Chapter 10

Introduction to Risk, Return, and the Opportunity Cost of Capital

Topics Covered

- Rates of Return
- A Century of Capital Market History
- Measuring Risk
- Risk & Diversification
- Thinking About Risk

Rates of Return

$$\text{Percentage Return} = \frac{\text{Capital Gain} + \text{Dividend}}{\text{Initial Share Price}}$$

$$\text{Percentage Return} = \frac{5.47 + .82}{31.12}$$

$$= .202 \text{ or } 20.2\%$$

Rates of Return

$$\text{Dividend Yield} = \frac{\text{Dividend}}{\text{Initial Share Price}}$$

$$\text{Capital Gain Yield} = \frac{\text{Capital Gain}}{\text{Initial Share Price}}$$

Rates of Return

$$\text{Dividend Yield} = \frac{0.82}{31.12}$$
$$= .026 \text{ or } 2.6\%$$

$$\text{Capital Gain Yield} = \frac{5.47}{31.12}$$
$$= .176 \text{ or } 17.6\%$$

Rates of Return

Nominal vs. Real

$$1 + \text{real ror} = \frac{1 + \text{nominal ror}}{1 + \text{inflation rate}}$$

$$1 + \text{real ror} = \frac{1 + .202}{1 + .033} = 1.164$$

$$\text{real ror} = 16.4\%$$

Market Indexes

Market Index

- Measure of the investment performance of the overall market.

Dow Jones Industrial Average (The Dow)

- Value of a portfolio holding one share in each of 30 large industrial firms.
- First be computed in 1896 and most people used to it and expect to hear it on the 6 o’clock news.

Market Indexes

Standard & Poor's Composite Index (The S&P 500)

- Value of a portfolio holding shares in 500 firms. Holdings are proportional to the number of shares in the issues.
- Only a small proportion of the publicly traded companies are represented in the S&P 500. However, there firms are among the largest in the country and they account for nearly 80 % of the stock traded.

