Muhlenberg College

Corporation Finance

Notes 10

CHAPTER 11: RISK, RETURN, AND THE COST OF CAPITAL

Portfolio

***Definition* - Portfolio**

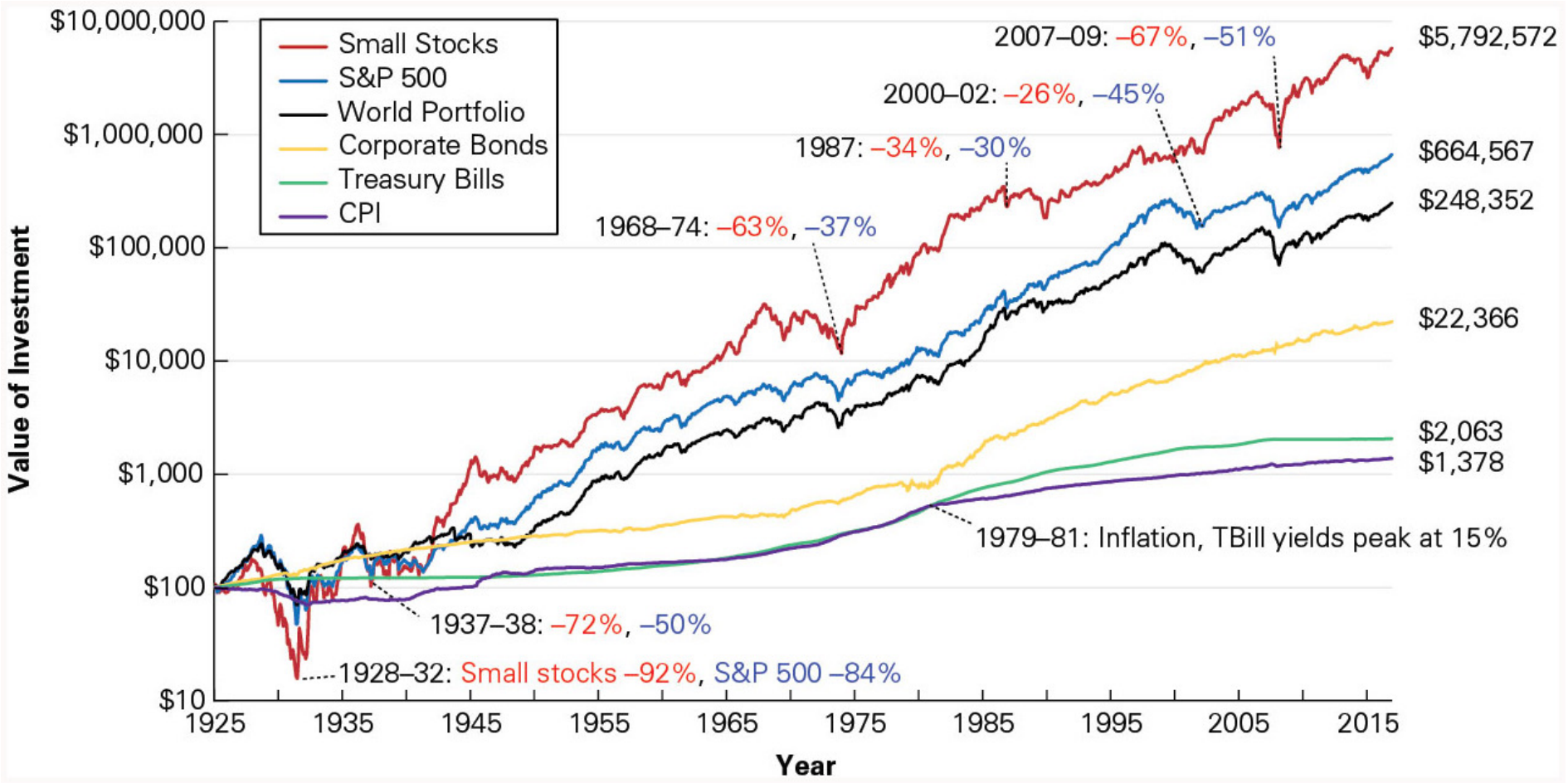
a grouping of **financial** assets such as stocks, bonds and cash equivalents, as well as their funds counterparts, including mutual and exchange-traded funds.

- **Portfolios** are held directly by investors and/or managed by **financial** professionals.
- **For example**, a person holds $100,000 invested in the stock market, $200,000 in treasury bills, and $200,000 in a saving account.
- Then, 20% of the portfolio is in the stock market, 40% in T-bills, and 40% in a saving account.

