Chapter 12

- **Some Lessons from Capital Market History**

Key Concepts and Skills

- Know how to calculate the return on an investment
- Understand the historical returns on various types of investments
- Understand the historical risks on various types of investments

Risk, Return and Capital Market History

- Required return on an investment depends on the risk of the investment.
  - The greater the risk the greater the required return.
- What Capital Market History can tell us about risk and return?
  - This perspective is essential for understanding how to analyze and value risky investment project.

Returns

- If you buy an asset of any sort, your gain/loss from that investment
- The return will be
  - Income component: Cash you receive while you own the investment
  - Capital Gain/Loss: Because the value of the asset you purchase will often change.

Eg. Stock : 1. Dividend
2. Capital Gain

Dollar Returns

- Total dollar return = income from investment + capital gain (loss) due to change in price
- Example:
  - You bought a bond for $950 one year ago. You have received two coupons of $30 each. You can sell the bond for $975 today. What is your total dollar return?
    - Income = 30 + 30 = 60
    - Capital gain = 975 – 950 = 25
    - Total dollar return = 60 + 25 = $85

Example 12.1

- Stock selling for $37/ share.If you had bought 100 shares, you will have had a total outlay $3,700. Suppose that over the year the stock paid of $1.85 dividend per share. Also the value of stock has risen to $40.33 / share by the end of the year. By the end of the year you would have received income of ?

Percentage Returns

- It is generally more perceptive to think in terms of percentages than in dollar returns
  'How much do we get for each dollar we invest?'
- Dividend yield = income / beginning price
- Capital gains yield = (ending price – beginning price) / beginning price
- Total percentage return = dividend yield + capital gains yield

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Example 12.2: Calculating Returns

- You bought a stock for $35 and you received dividends of $1.25. The stock is now selling for $40.
  - What is your dollar return?
  - What is your percentage return?

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To Check : Assume that you had bought 100 shares.

- Invested $3,500
  - Dividend income: $125
  - Capital Income: (40-35)*100 = $500
  - Total dollar return = 125+500 = $ 625
  - What % did your $3,500 increased?
  - End up with : 3500+625 = 4125
  - (4125 – 3500)/3500 = 17.86%

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The Historical Record

- Year to year historical rates of return on 5 important types of financial investments
  - Large company stocks: This c/s portfolio is based on the S&P 500 Index, which contains 500 of the largest companies in the US. (mv of outstanding stock)
  - Small Company stocks: This is the portfolios of the smallest 20% of the companies listed on the NYSE. (mv of outstanding stock)
  - L-T Corporate bonds: High quality bonds with 20 years to maturity.
  - L-T US government bonds: US government bonds with 20 years to maturity
  - US treasury bills: Treasury bills with a 3 months maturity
- These returns are not adjusted for inflation or taxes (i.e. nominal and pretax returns)
- Inflation rate: % change on CPI (Consumer Price Index). Calculating real returns using inflation rate

Table 12.1: Average Returns

Investment	Average Return
Large stocks	12.4%
Small Stocks	17.5%
Long-term Corporate Bonds	6.2%
Long-term Government Bonds	5.8%
U.S. Treasury Bills	3.8%
Inflation	3.1%

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Risk Premiums

- The "extra" return earned for taking on risk
- Treasury bills are considered to be risk-free
- The risk premium is the return over and above the risk-free rate
- The additional return we earn by moving from a relatively risk free investment to a risky one.
- It can be interpreted as reward for bearing risk

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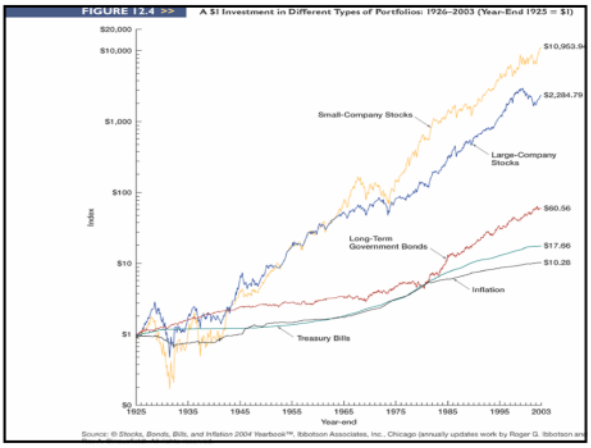
Table 12.2 Average Annual Returns and Risk Premiums

Investment	Average Return	Risk Premium
Large stocks	12.4%	8.6%
Small Stocks	17.5%	13.7%
Long-term Corporate Bonds	6.2%	2.4%
Long-term Government Bonds	5.8%	2.0%
U.S. Treasury Bills	3.8%	0.0%

