

Chapter 9 Outline

9.1 Returns

9.2 Holding-Period Returns

9.3 Return Statistics

9.4 Average Stock Returns and Risk-Free Returns

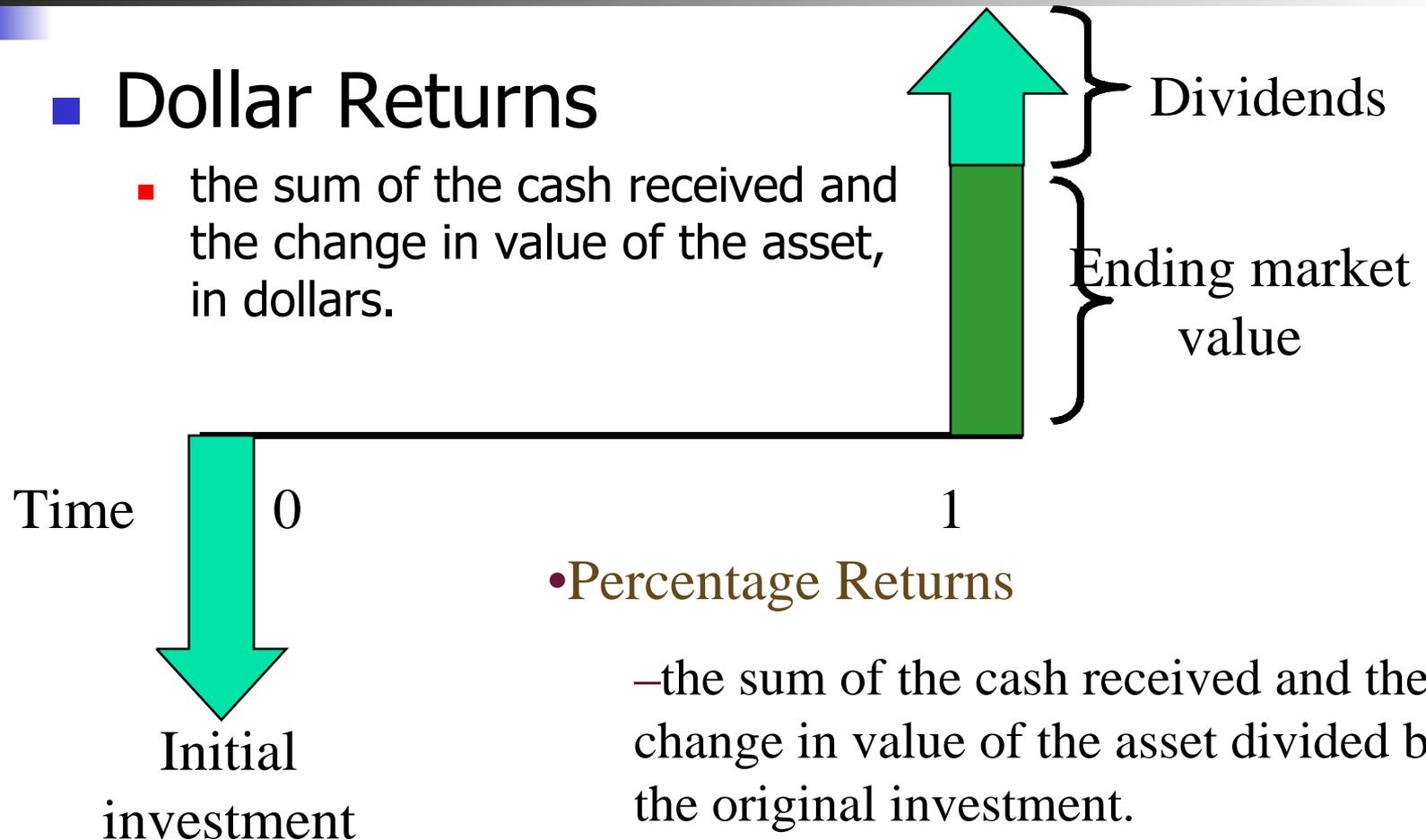
9.5 Risk Statistics

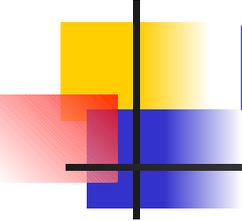
9.6 Summary and Conclusions

9.1 Returns

■ Dollar Returns

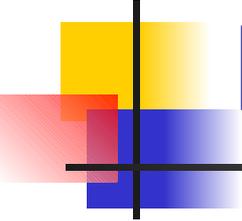
- the sum of the cash received and the change in value of the asset, in dollars.





Example -Calculating Returns

- Suppose you bought 100 shares of Walmart (WMT) one year ago today at \$25. Over the last year, you received \$20 in dividends (= 20 cents per share \times 100 shares). At the end of the year, the stock sells for \$30. How did you do?
- You invested $\$25 \times 100 = \$2,500$. At the end of the year, you have stock worth \$3,000 and cash dividends of \$20.



