Chapter 10 Lecture - Some Lessons from Capital Market History

Learning Objectives

After studying this chapter, you should be able to:

- LO1 Calculate the return on an investment.
- LO2 Discuss the historical returns on various important types of investments.
- LO3 Explain the historical risks on various important types of investments.
- LO4 Assess the implications of market efficiency

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Risk–Return Tradeoff

- Two key lessons from capital market history:
  - There is a reward for bearing risk
  - The greater the potential reward, the greater the risk

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Dollar & Percent Returns

- Total dollar return = the return on an investment measured in dollars
  - $ Return = Dividends + Capital Gains
  - Capital Gains = Price received – Price paid
- Total percent return = the return on an investment measured as a percentage of the original investment.
  - % Return = $ Return/$ Invested

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Percent Return

Dividend Yield ➡ $DY = \frac{D_{t+1}}{P_t}$

Capital Gains Yield ➡ $CGY = \frac{P_{t+1} - P_t}{P_t}$

$\%\,\text{Return} = DY + CGY$

$\%\,\text{Return} = \frac{D_{t+1} + P_{t+1} - P_t}{P_t}$

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Example: Calculating Total Dollar and Total Percent Returns

- You invest in a stock with a share price of $25.
- After one year, the stock price per share is $35
- Each share paid a $2 dividend
- What was your total return?

	Dollars	Percent
Dividend	$2.00	$2/25 = 8%
Capital Gain	$35 - $25 = $10	$10/25= 40%
Total Return	$2 + $10 = $12	$12/$25 = 48%

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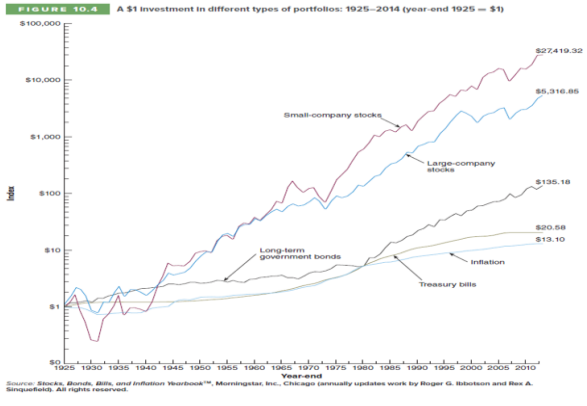

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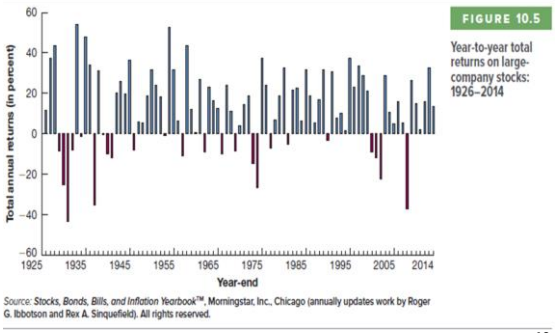
Year-to-Year Total Returns

Large-Company Stock Returns



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Year-to-Year Total Returns

Small-Company Stock Returns

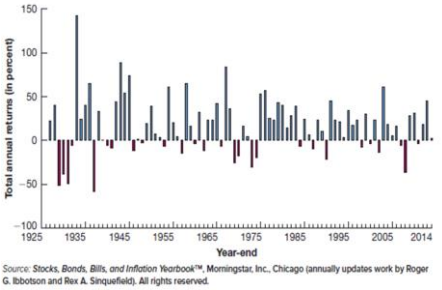

FIGURE 10.6
Year-to-year total returns on small-company stocks: 1926–2014

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Year-to-Year Total Returns

Long-Term Government Bond & U.S. Treasury Bill Returns

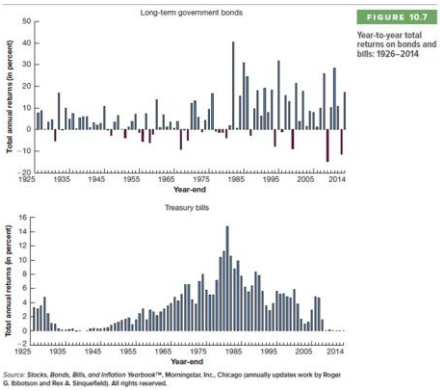

FIGURE 10.7
Year-to-year total returns on bonds and bills: 1926–2014

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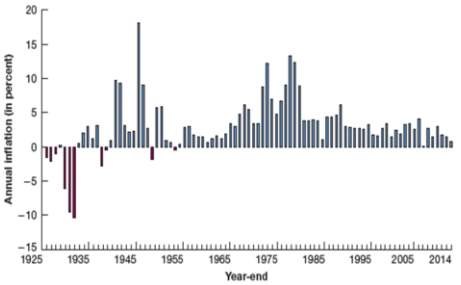
Year-to-Year Inflation

