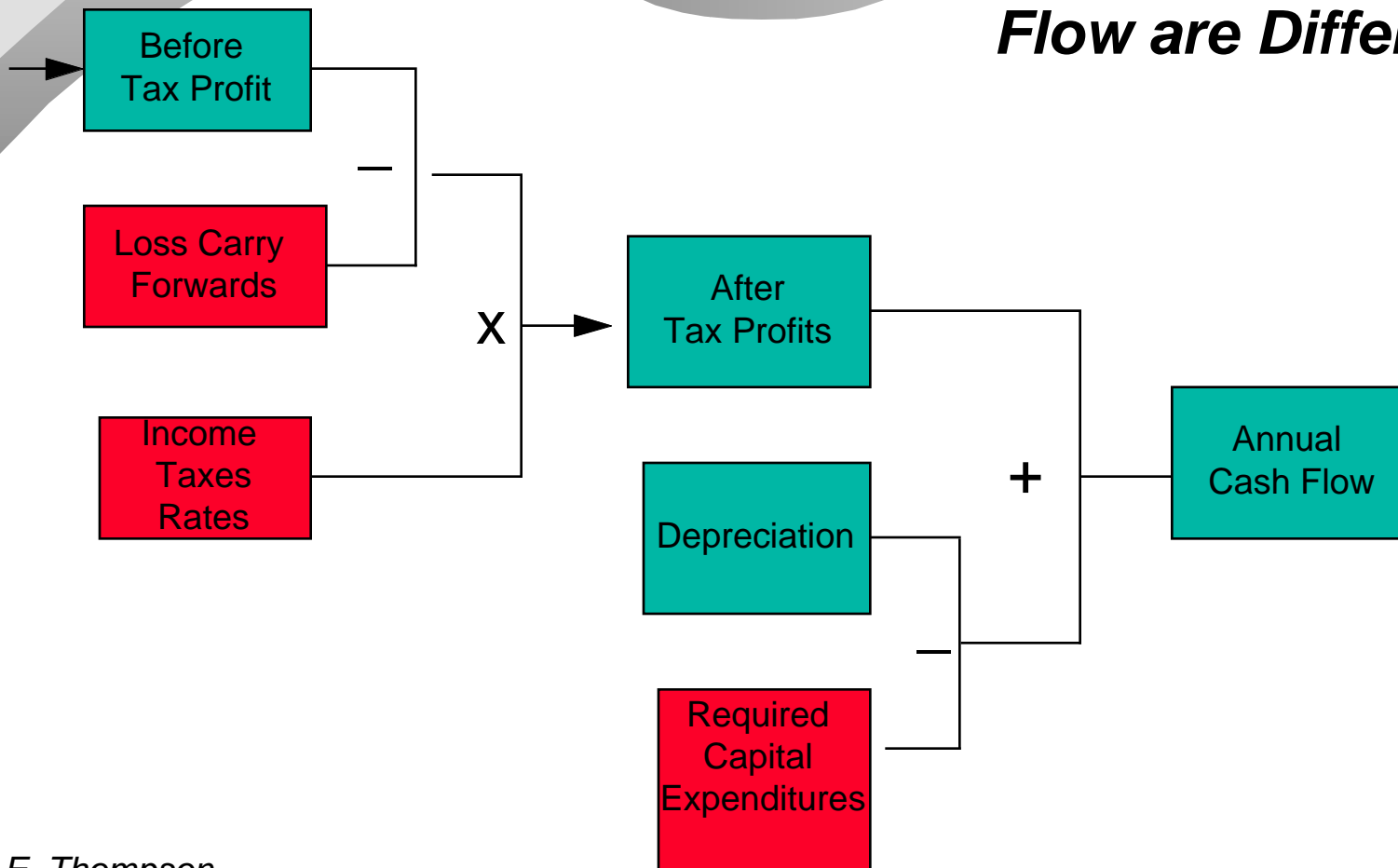
- Profits and cash flows are different*
- Cash flows are the actual revenue or expenditure rates at a particular time*
- Profits depend on **allocated** revenues and costs.*