Risk and Return

- Consider how an investment would have grown if it were invested in each of the following from the end of 1925 until the beginning of 2017:
  - Standard & Poor's 500 (S&P 500)
  - Small Stocks
  - World Portfolio
  - Corporate Bonds
  - Treasury Bills

Value of $100 Invested at the End of 1925



Compounding Realized Returns

- The table below includes the realized return at each period.

Date	Price	Dividend	Return
16-Mar-20	21.15		
10-May-20	20.70	0.06	-1.84%
9-Aug-20	20.62	0.06	-0.10%
8-Nov-20	19.39	0.06	-5.67%
15-Feb-21	20.33		4.85%
2-Mar-21	10.29	10.00	-0.20%
15-Mar-21	11.07		7.58%

Calculate the return from 03/16/20 to 03/15/21

Compounding Realized Returns

- We then determine the one-year return by compounding.

$$1+R_{annual}=(1+R_1)(1+R_2)(1+R_3)(1+R_4)(1+R_5)(1+R_6)$$

$$1+R_{annual}=(0.982)(0.999)(0.943)(1.048)(0.998)(1.076)$$

$$R_{annual}=1.0411-1=.0411 \text{ or } 4.11\%$$

Historical Risks and Returns of Stocks

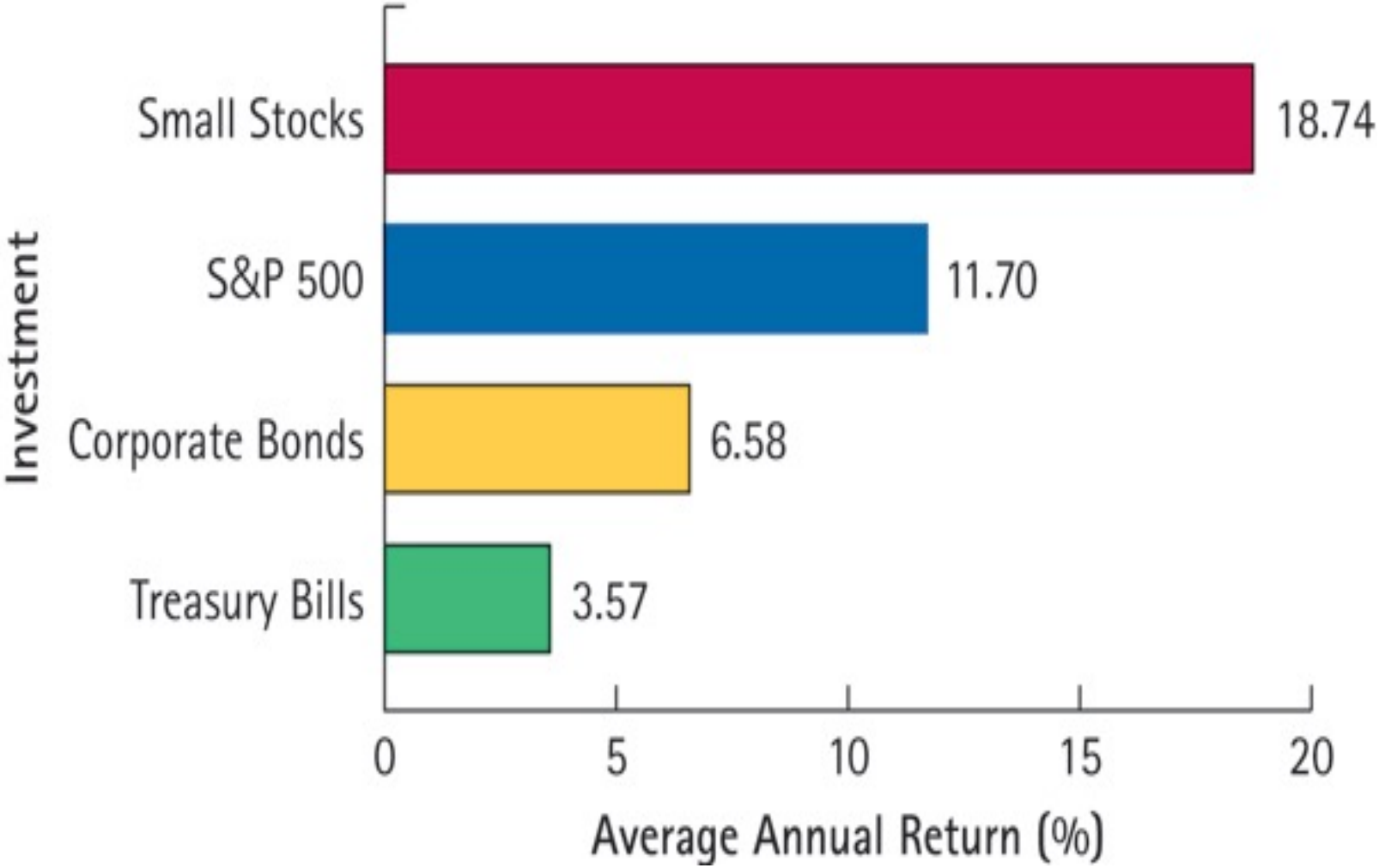
- (Arithmetic) Average Annual Returns: Average Annual Return of a Security

