Chapter 10 Some Lessons from Capital Market History

Key Concepts and Skills

After studying this chapter, you should be able to:

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

Chapter Outline

Risk–Return Trade-off

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

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

Percent Return

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

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

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

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

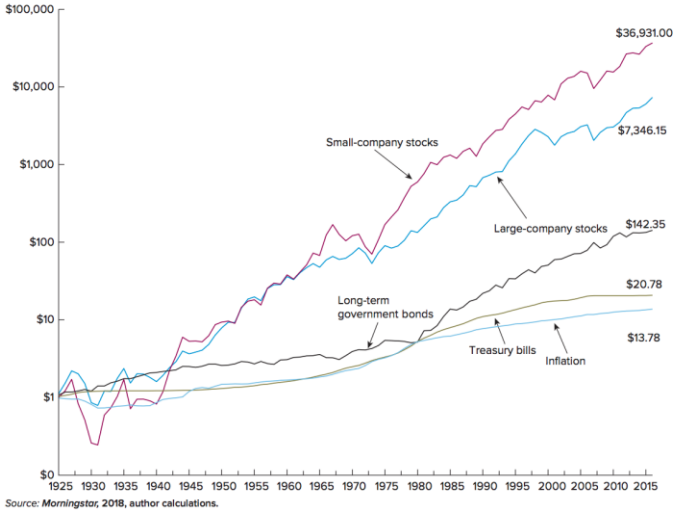
Example: Calculating Total Dollar and Total Percent Returns

- 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%

U.S. Financial Markets

FIGURE 10.4 A $1 investment in different types of portfolios: 1925–2017 (year-end 1925 = $1)



Source: Morningstar, 2018, author calculations.

Year-to-Year Total Returns (1 of 3)

Large-Company Stock Returns

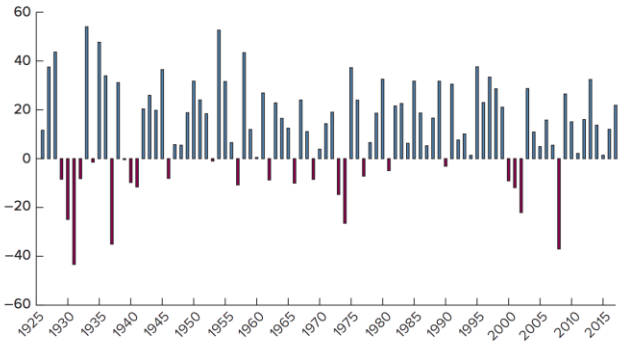


FIGURE 10.5

Year-to-year total returns on large-company stocks: 1926–2017

Source: *Morningstar,* 2018, author calculations.

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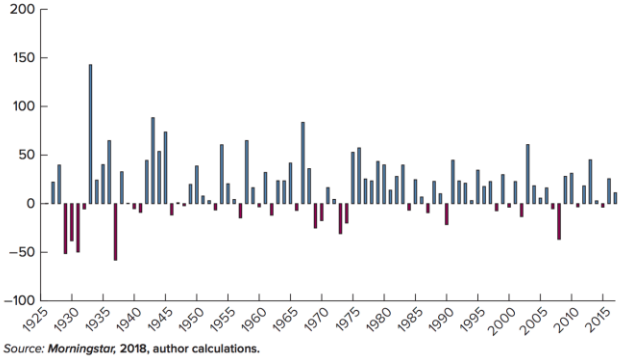
Year-to-Year Total Returns (2 of 3)

Small-Company Stock Returns

FIGURE 10.6

Year-to-year total returns on small-company stocks: 1926–2017



Source: *Morningstar,* 2018, author calculations.

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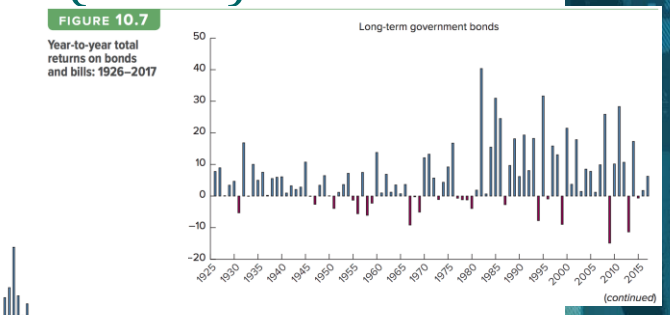
Year-to-Year Total Returns (3 of 3)