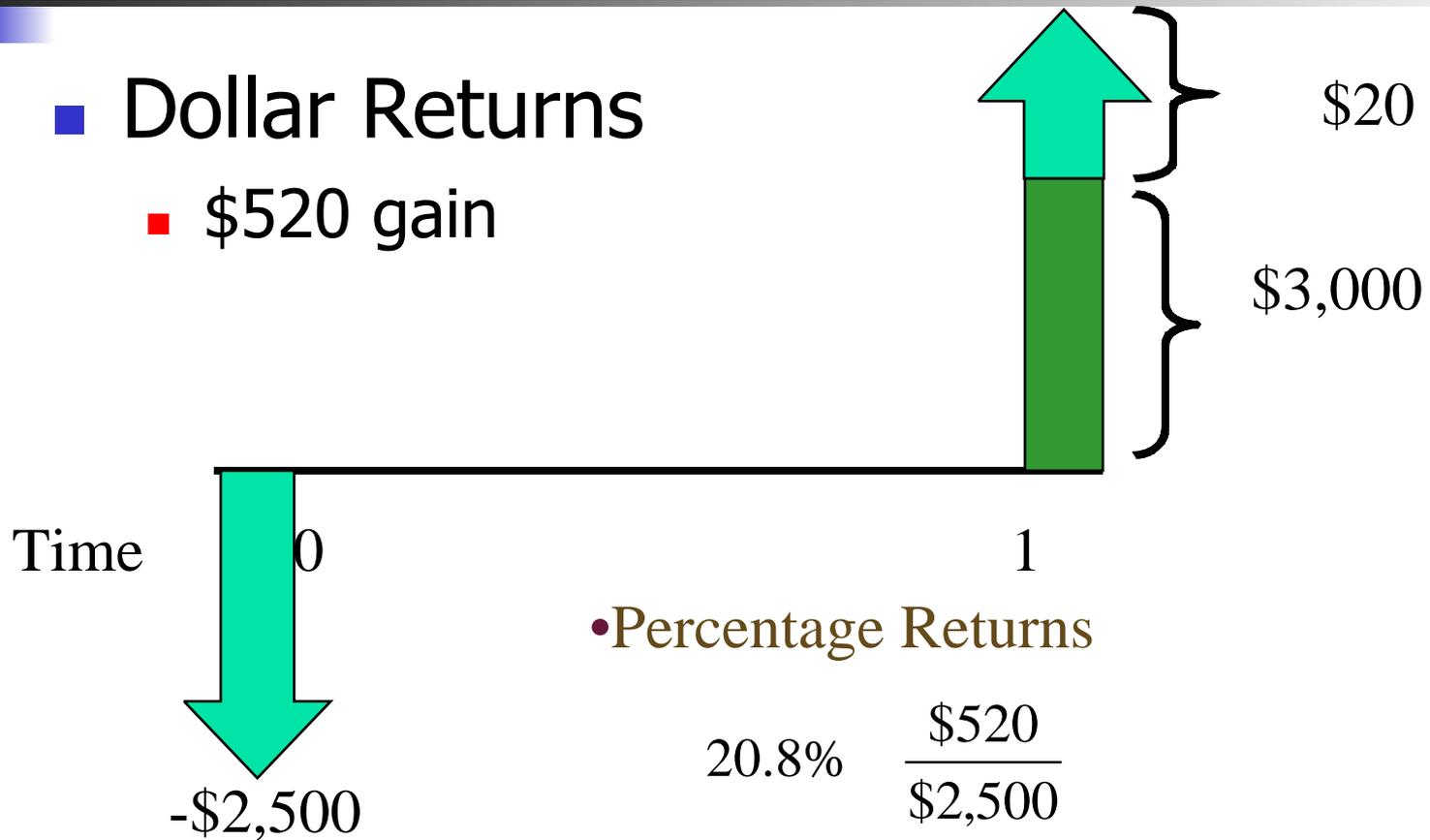
Example – Calculating Returns

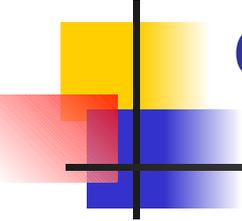
- What is your dollar return?
 - Dollar return = $\$20 + (3000 - 2500) = \520
- What is your percentage return?
 - Dividend yield = $20 / 2500 = 0.8\%$
 - Capital gains yield = $(3000 - 2500) / 2500 = 20\%$
 - Total percentage return = $0.8 + 20.0 = 20.8\%$

Returns: Example

- Dollar Returns

- \$520 gain





9.2 Holding-Period Returns

- The holding period return is the return that an investor would get when holding an investment over a period of ***n*** years, when the return during year ***i*** is given as ***r_i***:

holding period return

$$(1 + r_1) (1 + r_2) \wedge (1 + r_n) - 1$$

Holding Period Return: Example

- Suppose your investment provides the following returns over a four-year period:



1	10%
2	-5%
3	20%

Your holding period return

$$(1 + r_1)(1 + r_2)(1 + r_3)(1 + r_4) - 1$$
$$(1.10)(.95)(1.20)(1.15) - 1$$
$$.4421 \quad 44.21\%$$

Holding Period Return: Example

- An investor who held this investment would have actually realized an annual return of 9.58%:

Geometric average return

		$(1 + r_g)^4 = (1 + r_1)(1 + r_2)(1 + r_3)(1 + r_4)$
1	10%	$r_g = \sqrt[4]{(1.10)(.95)(1.20)(1.15)} - 1$
2	-5%	
3	20%	.095844 9.58%

- So, our investor made 9.58% on his money for four years, realizing a holding period return of 44.21%

$$1.4421 = (1.095844)^4$$

Holding Period Return: Example

- Note that the geometric average is not the same thing as the arithmetic average:

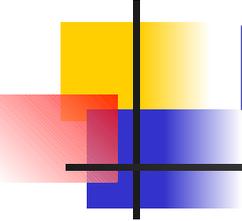


1	10%
2	-5%
3	20%

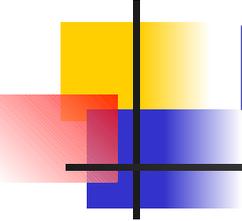
Arithmetic average return

$$\frac{r_1 \quad r_2 \quad r_3 \quad r_4}{4}$$
$$\frac{10\% \quad 5\% \quad 20\% \quad 15\%}{4} = 10\%$$