$$\bar{R} = \frac{1}{T}(R_1 + R_2 + \ldots + R_T)$$

- For example, if a security has 10%, -1%, and 6% annual returns, then the average annual return is

$$\bar{R} = \frac{1}{3}(10\% - 1\% + 6\%) = 5\%.$$

Average Annual Returns in the U.S. for Small Stocks, Large Stocks (S&P 500), Corporate Bonds, and Treasury Bills, 1926–2017



Historical Risks and Returns of Stocks

- The Variance and Volatility of Returns:
  - Variance

$$Var(R) = \frac{1}{T-1}\left((R_1 - \bar{R})^2 + (R_2 - \bar{R})^2 + \ldots + (R_T - \bar{R})^2\right)$$

  - Standard Deviation

$$SD(R) = \sqrt{Var(R)}$$

Computing Historical Volatility

Example: Using the data below, what is the standard deviation of the S&P 500's returns for the years 2017-2020?

Year	2017	2018	2019	2020
Rate of return	21.69%	-4.45%	31.29%	18.25%

Computing Historical Volatility

Year	2017	2018	2019	2020
Rate of return	21.69%	-4.45%	31.29%	18.25%

- The average during this period is 16.7%, and the variance is:

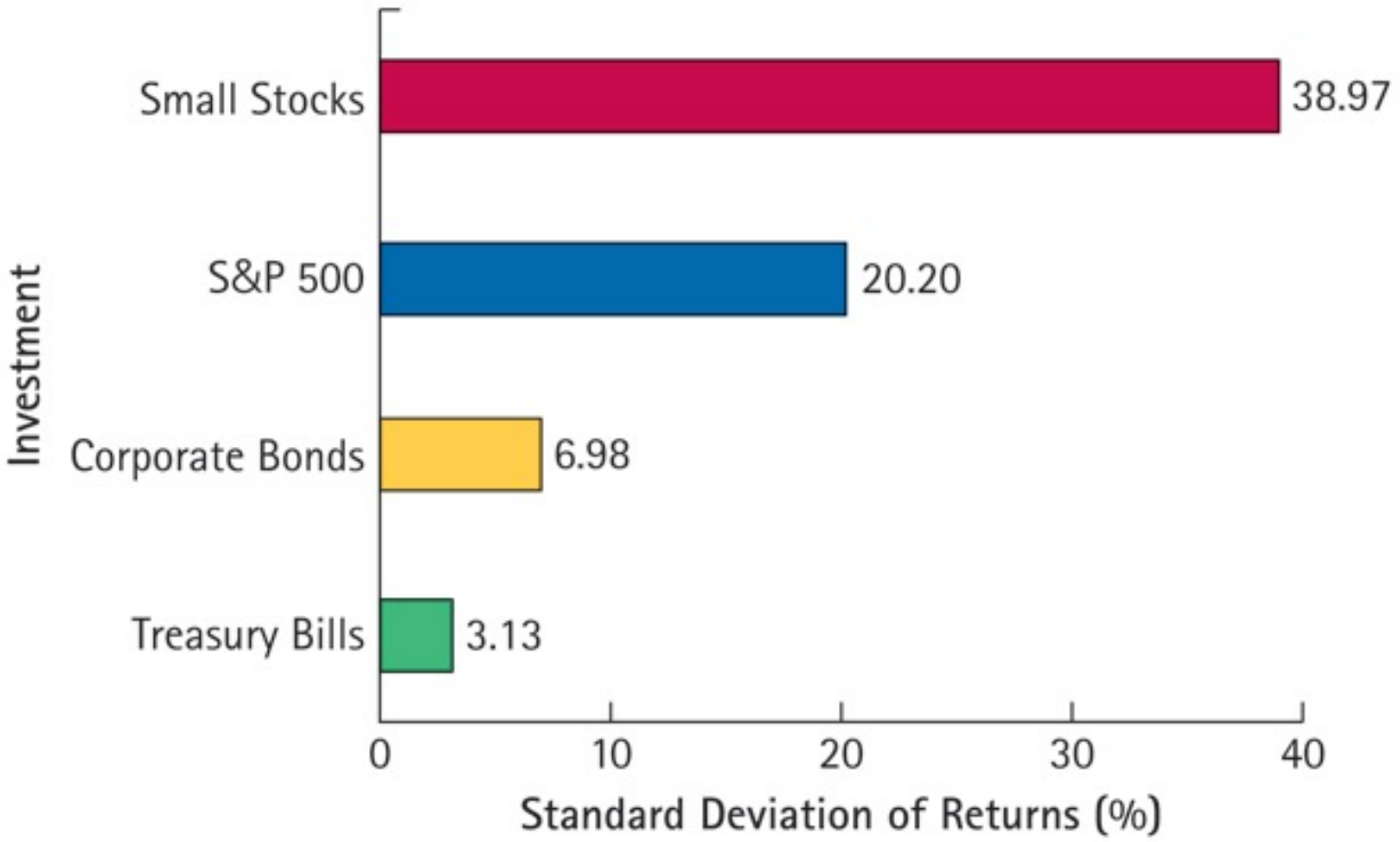
$$Var(R) = \frac{1}{T-1}[(R_1 - \bar{R})^2 + (R_2 - \bar{R})^2 + \cdots + (R_T - \bar{R})^2]$$
$$= 2.29\%$$