Market Indexes

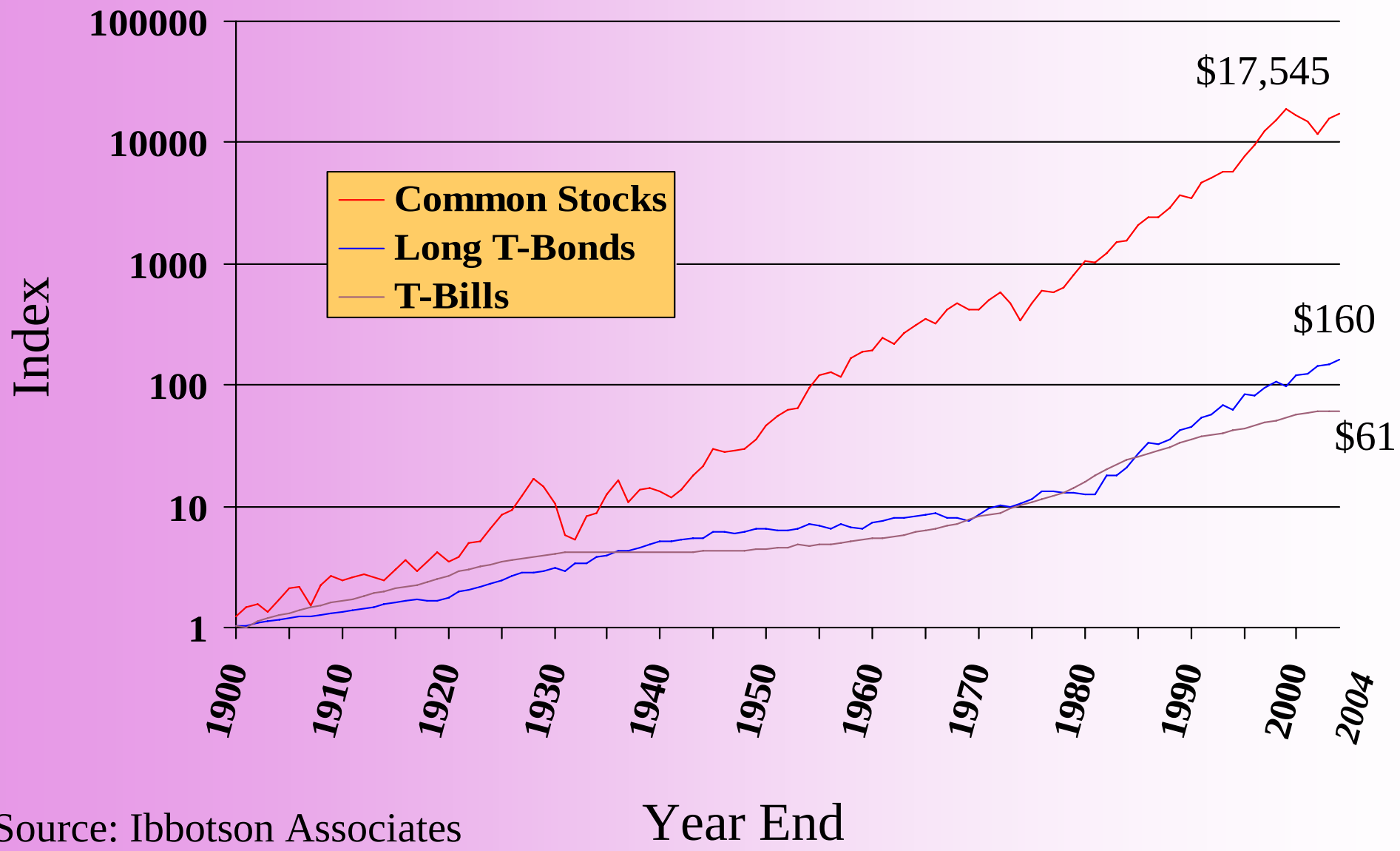
Nikkei Index of Tokyo

Financial Times Index for London

Morgan Stanley Capital