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

FIGURE 10.7

Year-to-year total returns on bonds and bills: 1926–2017



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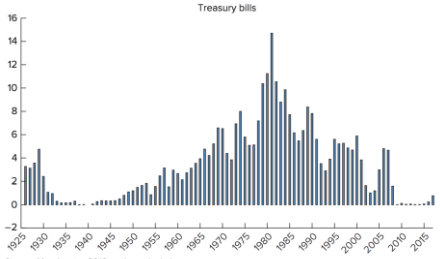


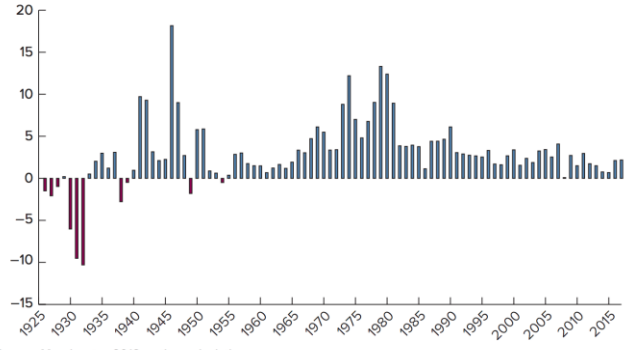
Source: *Morningstar*, 2018, author calculations.

Year-to-Year Inflation

Year-to-Year Percentage Change in the CPI

FIGURE 10.8

Year-to-year inflation: 1926–2017



Source: *Morningstar*, 2018, author calculations.

Average Returns: The First Lesson
1926–2017

Table 10.2

Investment	Average Return
Large stocks	12.1%
Small stocks	16.5%
Long-term corporate bonds	6.4%
Long-term government bonds	6.0%
U.S. Treasury bills	3.4%
Inflation	3.0%

Historical Average Returns

- Historical Average Return = simple, or arithmetic average

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

- Using the data in Table 10.1:
  - Sum the returns for large-company stocks from 1926 through 2014, you get about 10.77/89 years = 12.1%.
- *Your best guess about the size of the return for a year selected at random is 12.1%.*

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

Historical Risk Premiums

- Large Stocks: 12.1 – 3.4 = 8.7%
- Small Stocks: 16.5 – 3.4 = 13.1%
- L/T Corporate Bonds: 6.4 – 3.4 = 3.0%
- L/T Government Bonds: 6.0 – 3.4 = 2.6%
- U.S. Treasury Bills: 3.4 – 3.4 = 0*

* By definition!

Table 10.3

Risk

Risk is measured by the dispersion, spread, or volatility of returns.

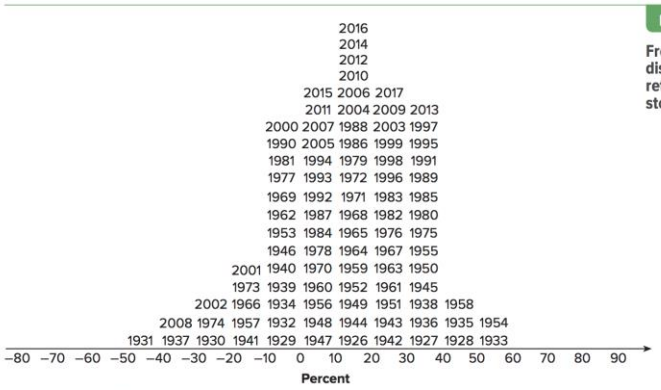


FIGURE 10.9

Frequency distribution of returns on common stocks: 1926–2017

Source: ***Morningstar,* 2018, author calculations.**

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

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:

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

Example: Calculating Historical Variance and Standard Deviation

- Using data from Table 10.1 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

Example: Work the Web

- How volatile are mutual funds?
- Morningstar provides information on mutual funds, including volatility (standard deviation).
- Click on this link to go to the Morningstar site.
  - Pick a fund, such as the Fidelity Magellan (FMAGX).
  - Enter the ticker in the "Stock/Fund" box, click on the "Go" button, and then click on "Ratings & Risk."

FIGURE 10.10 Historical average returns, standard deviations, and frequency distributions: 1926–2017

Series	Arithmetic Mean (%)	Standard Deviation (%)	Distribution (%)
Small-company stocks*	16.5	31.7	
Large-company stocks	12.1	19.8	
Long-term corporate bonds	6.4	8.3	
Long-term government bonds	6.0	9.9	
Intermediate-term government bonds	5.2	5.6	
U.S. Treasury bills	3.4	3.1	
Inflation	3.0	4.0	

*The 1933 small-company stocks total return was 142.9 percent.