- $SD(R) = \sqrt{Var(R)} = \sqrt{2.29\%} = 15.13\%.$

Computing Historical Volatility

- Our best estimate of the expected return for the S&P 500 is its average return, 16.7%, but it is risky, with a standard deviation of 15.13%.

Volatility (Standard Deviation) of U.S. Small Stocks, Large Stocks (S&P 500), Corporate Bonds, and Treasury Bills, 1926–2017



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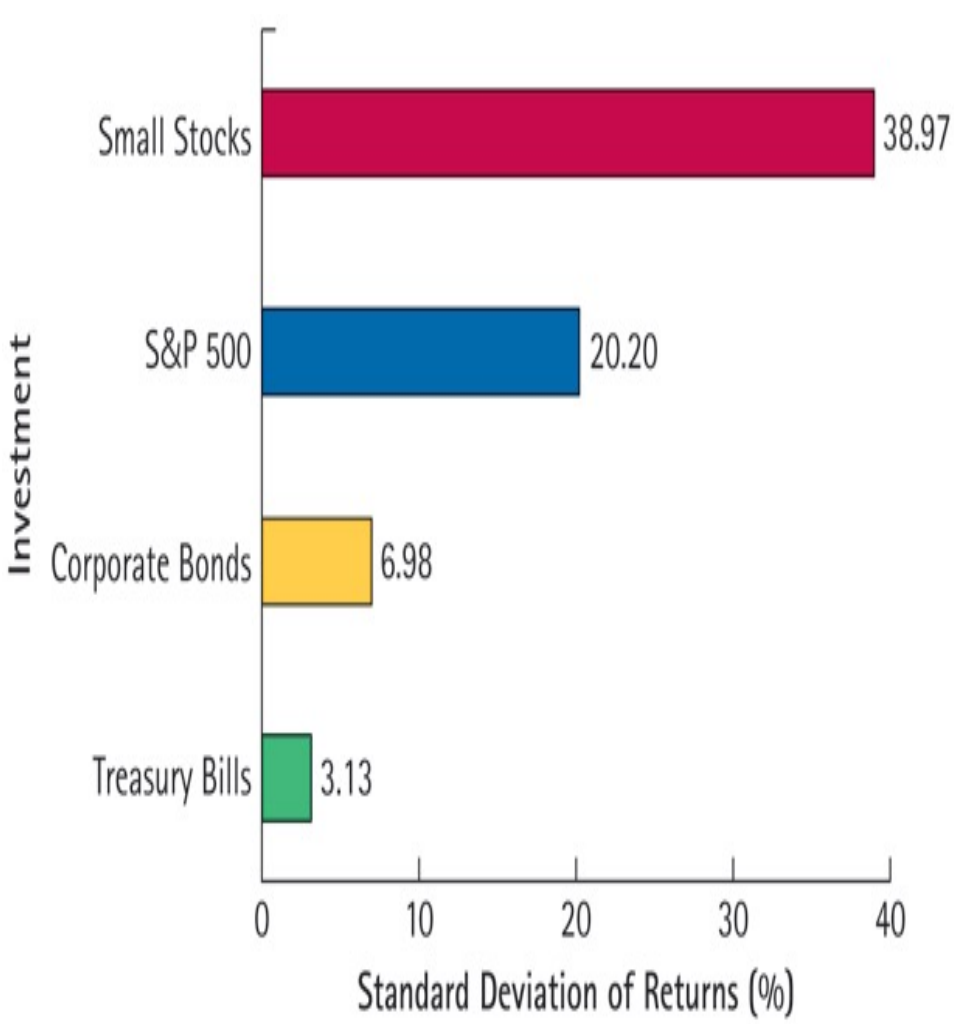