Before Tax Profit



After Tax Profit & Cash Flow

Profit and Cash Flow are Different



Maxim 4

Incremental Cash Flows

Business decisions are based on changes

- To value a project consider the difference between cash flows with the project and without it*
- To value Saturn, General Motors must look at not only the cash flows from Saturn but also the impact Saturn has on sales of Chevrolet, Buick, Pontiac*

Maxim 5

The Curse of Competitive Markets

- It is hard to find profitable projects*
- High profits in product markets attract competitors*
 - Competitors put downward pressure on prices and profits*
 - Profits can be maintained through*
 - ✦ economies of scale*
 - ✦ proprietary technology*
 - ✦ monopolistic control of product or raw materials markets*

Maxim 6

Efficient Capital Markets

Market prices fully reflect all public information about a security

- Capital markets react very quickly to information*
- The value of a firm in the market is the best measure of true value*
- Investors cannot profit from publicly available information*
- Maximize shareholder wealth implies maximize the share price*

The Efficient Capital Markets Hypothesis

Three forms:

- **strong** form - market prices are an unbiased estimate of future cash flows and reflect all information both public and private
- **semistrong** form - market prices ... reflect fully all publicly available information
- **weak** form - market prices...reflect only past history of stock prices

The Semistrong Form: Implications

- 1. You can't consistently beat the market by investing in stocks you think are **undervalued***
- 2. Stock prices respond to **new information** (that the market does not have)*

Test of Capital Market Efficiency

- 1. The efficient capital markets hypothesis can't be tested directly*
 - the **actual** price a a stock cannot be compared to the **correct** price*
 - every test is a **joint test** of the theory of the correct price and efficiency*
- 2. Evidence supporting it seems to be stronger than evidence not supporting it*
 - many empirical studies*
 - the “dart” throwers do as well as the “analysts” in Wall Street Journal contests in stock picking*

Maxim 7

The Agency Problem

Managers are agents of the stockholders

- But manager's primary interest is in their own wealth*
- So managers' incentives must be aligned to maximize wealth of shareholders*
- Mechanisms for aligning incentives*
 - ✦ Stock options, profit sharing*
 - ✦ Bond covenants*

Aligning Incentives

Creation and maintenance of wealth

An Example

Disney- Michael Eisner CEO

Disney Market Value 1984 \$2.2 Billion

Disney Market Value 1994 \$22 Billion

-

A shareholder who invested \$100 in 1984

has value of \$1460 in 1994

-

Eisner's Reward: \$203 Million

Mostly Incentive Related

Maxim 8

Taxes Bias Business Decisions

Taxes have a significant impact on decisions

- *Income taxes affect cash flows*
- *Government sometimes provides incentives for investment that are tax related*
 - ✦ *accelerated depreciation*
 - ✦ *investment tax credits*
- *Dividends and interest are taxed differently*

Maxim 9

All Risk is Not Equal

Credit risk and market risk

- *Credit risk - risk of missing or being late on a payment*
- *Market risk - risk of change in market value*

Systematic risk and residual risk

- *Residual risk - that which can be diversified away in a portfolio*
- *Systematic risk - that which cannot be diversified away*

Maxim 10

Ethical Dilemmas are Everywhere in Finance

Ethical behavior and value maximization

- *Opportunities for unethical behavior exist*
- *Ethical behavior leads to trust*
- *Trust is necessary for business efficiency*
- *Ethical behavior is enforced*
 - ✦ *Through markets*
 - ✦ *Through regulations*
 - ✦ *Through courts*



Project Selection Techniques

- a. Basic rule for project selection*
- b. Calculating the project return*
- c. Alternative rule for project selection*

a. Basic Rule for Project Selection

The prospective return on the project must be competitive with other investments of comparable risk