Source: Morningstar, 2018, author calculations.

Historical Average Returns and Standard Deviations

Figure 10.10

Return Variability Review and Concepts

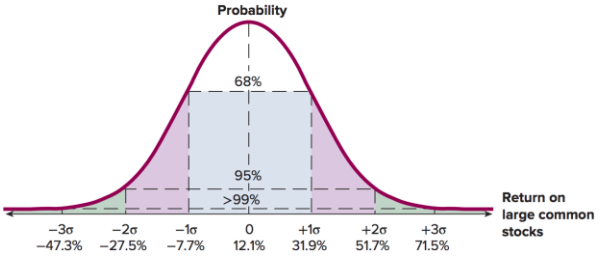
- Normal distribution:
  - A symmetric frequency distribution
  - The “bell-shaped curve”
  - Completely described by the mean and variance
- Does a normal distribution describe asset returns?

The Normal Distribution
Figure 10.11

FIGURE 10.11

The normal distribution

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



Record One-Day Losses

Top 12 One-Day Percentage Changes in the Dow Jones Industrial Average		
1	October 19, 1987	−22.61
2	October 28, 1929	−12.82
3	October 29, 1929	−11.73
4	November 6, 1929	− 9.92
5	December 18, 1899	− 8.72
6	August 12, 1932	− 8.40
7	March 14, 1907	− 8.29
8	October 26, 1987	− 8.04
9	October 15, 2008	− 7.87
10	July 21, 1933	− 7.84
11	October 18, 1937	− 7.75
12	December 1, 2008	− 7.70

Source: http://online.wsj.com/mdc/public/page/2_3047-djia_alltime.html.

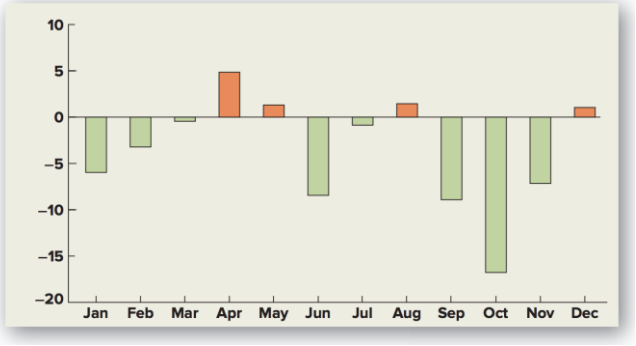
2008: The Bear Growled and Investors Howled

- The S&P 500 lost 50% of its value from November 2007 through March 2009.
  - On the other hand, long-term Treasuries gained 40% during 2008.
- A global phenomenon
- Volatile in both directions
  - The S&P 500 doubled in value from March 2009 through February 2011.

2008: S&P 500 Monthly Returns

FIGURE 10.12

S&P 500 monthly returns: 2008



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

Geometric Average Return: Formula

Equation 10.4

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

Where:

R_i = return in each period

T = number of periods

Geometric Average Return (1 of 2)

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

Where:

Π = Product (like Σ for sum)

T = Number of periods in sample

R_i = Actual return in each period

Example: Calculating a Geometric Average Return

Example 10.4

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%

Geometric Average Return (2 of 2)

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%

N	5	
I/Y	*CPT* =	8.26%
PV	$ (1.0000)	
PMT	0	
FV	$ 1.4870	

Historical Geometric vs. Arithmetic Average Returns

TABLE 10.4

Geometric versus arithmetic average returns: 1926–2017

Series	Average Return		Standard Deviation
	Geometric	Arithmetic	
Large-company stocks	10.2%	12.1%	19.8%
Small-company stocks	12.1	16.5	31.7
Long-term corporate bonds	6.1	6.4	8.3
Long-term government bonds	5.5	6.0	9.9
Intermediate-term government bonds	5.1	5.2	5.6
U.S. Treasury bills	3.4	3.4	3.1
Inflation	2.9	3.0	4.0

Arithmetic vs. Geometric Mean

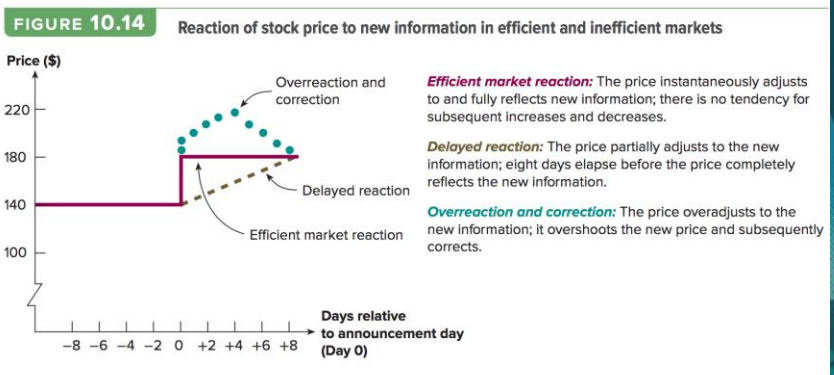
Which is better?