Risk, Return and Financial Markets



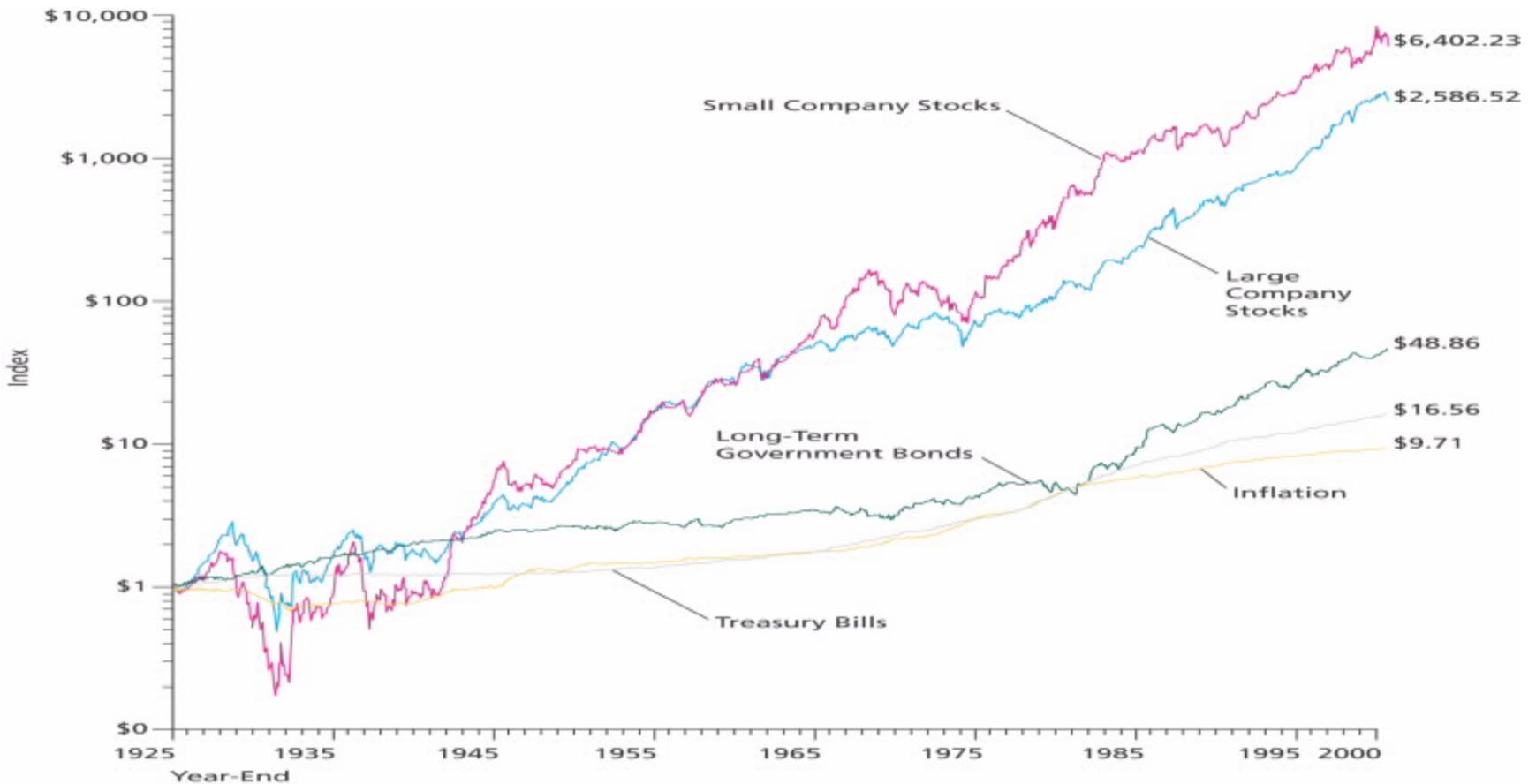
- We can examine returns in the financial markets to help us determine the appropriate returns on non-financial assets
- Lesson from capital market history
 - There is a reward for bearing risk
 - The greater the potential reward, the greater the risk
 - This is called the risk-return trade-off

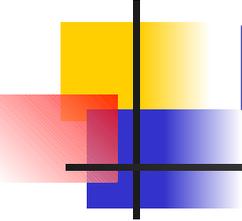


Holding Period Returns

- A famous set of studies dealing with the rates of returns on common stocks, bonds, and Treasury bills was conducted by Roger Ibbotson and Rex Sinquefeld.
- They present year-by-year historical rates of return starting in 1926 for the following five important types of financial instruments in the United States:
 - Large-Company Common Stocks
 - Small-company Common Stocks
 - Long-Term Corporate Bonds
 - Long-Term U.S. Government Bonds
 - U.S. Treasury Bills

The Future Value of an Investment of \$1 in 1926





Return Statistics

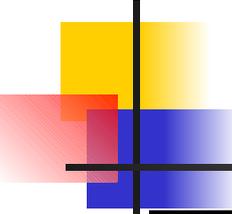
- The history of capital market returns can be summarized by describing the

- average return $\bar{R} = \frac{(R_1 \wedge R_T)}{T}$

- the standard deviation of those returns

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

- the frequency distribution of the returns.