Year-to-Year Percentage Change in the CPI

FIGURE 10.8
Year-to-year Inflation: 1926–2014



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Average Returns: The First Lesson 1926 - 2014

Investment	Average Return
Large Stocks	12.1%
Small Stocks	16.7%
Long-term Corporate Bonds	6.4%
Long-term Government Bonds	6.1%
U.S. Treasury Bills	3.5%
Inflation	3.0%

http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/histretSP.html

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Historical Average Returns

- **Historical Average Return = simple, or arithmetic average**

$$\text{Historical Average Return} = \frac{\sum_{i=1}^{T} \text{yearly return}}{T}$$

- **Referring to data form text:**
  - **Sum the returns for large-company stocks from 1926 through 2011, you get about 10.15/86 years = 11.8%.**
- ***Your best guess about the size of the return for a year selected at random is 11.8%.***

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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**
- **Large Stocks: 11.8 – 3.6 = 8.2%**
- **Small Stocks: 16.5 – 3.6 = 12.9%**
- **L/T Corporate Bonds: 6.4 – 3.6 = 2.8%**
- **L/T Government Bonds: 6.1 – 3.6 = 2.5%**
- **U.S. Treasury Bills: 3.6 – 3.6 = 0***

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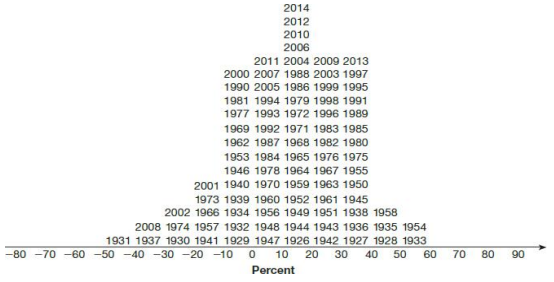
Risk

FIGURE 10.9 Frequency distribution of returns on common stocks: 1926–2014 - Risk is measured by the dispersion, spread, or volatility of returns



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Return Variability Review

- **Variance = VAR(R) or σ^2**
  - **Common measure of return dispersion**
  - **Also call *variability***
- **Standard deviation = SD(R) or σ**
  - **Square root of the variance**
  - **Sometimes called *volatility***
  - **Same "units" as the average**

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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:

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

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Example: Calculating Historical Variance and Standard Deviation

- Using data from text for large-company stocks:

(1)	(2)	(3)	(4)	(5)
Year	Return	Average Return:	Difference (2) - (3)	Squared (4) x (4)
1926	11.14	11.48	-0.34	0.12
1927	37.13	11.48	25.65	657.82
1928	43.31	11.48	31.83	1013.02
1929	-8.91	11.48	-20.39	415.83
1930	-25.26	11.48	-36.74	1349.97
Sum:	57.41		Sum:	3436.77
Average:	11.48		Variance:	859.19
			Standard Deviation:	29.31

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Return Variability Review and Concepts

- Normal distribution:
  - A symmetric frequency distribution
  - The "bell-shaped curve"
  - Completely described by the mean and variance
- Does a normal distribution describe asset returns?

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The Normal Distribution

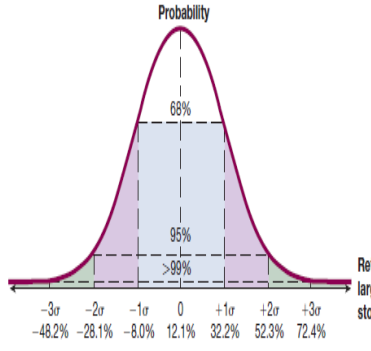

FIGURE 10.11

The normal distribution

Illustrated returns are based on the historical return and standard deviation for a portfolio of large common stocks.

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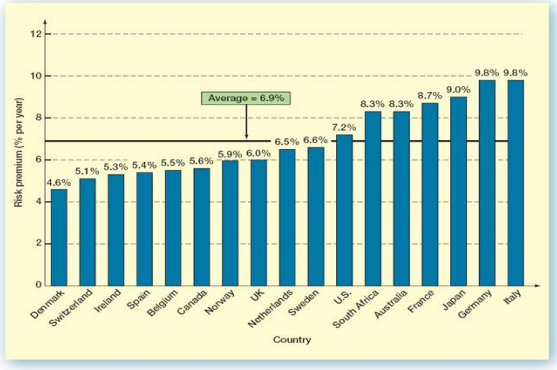

Source: Based on information in Elroy Dimson, Paul Marsh, and Michael Staunton, "The Worldwide Equity Premium: A Smaller Puzzle," in Handbook of the *Equity Risk Premium*, Rajnish Mehra, ed. (Elsevier: 2007). Updates by the authors.