International (MSCI)

- World Stock Market Index

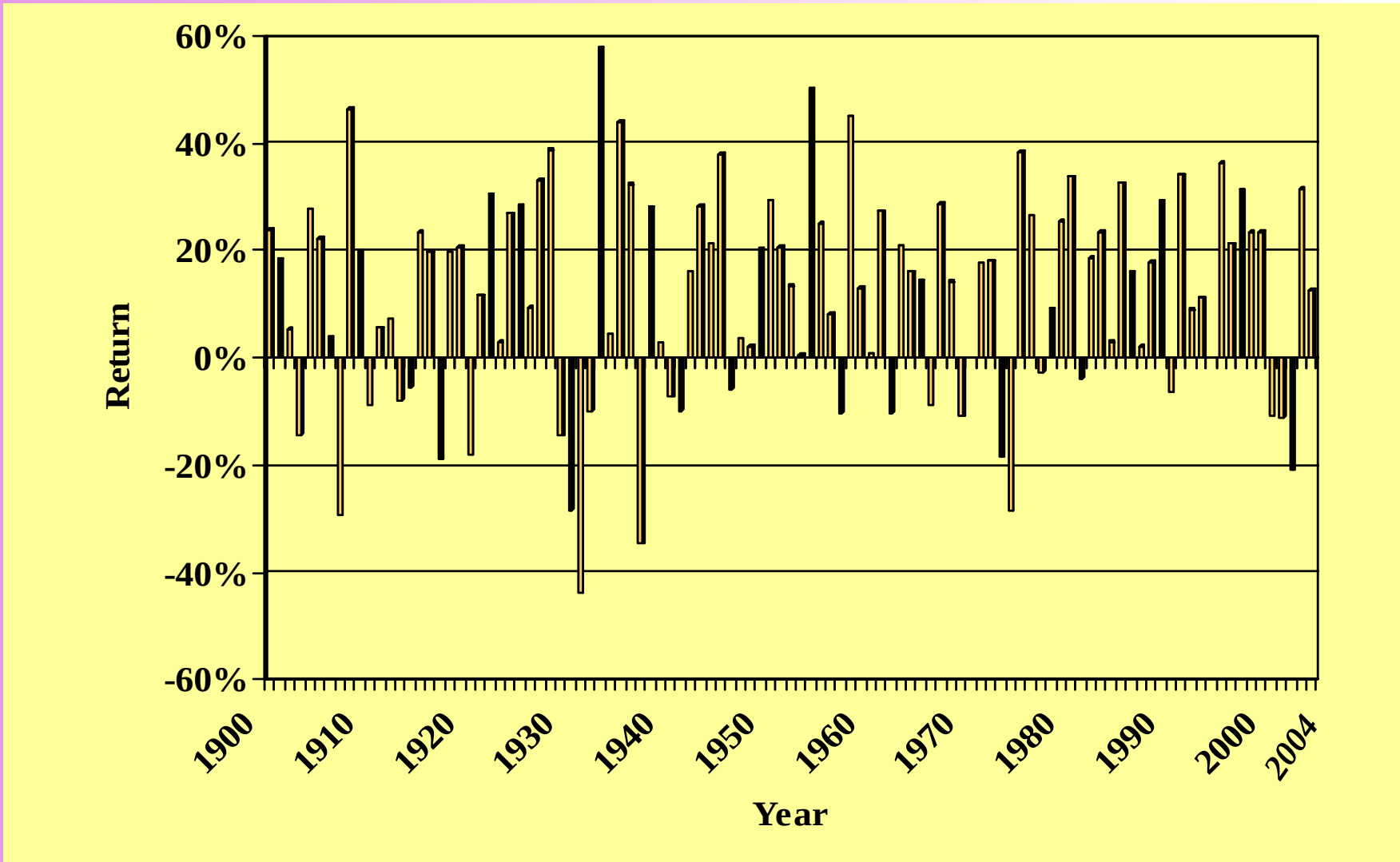
The Value of an Investment of $1 in 1900