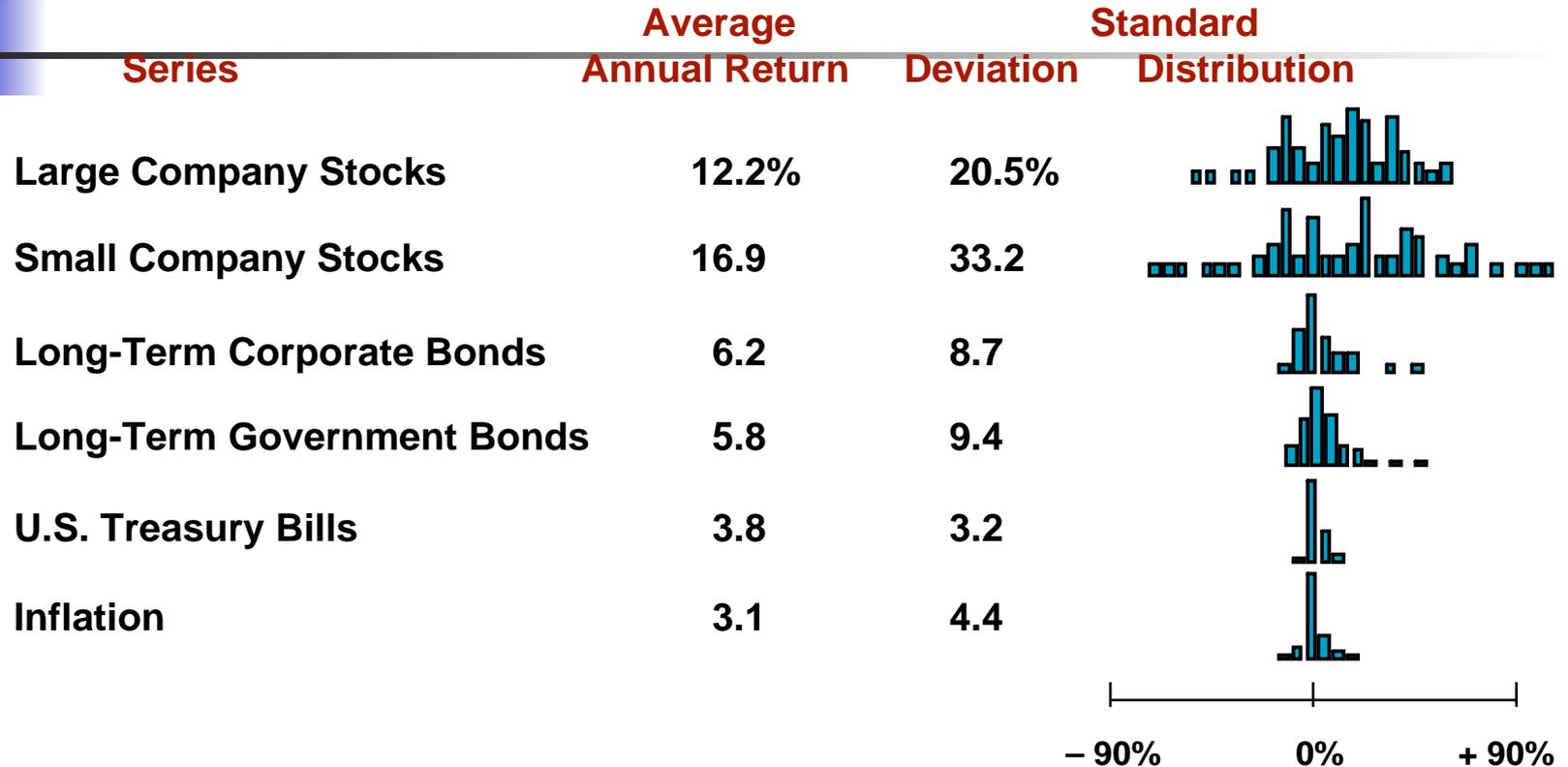


Example

Year	Actual Return	Average Return	Deviation from the Mean	Squared Deviation
1	.15	.105	.045	.002025
2	.09	.105	-.015	.000225
3	.06	.105	-.045	.002025
4	<u>.12</u>	.105	<u>.015</u>	<u>.000225</u>
Totals	.42		.00	.0045

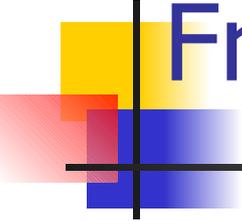
Variance = $.0045 / (4-1) = .0015$ Standard Deviation = $.03873$

Historical Returns, 1926-2002

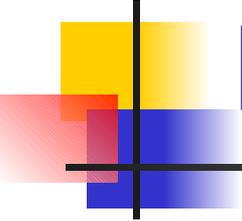


Source: © *Stocks, Bonds, Bills, and Inflation 2003 Yearbook*™, Ibbotson Associates, Inc., Chicago (annually updates work by Roger G. Ibbotson and Rex A. Sinquefeld). All rights reserved.