Assume that average inflation rate was 3,1. Then average real return on treasury bill is 3.8-3.1=0,7% per year



Year-to-Year Total Returns

Large-Company Stock Returns — Large Companies

Long-Term Government Bond Returns — Long-Term Government Bonds

U.S. Treasury Bill Returns — U.S. Treasury Bills

Variance and Standard Deviation

- Variance and standard deviation measure the volatility of asset returns
- The greater the volatility, the greater the uncertainty
- Historical variance = sum of squared deviations from the mean / (number of observations – 1)
- Standard deviation = square root of the variance

Variance and Standard Deviation

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	.12	.105	.015	.000225
Totals	.42		.00	.0045

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

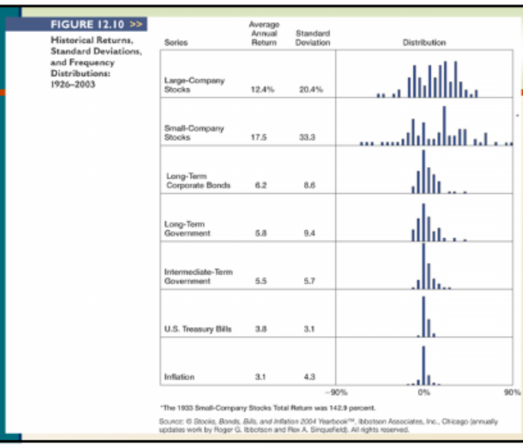
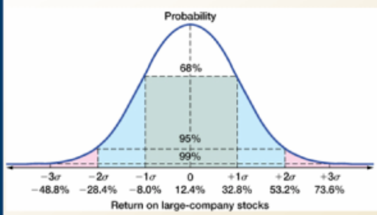


Figure 12.2



<< FIGURE 12.11

The Normal Distribution. Illustrated returns are based on the historical return and standard deviation for a portfolio of large-firm common stocks.

Arithmetic vs. Geometric Mean

- Arithmetic average – return earned in an average period over multiple periods
- Geometric average – average compound return per period over multiple periods
- The geometric average will be less than the arithmetic average unless all the returns are equal
- Which is better?
  - The arithmetic average is overly optimistic for long horizons
  - The geometric average is overly pessimistic for short horizons
  - So the answer 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

Example 12.3: Computing Averages (Arithmetic and Geometric Average)

- What is the arithmetic and geometric average for the following returns?
  - Year 1 5%
  - Year 2 -3%
  - Year 3 12%
  - Arithmetic average =
  - Geometric average =

Example 12.4 : Use table 12.1 from book to calculate the average returnover the years 1996 through 2000 for large company stocks, long term government bonds and Treasury bills.

Actual Returns

Year	Large Company Stocks	Long-Term Government Bonds	Treasury Bills
1996	0.2296	0.0013	0.0514
1997	0.3336	0.1202	0.0519
1998	0.2858	0.1445	0.0486
1999	0.2104	-0.0751	0.0480
2000	-0.0910	0.1722	0.0598

Answer 12.4

Actual Returns

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2000	-0.0910	0.1722	0.0598
Average	**0.1937**	**0.0726**	**0.0519**

Example 12.5

- Calculate the standard deviation for each security type using information from Example 12.4. Which of the investments was the most volatile over this period?

Answer 12.5

Deviation from Average Returns

Year	Large Company Stocks	Long-Term Government Bonds	Treasury Bills
1996	0.0359	-0.0713	-0.0005
1997	0.1400	0.0476	0.0000
1998	0.0921	0.0719	0.0033
1999	0.0167	-0.1477	-0.0039
2000	-0.2847	0.0996	0.0079
Total	**0.0000**	**0.0000**	**0.0000**

Answer 12.5

Squared Deviation from Average Returns

Year	Large Company Stocks	Long-Term Government Bonds	Treasury Bills
1996	0.0012906	0.0050865	0.0000005
1997	0.0195872	0.0022639	0.0000000
1998	0.0084837	0.0051667	0.0000112
1999	0.0002801	0.0218212	0.0000155
2000	0.0810670	0.0099162	0.0000618
Variance	**0.0276771**	**0.0110636**	**0.0000222**
Std dev	**0.1663645**	**0.1051838**	**0.0047104**

Variance = 0.1107086 / (5-1) = 0.276771

Standard Deviation = 0.1663645

- Notice that stocks had much more volatility than the bonds with a much larger average return (19.37%).

Sugested Problems

- 1-7, 9-11, 15, 16.