Source: Ibbotson Associates

Rates of Return

Common Stocks (1900-2004)



The Value of an Investment of $1 in 1900

Maturity Premium: Extra overage return from investing in long- versus short-term Treasury securities

Risk Premium: Expected return in excess of risk-free return as compensation for risk

★The expected return on an investment provides compensation to investors both for waiting (the time value of money) and for worrying (the risk of the particular asset)

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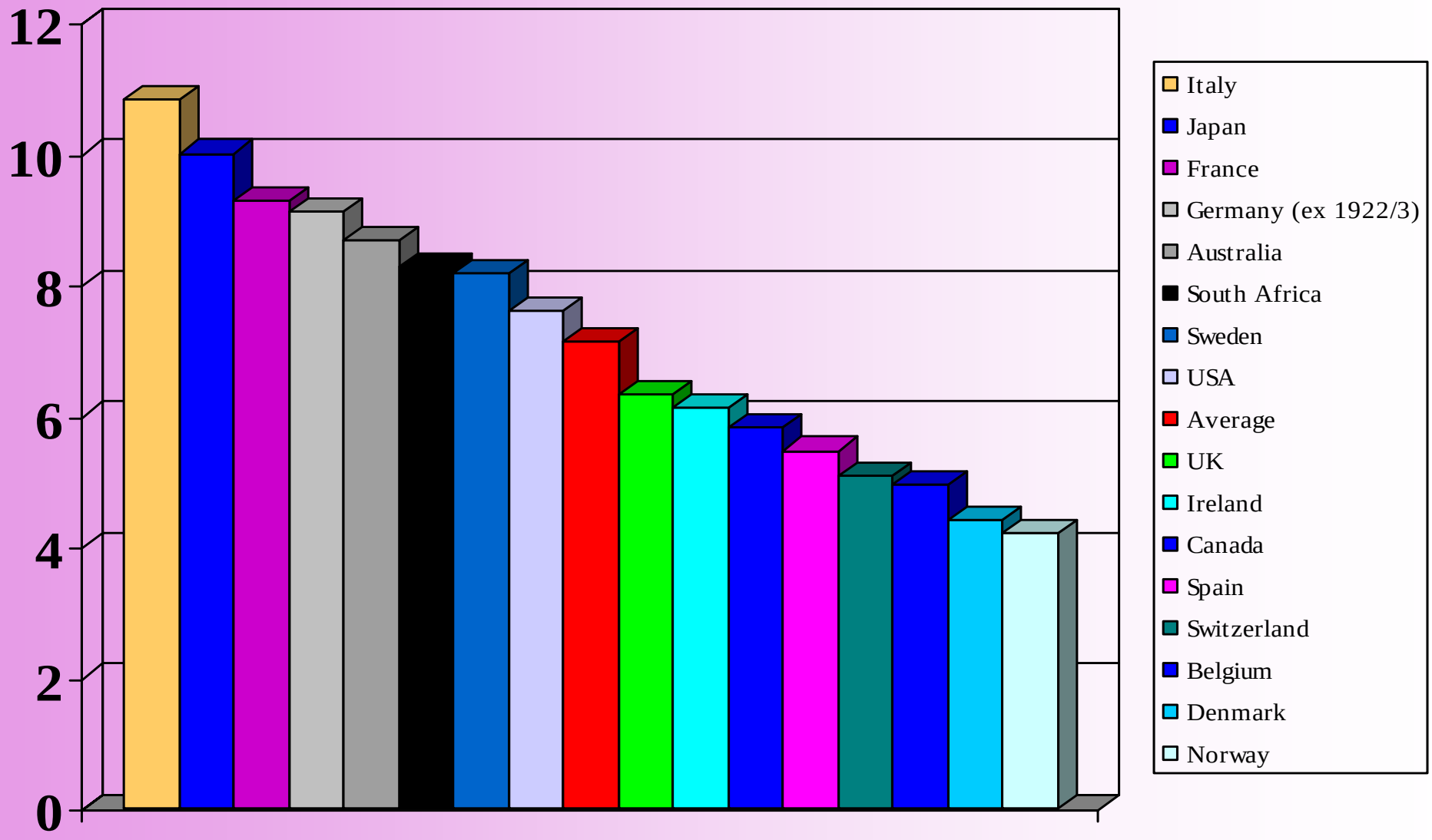
Expected Return