Average Stock Returns and Risk-Free Returns



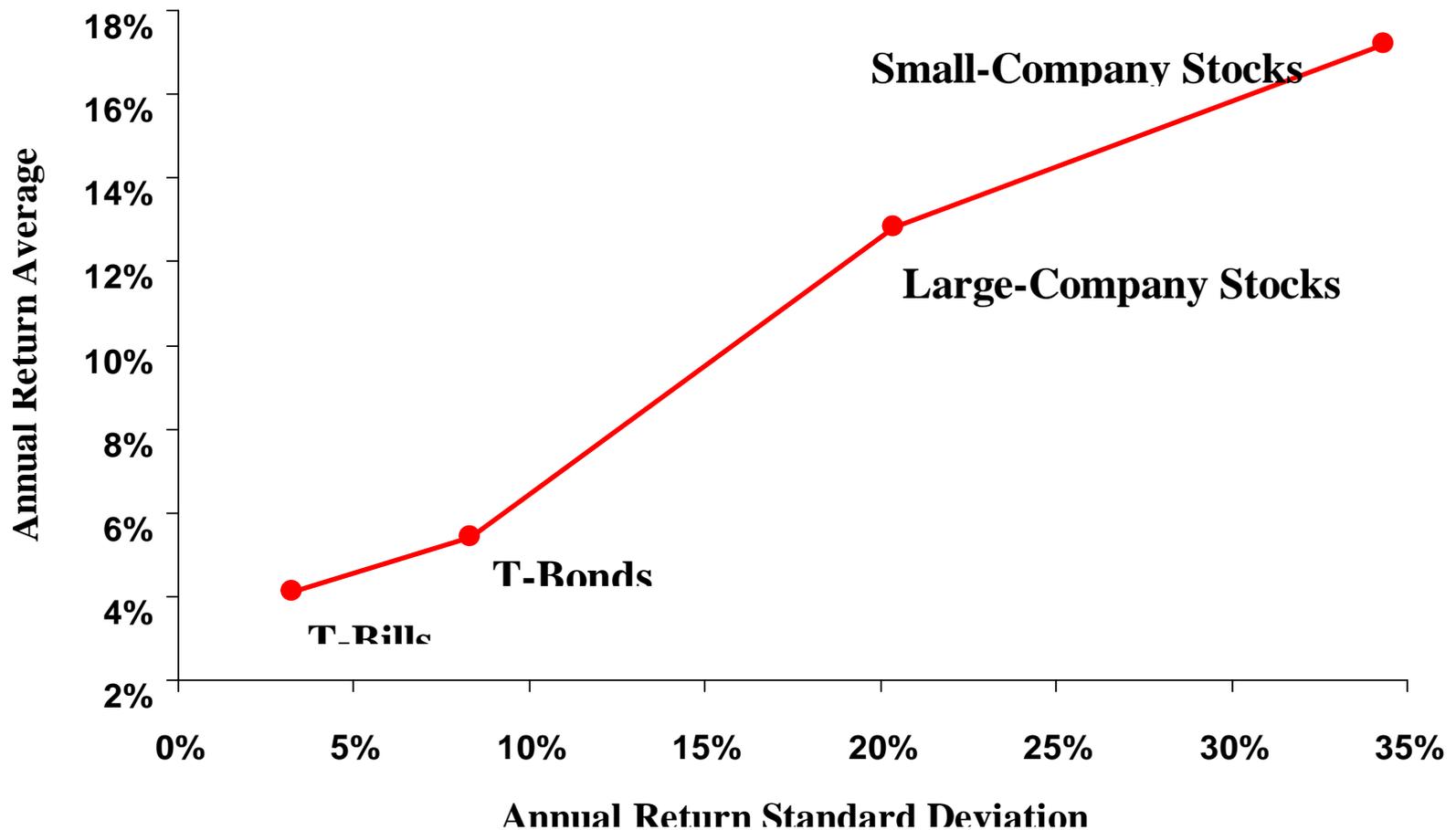
- The ***Risk Premium*** is the additional return (over and above the risk-free rate) resulting from bearing risk.
- One of the most significant observations of stock market data is this long-run excess of stock return over the risk-free return.
 - The average excess return from large company common stocks for the period 1926 through 1999 was $9.2\% = 13.0\% - 3.8\%$
 - The average excess return from small company common stocks for the period 1926 through 1999 was $13.9\% = 17.7\% - 3.8\%$
 - The average excess return from long-term corporate bonds for the period 1926 through 1999 was $2.3\% = 6.1\% - 3.8\%$