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Arithmetic vs. Geometric Mean

- **Arithmetic average:**
  - **Return earned in an average period over multiple periods**
  - **Answers the question: "What was your return *in an average year* over a particular period?"**
- **Geometric average:**
  - **Average compound return per period over multiple periods**
  - **Answers the question: "What was your average *compound return per year* over a particular period?"**
- **Geometric average < arithmetic average unless all the returns are equal**

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Geometric Average Return

$$GAR = \left[(1+R_1)\times(1+R_2)\times\ldots\times(1+R_{N)}\right]^{1/T} - 1$$

Where:

R_i = return in each period

T = number of periods

$$GAR = \left[\prod_{i=1}^{T}(1+R_i)\right]^{1/T} - 1$$

Where:

Π = Product (like Σ for sum)

T = Number of periods in sample

R_i = Actual return in each period

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Example: Calculating a Geometric Average Return

Year	Percent Return	One Plus Return	Compounded Return:
1926	11.14	1.1114	1.1114
1927	37.13	1.3713	1.5241
1928	43.31	1.4331	2.1841
1929	-8.91	0.9109	1.9895
1930	-25.26	0.7474	1.4870
		(1.4870)^(1/5):	1.0826

Geometric Average Return: 8.26%

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Historical Geometric vs. Arithmetic Average Returns

TABLE 10.4

Geometric versus arithmetic average returns: 1926–2014

Series	Average Return		Standard Deviation
	Geometric	Arithmetic	
Large-company stocks	10.1%	12.1%	20.1%
Small-company stocks	12.2	16.7	32.1
Long-term corporate bonds	6.1	6.4	8.4
Long-term government bonds	5.7	6.1	10.0
Intermediate-term government bonds	5.3	5.4	5.6
U.S. Treasury bills	3.5	3.5	3.1
Inflation	2.9	3.0	4.1

Arithmetic vs. Geometric Mean Which is better?

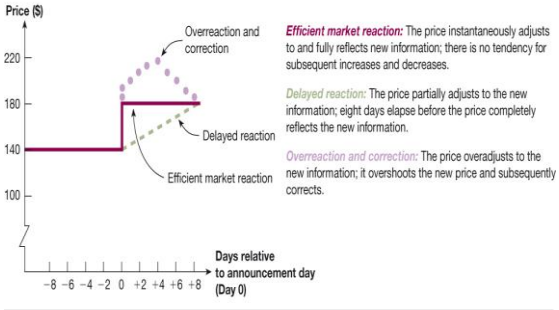
- The arithmetic average is overly optimistic for long horizons
- The geometric average is overly pessimistic for short horizons
- Depends on the planning period under consideration
  - 15 – 20 years or less: use arithmetic
  - 20 – 40 years or so: split the difference between them
  - 40 + years: use the geometric

Efficient Capital Markets

- The Efficient Market Hypothesis:
  - Stock prices are in equilibrium
  - Stocks are "fairly" priced
  - Informational efficiency
- If true, you should not be able to earn "abnormal" or "excess" returns
- Efficient markets *DO NOT* imply that investors cannot earn a positive return in the stock market

Reaction of stock price to new information in efficient and inefficient markets

FIGURE 10.14 Reaction of stock price to new information in efficient and inefficient markets



Forms of Market Efficiency

- **Strong-form Efficient Market:**
  - Prices reflect all information, including public and private
  - If true, then investors can not earn abnormal returns regardless of the information they possess
  - Empirical evidence indicates that markets are NOT strong form efficient
    - *Insiders* can earn abnormal returns (may be illegal)

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Forms of Market Efficiency

- **Semistrong Form Efficiency**
  - Prices reflect all publicly available information including trading information, annual reports, press releases, etc.
  - If true, then investors cannot earn abnormal returns by trading on public information
  - Implies that fundamental analysis will not lead to abnormal returns

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Forms of Market Efficiency

- **Weak Form Efficiency**
  - Prices reflect all past market information such as price and volume
  - If true, then investors cannot earn abnormal returns by trading on market information
  - Implies that technical analysis will not lead to abnormal returns
  - Empirical evidence indicates that markets are generally weak form efficient

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Common Misconceptions about EMH

- EMH does not mean that you can't make money
- EMH does mean that:
  - On average, you will earn a return appropriate for the risk undertaken
  - There is no bias in prices that can be exploited to earn excess returns
  - Market efficiency will not protect you from wrong choices if you do not diversify – you still don't want to put all your eggs in one basket

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