Expected market return	=	interest rate on Treasury bills	+	normal risk premium
(1981) 21.6%	=	14	+	7.6
(2005) 10.1%	=	2.5	+	7.6

The average risk premium for 16 countries from 1900-2004. The common stocks has averaged about 7.1% more than the interest rate on bills (see the next slide)

Country Risk Premia (%)



Measuring Risk

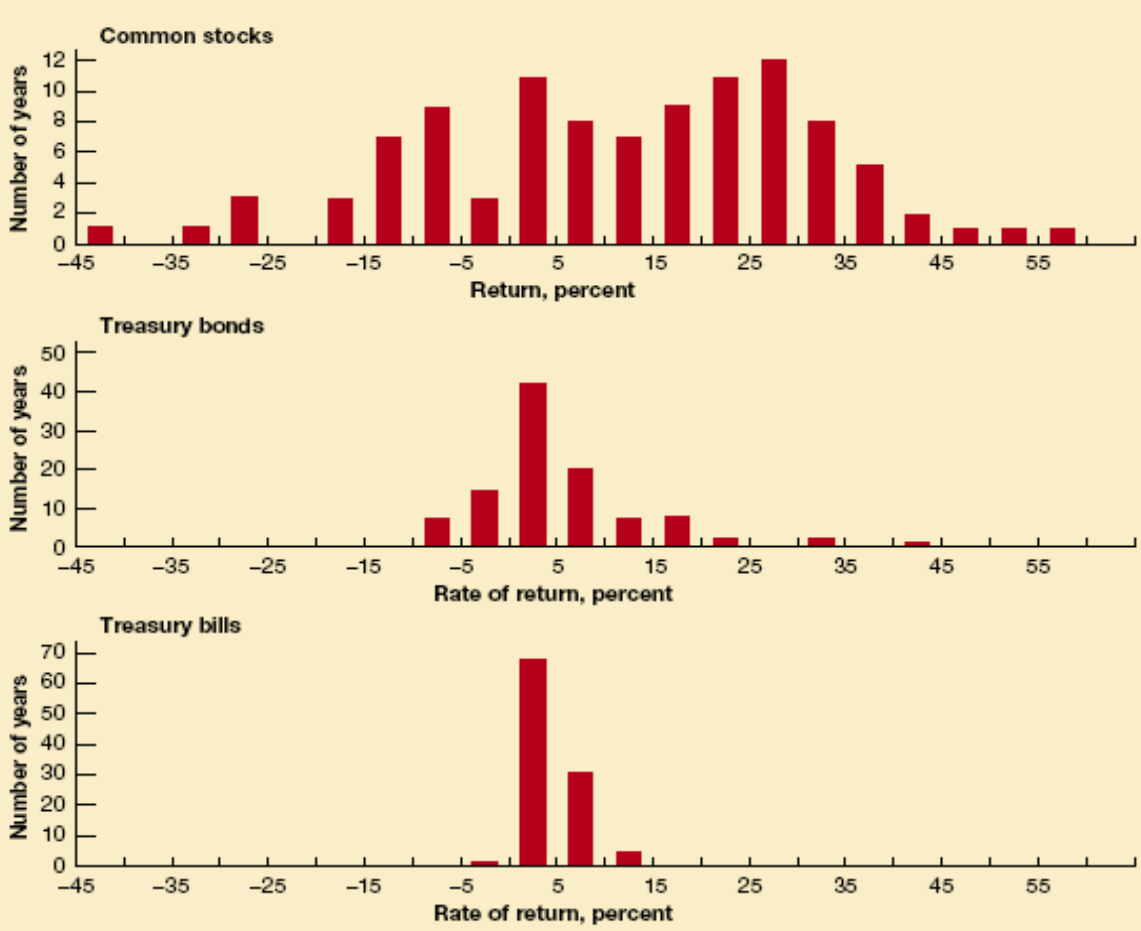
Variance - Average value of squared deviations from mean. A measure of volatility.