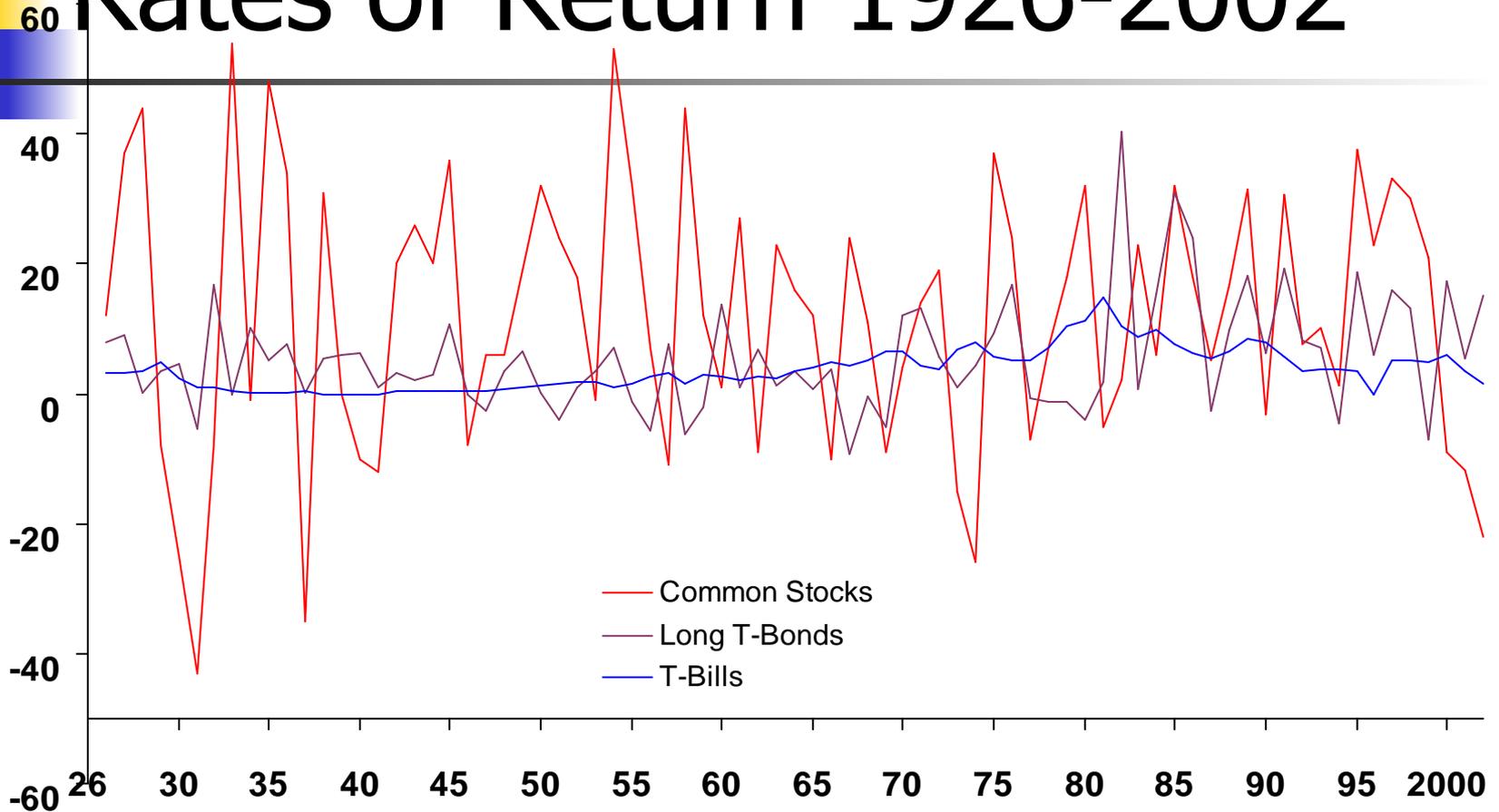
Risk Premia

- Suppose that ***The Wall Street Journal*** announced that the current rate for on-year Treasury bills is 5%.
- What is the expected return on the market of small-company stocks?
- Recall that the average excess return from small company common stocks for the period 1926 through 1999 was 13.9%
- Given a risk-free rate of 5%, we have an expected return on the market of small-company stocks of $18.9\% = 13.9\% + 5\%$

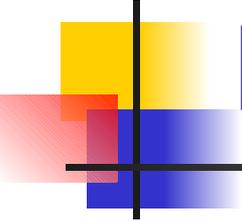
The Risk-Return Tradeoff



Rates of Return 1926-2002



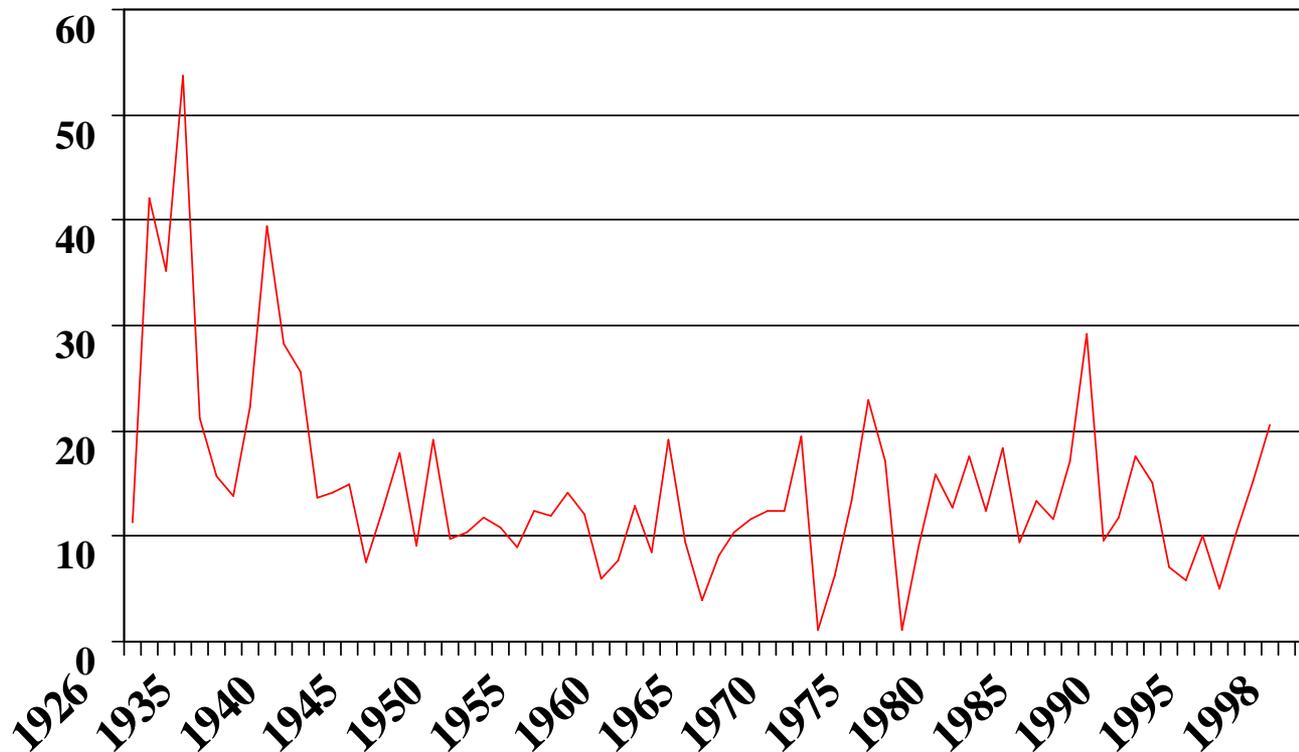
Source: © *Stocks, Bonds, Bills, and Inflation 2000 Yearbook*™, Ibbotson Associates, Inc., Chicago (annually updates work by Roger G. Ibbotson and Rex A. Sinquefeld). All rights reserved.



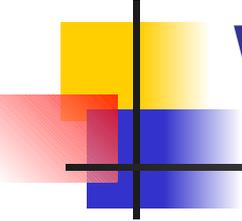
Risk Premiums

- Rate of return on T-bills is essentially risk-free.
- Investing in stocks is risky, but there are compensations.
- The difference between the return on T-bills and stocks is the risk premium for investing in stocks.
- An old saying on Wall Street is “You can either sleep well or eat well.”