Prospective return > return on investment with comparable risk

b. Calculating the Project Return

The timing of cash flows is important

– Typical project

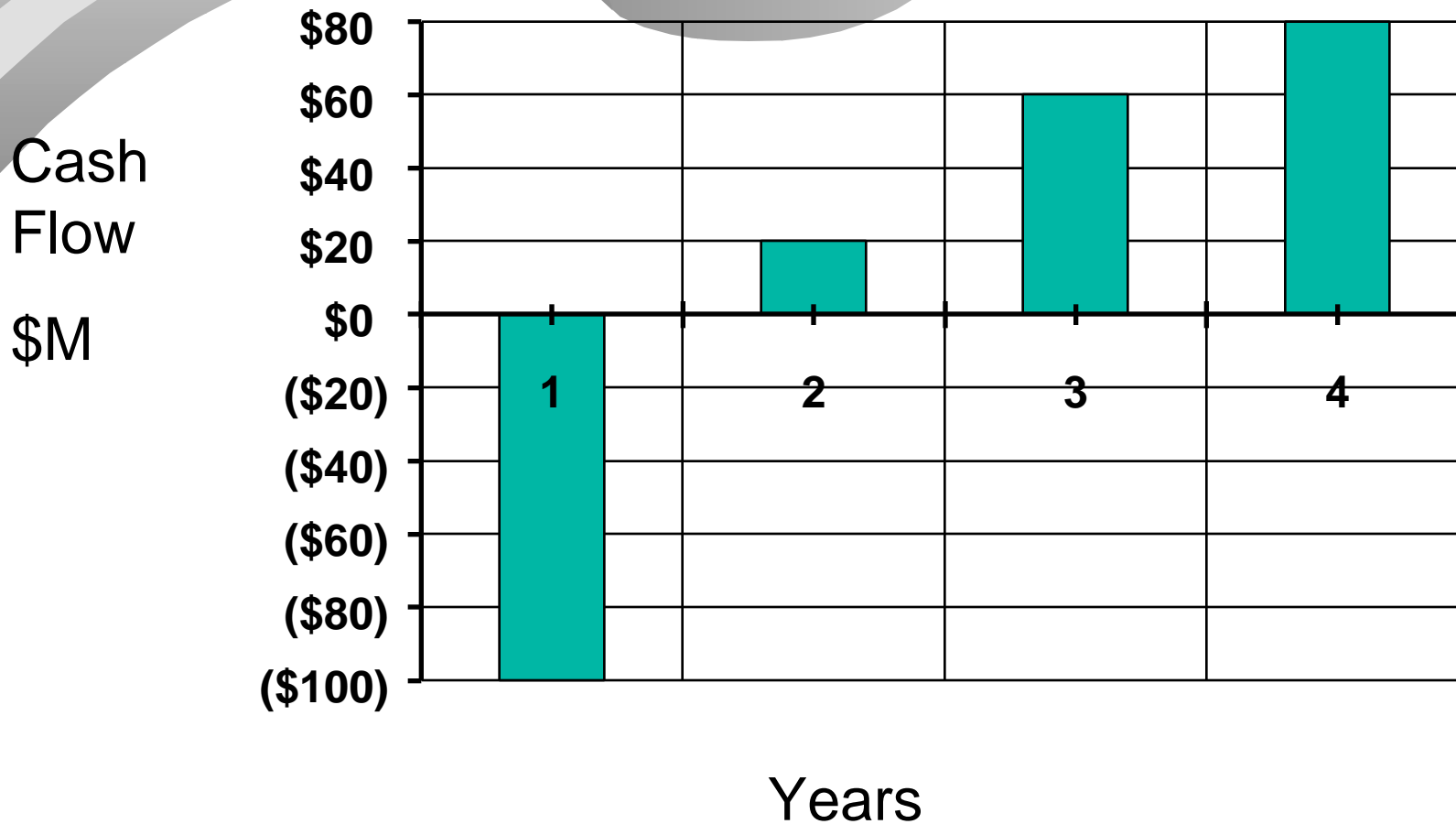
- ✦ Initial cash outflows followed by cash inflows*
- ✦ Extends over more than one year*