Standard Deviation – Square root of variance. Another measure of volatility.

★Historical returns on major asset classes, 1900-2004 (see the next slide)

Histogram of Returns

FIGURE 10–4 Historical returns on major asset classes, 1900–2004



Source: E. Dimson, P. R. Marsh, and M. Staunton, *Triumph of the Optimists: 101 Years of Global Investment Returns* (Princeton, NJ: Princeton University Press, 2002), with updates kindly provided by *Triumph's* authors.

Measuring Risk

Two-Coins Toss Game-calculating variance and standard deviation

(1) Percent Rate of Return	(2) Deviation from Mean	(3) Squared Deviation
+ 40	+ 30	900
+ 10	0	0
+ 10	0	0
- 20	- 30	900

Variance = average of squared deviations = 1800 / 4 = 450

Standard deviation = square of root variance = $\sqrt{450}$ = 21.2%

Risk and Diversification

★ Standard deviation of returns, 1999-2004.

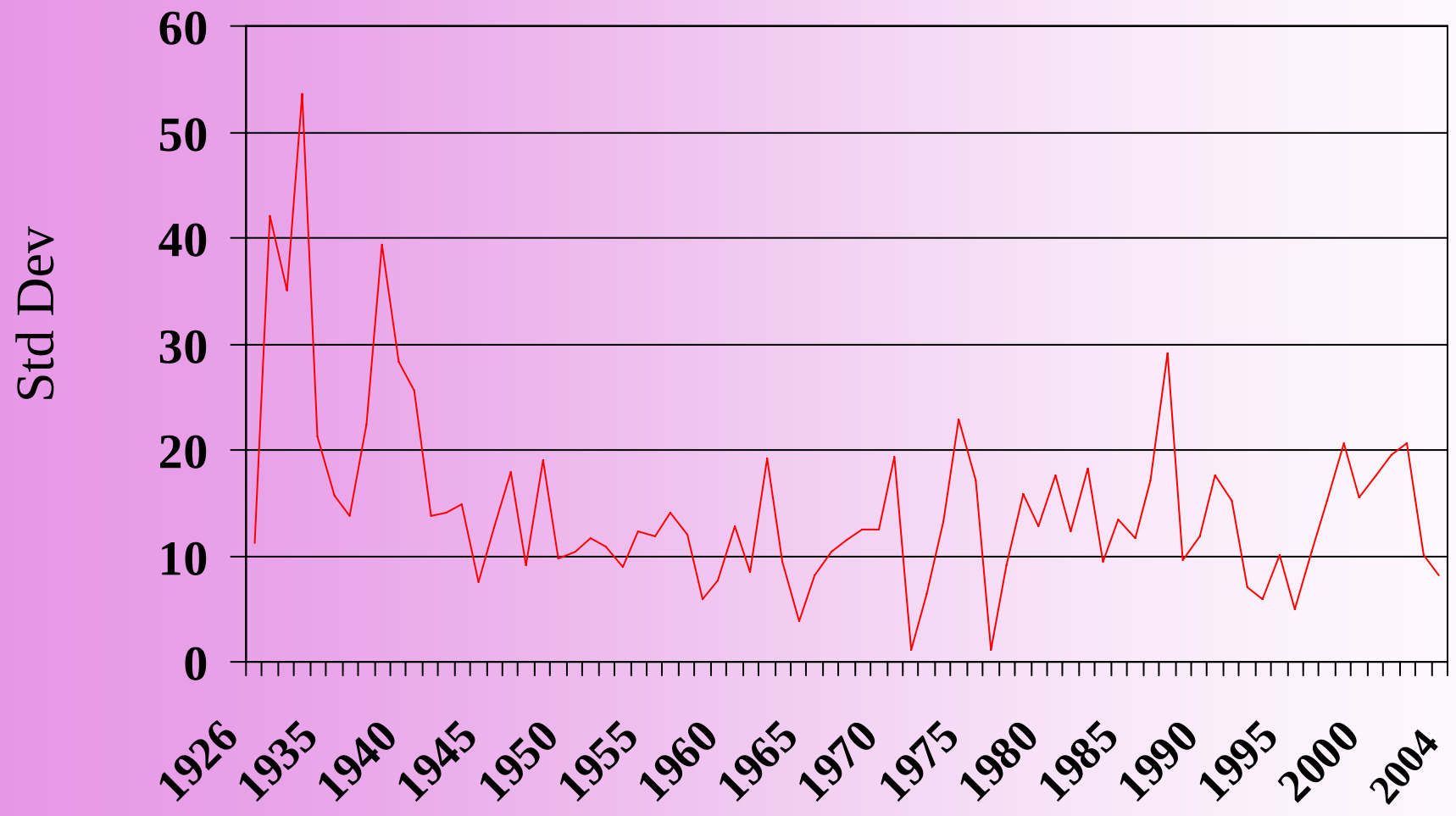
Year	Rate of Return	Deviation from Average Return	Squared Deviation
1999	23.7	19.52	381.03
2000	(10.9)	(15.08)	227.41
2001	(11.0)	(15.18)	230.43
2002	(20.9)	(25.08)	629.01
2003	31.6	27.42	751.86
2004	12.6	8.42	70.90
Total	25.1		2,290.63

Average rate of return = 25.1/6=4.18%

Variance = average of squared deviations = 2290.63/6=381.77

Standard deviation = squared root of variance = 19.54%

Stock Market Volatility 1926-2004



★ monthly variance x 12 = annual variance

Risk and Diversification

Diversification - Strategy designed to reduce risk by spreading the portfolio across many investments.

Unique Risk - Risk factors affecting only that firm. Also called "diversifiable risk."

Market Risk - Economy-wide sources of risk that affect the overall stock market. Also called "systematic risk."