Stock Market Volatility



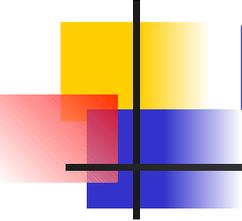
Source: © *Stocks, Bonds, Bills, and Inflation 2000 Yearbook*TM, Ibbotson Associates, Inc., Chicago (annually updates work by Roger G. Ibbotson and Rex A. Sinquefeld). All rights reserved.



Work the Web Example

- How volatile are mutual funds?
- Morningstar provides information on mutual funds, including volatility
- Click on the web surfer to go to the Morningstar site
 - Pick a fund, such as the Aim European Development fund (AEDCX)
 - Enter the ticker, press go and then scroll down to volatility



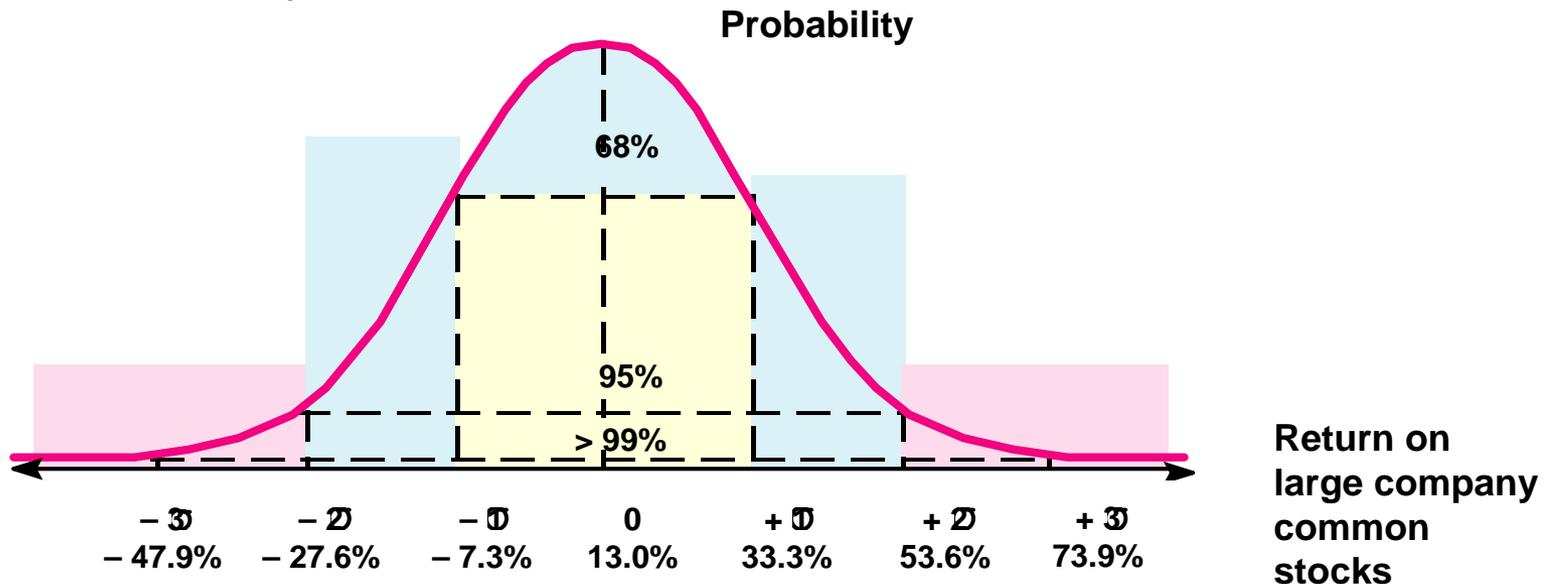


Risk Statistics

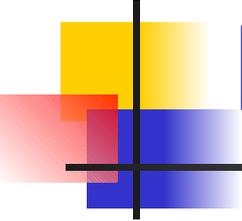
- There is no universally agreed-upon definition of risk.
- The measures of risk that we discuss are variance and standard deviation.
 - The standard deviation is the standard statistical measure of the spread of a sample, and it will be the measure we use most of this time.
 - Its interpretation is facilitated by a discussion of the normal distribution.

Normal Distribution

- A large enough sample drawn from a normal distribution looks like a bell-shaped curve.



- the probability that a yearly return will fall within 20.1 percent of the mean of 13.3 percent will be approximately 2/3.