– Non typical project

- ✦ Cash outflows followed by a mixture of inflows and outflows*
- ✦ Examples - mines, nuclear power plants which have substantial outflows at termination*

An Example of Cash Flows

Maxim 3 Cash is King



Rate of Return Calculation

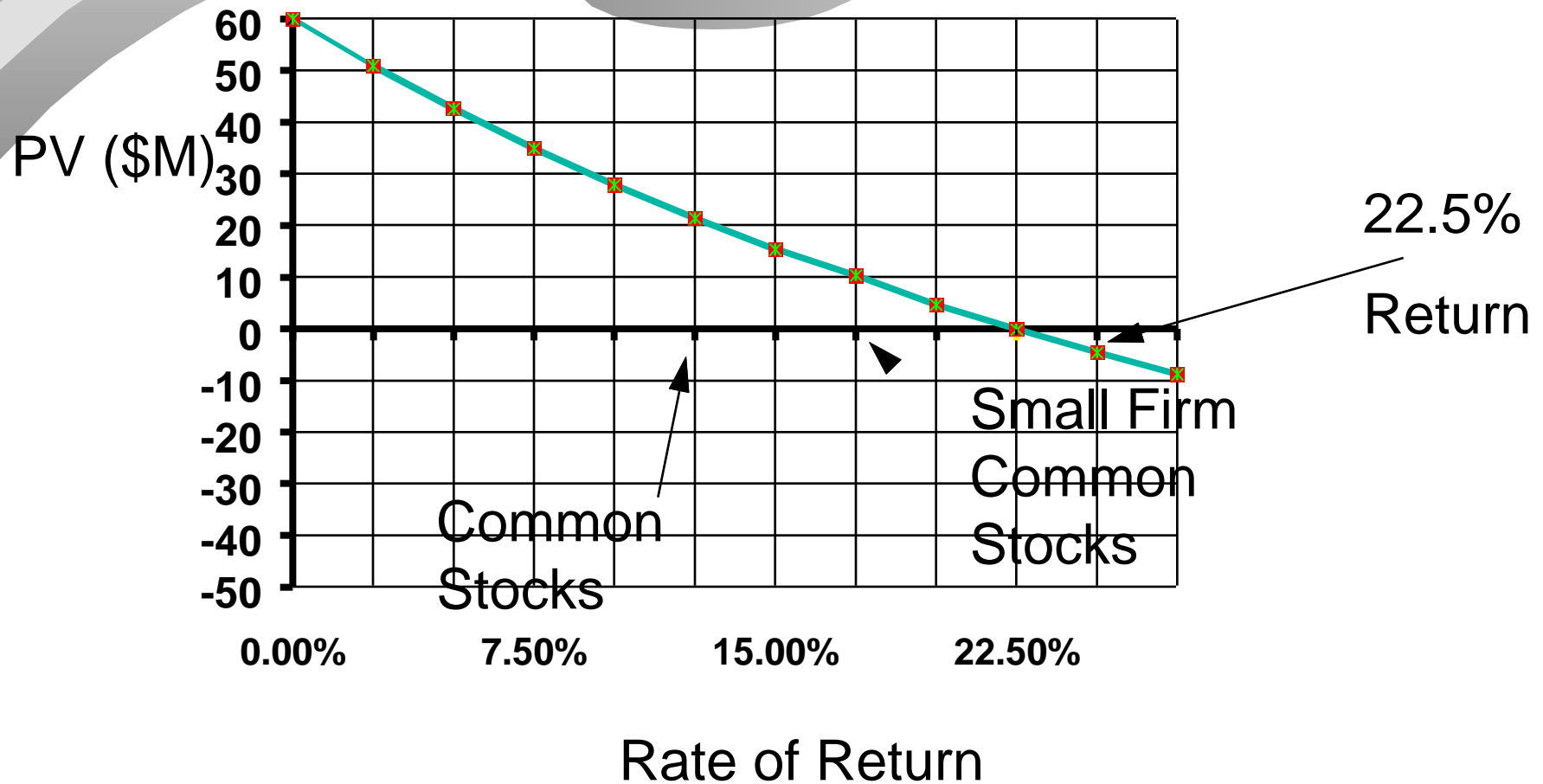
Solve: Present Value = 0 for r

$$PV = -100 + 20/(1+r) + 60/(1+r)^2 + 80/(1+r)^3 = 0$$

Maxim 2 Time Value of Money

Rate of Return on The Project

Maxim 1 Risk-Return Tradeoff



c. Alternative Rule for Project Selection

The present value of the project, at the cost of capital (c), must be greater than zero