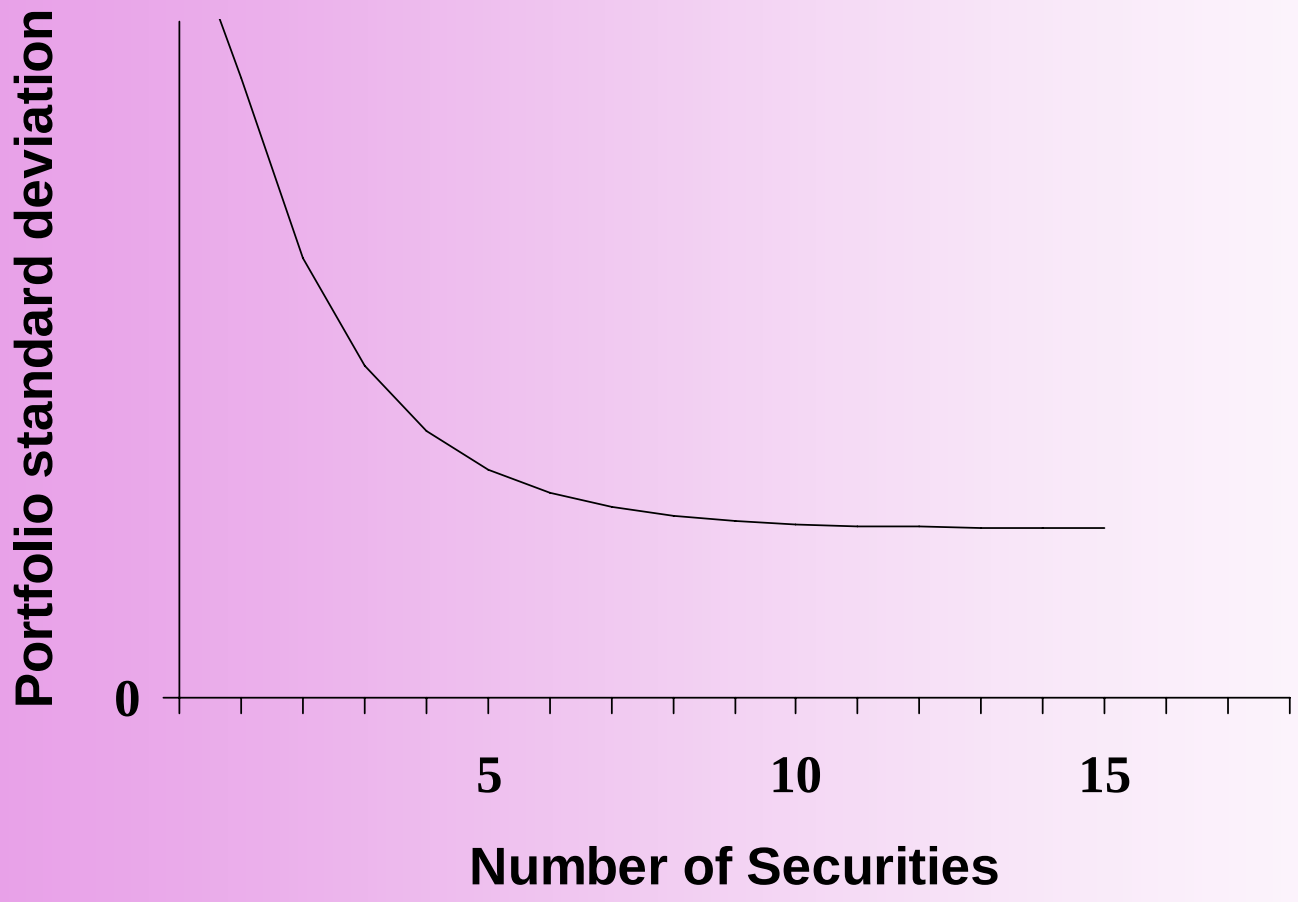
Risk and Diversification

$$\text{Portfolio rate of return} = \left(\begin{array}{l}\text{fraction of portfolio}\\ \text{in first asset}\end{array}\right) \times \left(\begin{array}{l}\text{rate of return}\\ \text{on first asset}\end{array}\right) + \left(\begin{array}{l}\text{fraction of portfolio}\\ \text{in second asset}\end{array}\right) \times \left(\begin{array}{l}\text{rate of return}\\ \text{on second asset}\end{array}\right)$$