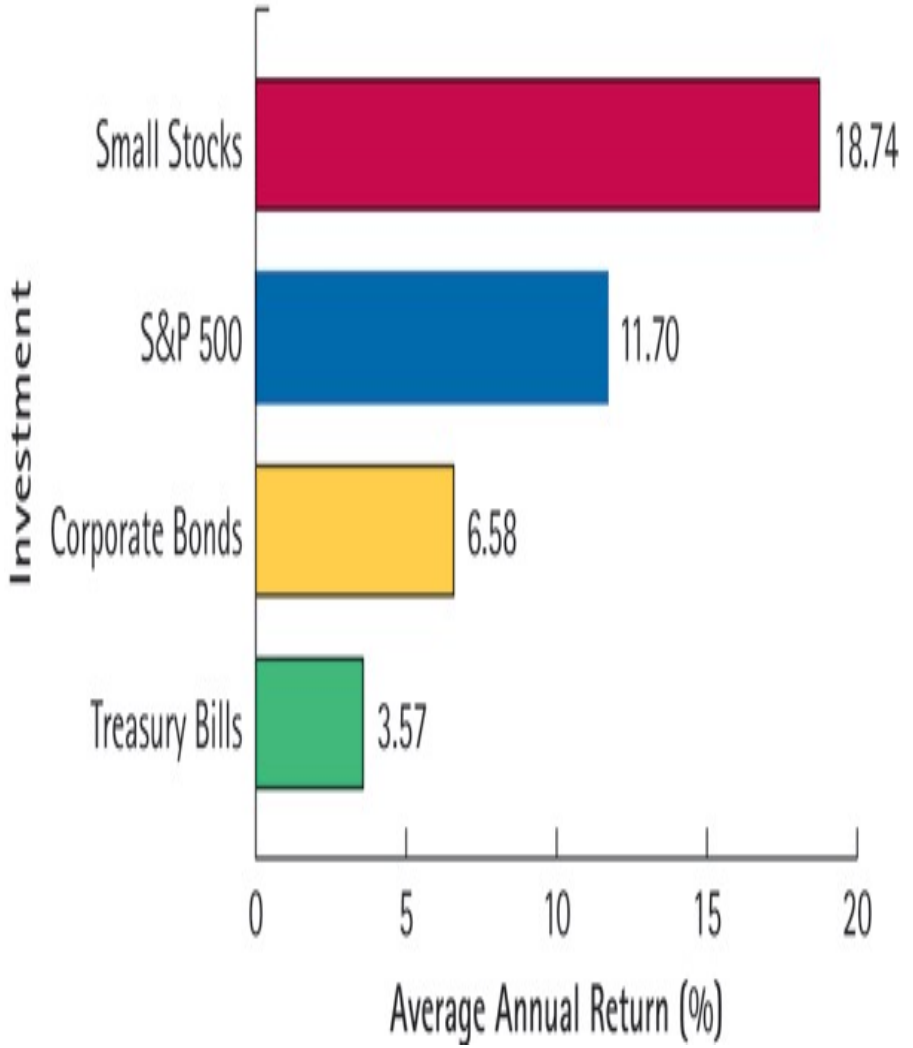

Cost of capital

- In chapter 8, we used the cost of capital (r) to discount future cash flows to estimate the NPV.
- One way of getting that estimate, is to compare the risk level of the project (using the standard deviation) to a diversified portfolio of U.S. stocks with the same risk level (again using the standard deviation) and using the return on the portfolio as the cost of capital..