$$PV = -100 + 20/(1+c) + 60/(1+c)^2 + 80/(1+c)^3 > 0$$



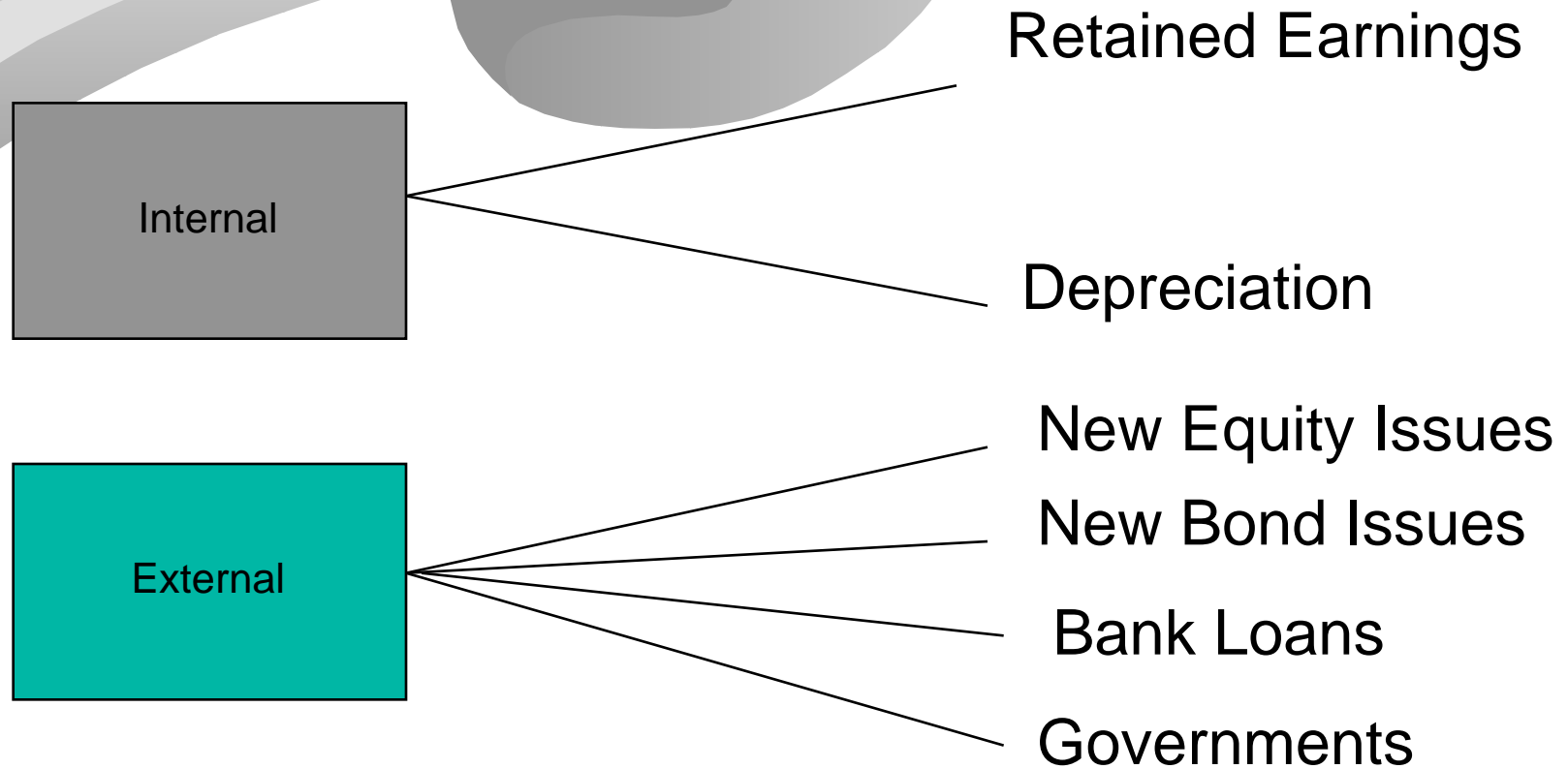
Financing Issues

How are projects financed?

How big are the financial markets?

*How are the costs of financing related to
the risks?*

Financing Projects



Amount & Sources of Funds: Nonfinancial Corporations

Yearly Funds Committed (\$Billions)

<u>Year</u>	<u>Funds Amount</u>	<u>Percent Internal</u>	<u>Percent External</u>
1992	\$586.6	78.9%	21.1%
1991	\$473.2	92.5%	7.5%
1990	\$522.8	78.3%	21.7%
1989	\$562.3	71.1%	28.9%
1988	\$610.9	66.1%	33.9%
1987	\$540.5	<u>69.5%</u>	<u>30.5%</u>
Ave		76.1%	23.9%

Source: *Economic Report of the President*, February 1994

Bonds and Stocks

Bonds - "Fixed Income"- coupon paid twice yearly, fixed term to maturity (callable, convertible, payment in kind).

Bear credit risk and interest rate risk.

Stocks - Share in earnings after taxes, if they exist; are paid dividends, reinvest in the company when earnings exceed dividends.

Bear business, systematic and residual risks.

Outstanding Equity & Debt

U.S. Corporations 1993

Market Value of Equity	\$5,725 Billion (79.7%)
Market Value of Debt	\$1,455 Billion (20.3%)

Source, *Flow of Funds Accounts, Supplement*, Board of Governors, 1994
International Bond Market Analysis, Salomon Brothers 1994

Outstanding Debt

U.S. Bond Market, Year-End 1993 (\$Billions)

U.S. Treasury Securities	\$2,275	32.5%
U.S. Agency Securities	549	7.9%
Domestic Corporate Bonds	1,455	20.8%
Municipal Securities	988	14.1%
Yankee Bonds	126	1.8%
Mortgage-Backed Securities	1,600	22.9%
Total U.S. Bond Market	\$6,993	100.0%

Source: F. Fabozzi, *Bond Markets, Analysis and Strategies*, 2nd ed. 1996, p.2

Risks and the Cost of Debt Financing

Risks - ***credit risk*** is the risk that the bond will not pay the promised interest or principal

interest rate risk is the risk that interest rates will change and as a result bond values will change

Cost of debt capital - the rate of return that can be earned on comparable risk bonds; related to both interest rate risks and credit risk