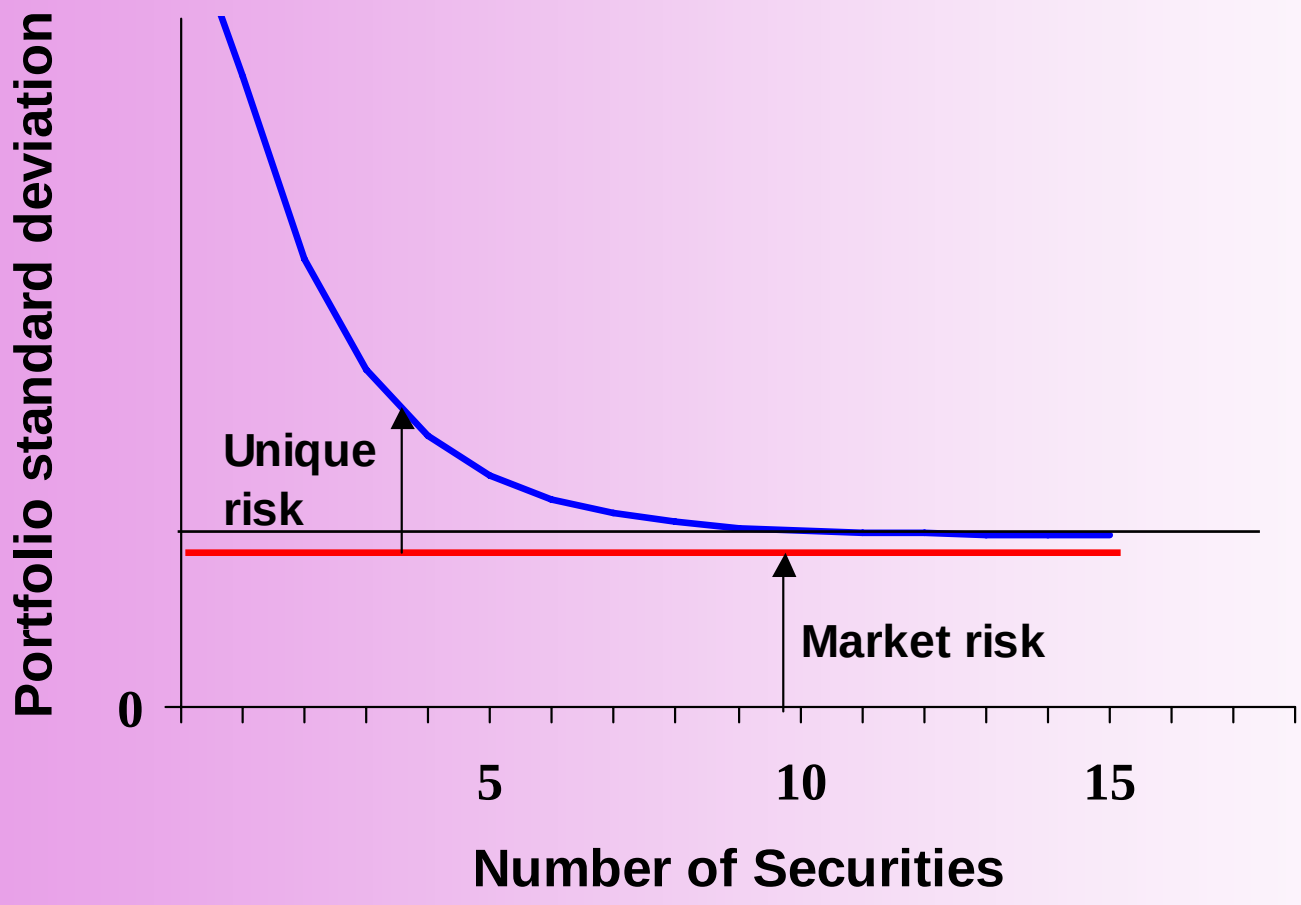
Risk and Diversification

Scenario	Probability	A (0.75)	B (0.25)	Portfolio
Recession	1/3	-8%	20%	-1%
Normal	1/3	+5%	+3%	+4.5%
Boom	1/3	+18%	-20%	+8.5%
Expected Return		5%	1%	4%
Variance		112.7 (%^2)	268.7 (%^2)	15.2 (%^2)
Standard Deviation		10.6%	16.4%	3.9%

Risk and Diversification



Risk and Diversification



Risk and Diversification

Message 1 - Some Risks Look Big and Dangerous but Really Are Diversifiable (p.285 Example 10.2)

Message 2 – Market Risks Are Macro Risks

- ➔ Diversified portfolios are not exposed to the unique risks of individual stocks but are exposed to the uncertain events that affect the entire securities market and the entire economy. For instance, interest rates, inflation, foreign exchange rates, and energy costs
- ➔ Company managers may worry about both macro and micro risks, but only the former affect the cost of capital (因為投資人只看macro risk)

Risk and Diversification

<u>Message 3</u> – Risk Can Be Measured

- ➔ The risk of firms can be measured by looking at how their stock prices fluctuate (measure the individual stock's sensitivity to the fluctuations of the overall stock market - beta)