- 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 the 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



Forms of Market Efficiency

- **Strong Form Efficient Market:**
  - Information = public or private
  - ➡**"Inside information" is of little use**
- **Semistrong Form Efficient Market:**
  - Information = publicly available information
  - ➡**Fundamental analysis is of little use**
- **Weak Form Efficient Market:**
  - Information = past prices and volume data
  - ➡**Technical analysis is of little use**

Strong Form Efficiency

- Prices reflect <u>all information</u>, including public and private.
- If true, then investors cannot 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).

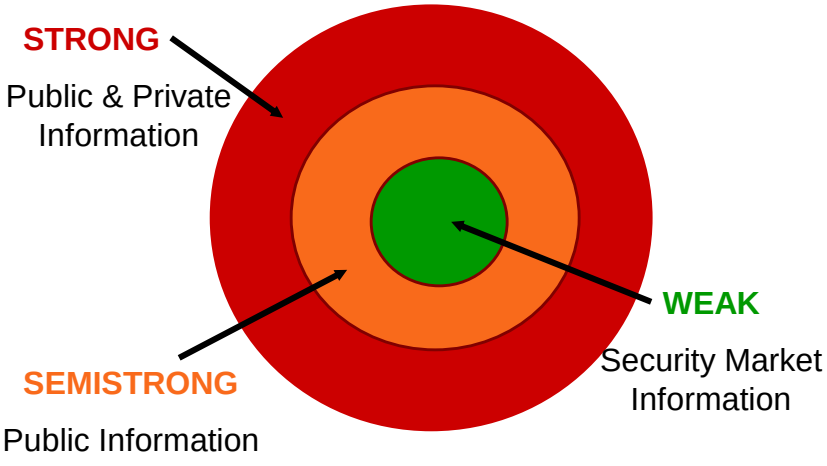
Semistrong Form Efficiency

- 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

Weak Form Efficiency

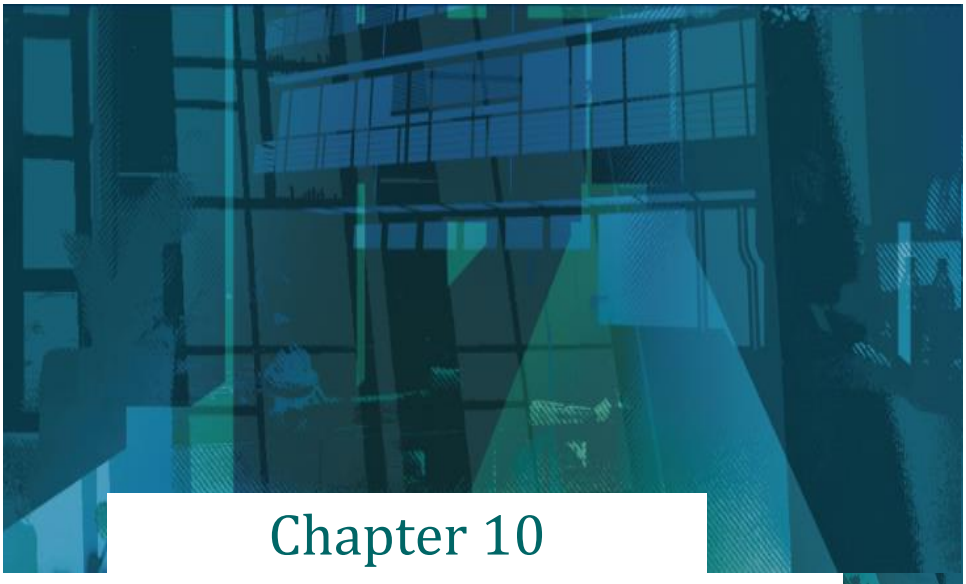
- Prices reflect all past market information such as price and volume.
- If true, then investors cannot earn abnormal returns by trading on market information.
- Implies that technical analysis will not lead to abnormal returns
- Empirical evidence indicates that markets are generally weak form efficient.

Efficient Market Hypotheses



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.



Chapter 10

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