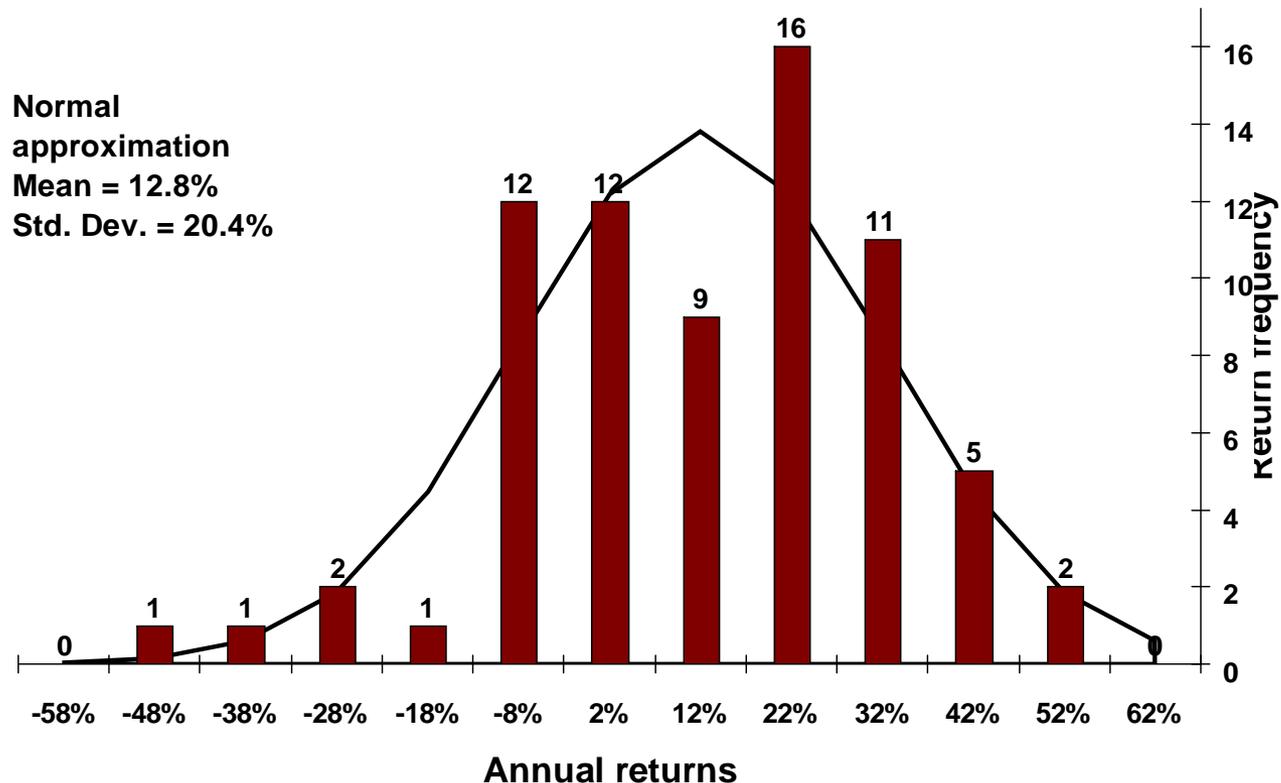


Normal Distribution

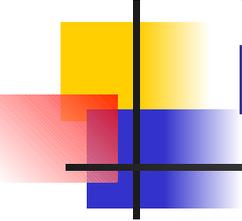
- The 20.1-percent standard deviation we found for stock returns from 1926 through 1999 can now be interpreted in the following way: if stock returns are approximately normally distributed, the probability that a yearly return will fall within 20.1 percent of the mean of 13.3 percent will be approximately $2/3$.

Normal Distribution

S&P 500 Return Frequencies

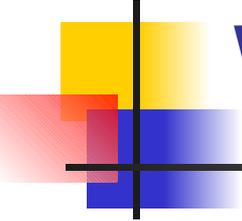


Source: © *Stocks, Bonds, Bills, and Inflation 2000 Yearbook*TM, Ibbotson Associates, Inc., Chicago (annually updates work by Roger G. Ibbotson and Rex A. Sinquefeld). All rights reserved.



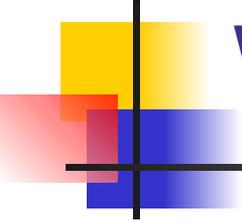
Holding Stocks and Bonds May Be the Way to Go *(WSJ 2003)*

- Which is your best bet, stocks or bonds? Speculators may like to roll the dice, banking everything on one or the other. But I believe investors are better off taking the wimp's option and choosing "all of the above."
- Here's why holding both stocks and bonds can greatly improve your portfolio:



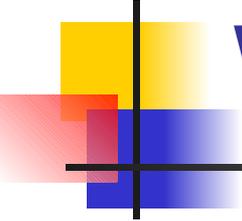
WSJ - Continued

- Over the 16 years since 1986, large-company stocks gained 11.1% a year, while corporate bonds delivered 9.3%. The extra 1.8 percentage points a year earned by stocks may be no great surprise. Stocks are riskier than bonds. You would expect that greater risk to be rewarded, especially over a long period.
- Still, the numbers contain a curiosity. Suppose you had an all-bond portfolio at year-end 1986 and you moved 25% into stocks. Intuitively, you might expect to capture 25% of the performance difference between stocks and bonds. But in fact, you captured roughly 40% of the difference, cranking up your portfolio's return by more than 0.7 percentage points a year.



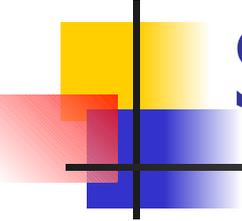
WSJ - Continued

- Similarly, by opting for a 50%-stock weighting, you would have boosted your performance by almost 1.3 percentage points a year. That means you captured about 75% of the performance difference between stocks and bonds, despite having only 50% in stocks.
- If you look at risk, you find another curiosity. Over the 16 years, an all-stock portfolio was twice as volatile as an all-bond portfolio. But if you took an all-bond portfolio and shifted 25% into stocks, you didn't increase risk at all. Even with 50% in stocks, the boost in volatility was only 20%. But as you moved additional money into stocks, your portfolio's volatility skyrocketed.



WSJ - Continued

- What's going on here? Because stocks and bonds don't move in sync, you don't necessarily increase a bond portfolio's volatility by adding stocks. Over the past 16 years, stocks posted four calendar-year losses, while bonds suffered three losses. But these annual losses never coincided. When bonds were suffering, stocks delivered offsetting gains, thus helping to reduce the portfolio's volatility.
- This pattern of returns also explains the surprisingly large performance gain that comes from adding stocks to an all-bond portfolio.



Summary and Conclusions

- This chapter presents returns for four asset classes:
 - Large Company Stocks
 - Small Company Stocks
 - Long-Term Government Bonds
 - Treasury Bills
- Stocks have outperformed bonds over most of the twentieth century, although stocks have also exhibited more risk.
- The stocks of small companies have outperformed the stocks of large companies over most of the twentieth century, again with more risk.
- The statistical measures in this chapter are necessary building blocks for the material of the next three chapters.