Bond Ratings

Moody's Ratings for Corporate Bonds

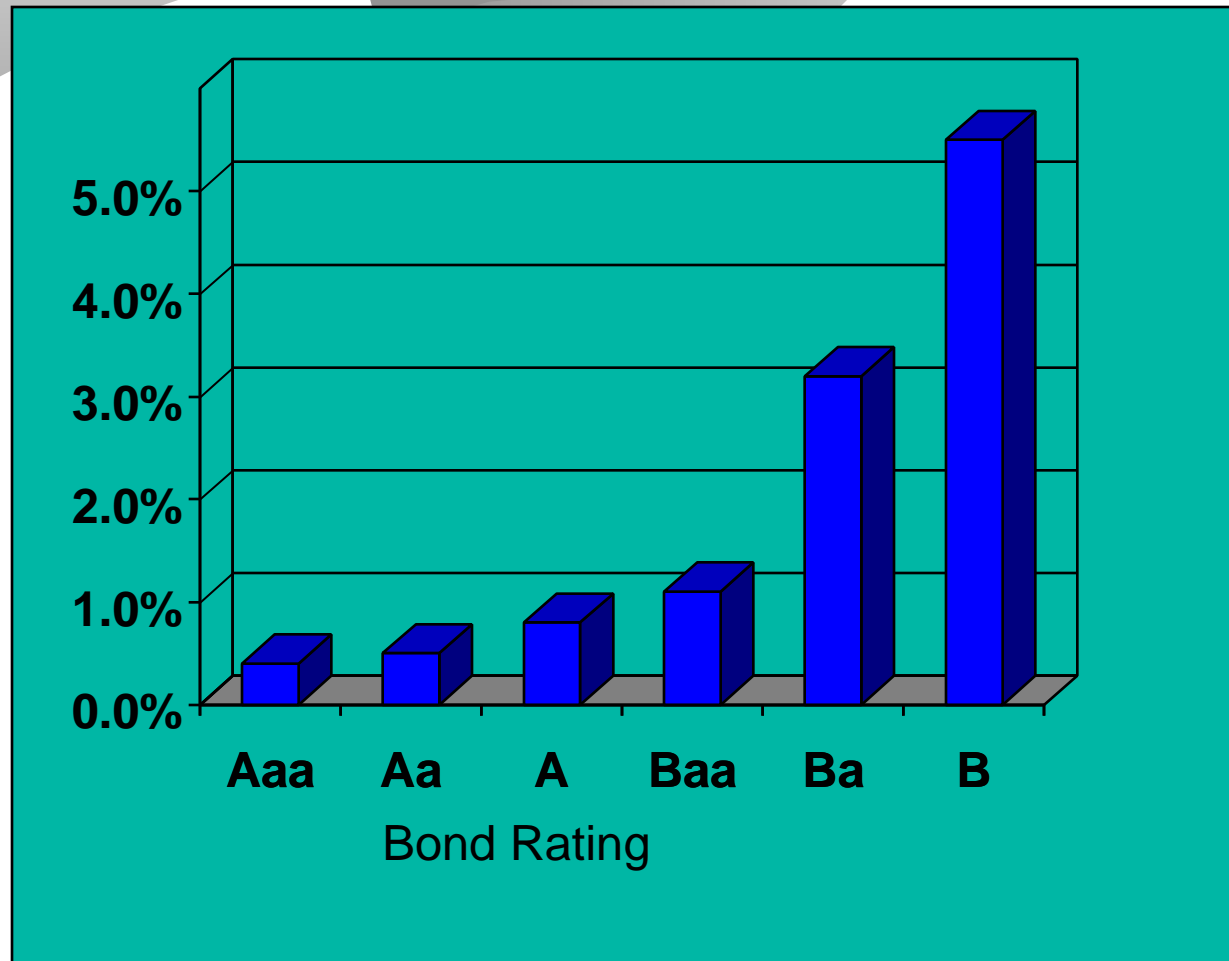
Investment Grade

Aaa	Prime, Maximum Safety
Aa	Very High Grade
A	Upper medium Grade
Baa	Lower Medium Grade

Junk

Ba	Speculative
B	Highly Speculative
Caa	Substantial Risk of Default
Ca	May be in Default

Yield Spreads Over U.S. Treasuries



Recent Yields

March 1, 1996

<u>Security</u>	<u>Yield</u>	<u>Spread</u>
Treasury 10+ Yrs	6.63%	
Corporates(Aaa-Aa)	7.28%	.65%
Corporates(A-Baa)	7.61%	.98%
Junk(Ba-C)	9.57%	2.94%
Nextel Commun(Caa)	13.29%	6.66%

Source: *The Wall Street Journal* , March 4, 1996

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