

FN211

Stock Valuation and Risk

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Stock Valuation Methods

- 1 **The Price-Earnings (PE) Method** applies the mean price-earnings (PE) ratio based on expected earnings of all traded competitors to the firm's expected earnings for the next year

$$\text{Valuation} = \text{Expected earnings per share} \times \text{Mean industry PE ratio}$$

- Assumes future earnings are an important determinant of a firm's value
- Assumes that the growth in earnings in future years will be similar to that of the industry

Stock Valuation Methods

- **Reasons for Different Valuations**

- Investors may use different forecasts for the firm's earnings or the mean industry earnings over the next year.
- Investors may on which firms represent the industry norm.

- **Limitations of the PE Method**

- May result in an inaccurate valuation of a firm if errors are made in forecasting the firm's future earnings or in choosing the industry composite used to derive the PE ratio.

Stock Valuation Methods

2 Dividend Discount Model

$$P = \sum_{t=1}^{\infty} \frac{D_t}{(1+k)^t}$$

where t = period

D_t = dividend in period t

k = discount rate (or required rate of return)

Stock Valuation Methods

Relationship with PE Ratio for Valuing

- When using the PE ratio, we implicitly assume that k and g of the firm are similar to those of its competitors
- The inverse relationship between k and value exists in both models
- The positive relationship between g and value exists in both models

Stock Valuation Methods

Limitations of the Dividend Discount Model

- Errors can be made in determining the dividend to be paid, the growth rate, and the required rate of return.
- Errors are more pronounced for firms that retain most of their earnings.

Stock Valuation Methods

3 Free Cash Flow Model

- For firms that do not pay dividends:
 - estimate the FCFs that will result from operations.
 - subtract existing liabilities to determine the value of the firm.
 - divide the value of the firm by the number of shares to derive a value per share.
- Limitations - difficulty of obtaining an accurate estimate of FCF per period.

Required Rate of Return on Stocks

Capital Asset Pricing Model

- Sometimes used to estimate the **required rate of return** for any firm with publicly traded stock.
- The only important risk of a firm is **systematic risk**.
- Suggests that the return of a stock (R_j) is influenced by the prevailing risk-free rate (R_f), the market return (R_m), and the beta (B_j):

$$R_j = R_f + B_j(R_m - R_f)$$

where B_j is measured as the covariance between R_j and R_m , which reflects the asset's sensitivity to general stock market movements.

Required Rate of Return on Stocks

- Estimating the **Market Risk Premium**
 - The government bond yield is commonly used as a proxy for the risk-free rate.
 - The term, $(R_m - R_f)$, is the market risk premium: the return of the market in excess of the risk-free rate.
 - Historical data for 30 or more years can be used to determine the average market risk premium over time.
- **Estimating the Firm's Beta** - typically measured by applying regression analysis to determine the sensitivity of the asset's return to the market return based on monthly or quarterly data.

Required Rate of Return on Stocks

Application of the CAPM

- Given the R_f as well as estimates of the firm's beta and the market risk premium, it is possible to estimate the required rate of return from investing in the firm's stock.
- At any given time, the required rates of return estimated by the CAPM will vary across stocks because of differences in their risk premiums, which are due to differences in their systematic risk (as measured by beta).

Factors that Affects Stock Prices

- Economic factors – Economic growth, interest rates, exchange rates, etc.
- Market-related factors – Stock markets, size, value, momentum, etc.
- Firm-specific factors – Change in dividend policy, earnings surprises, capital raising, M&A, etc.
- Other factors

Stock Risk

The return from investing in stock over a particular period is measured as

$$R = \frac{(SP - INV) + D}{INV}$$

where INV = initial investment

D = dividend

SP = selling price of the stock

The risk of a stock can be measured by using its price volatility, its beta, and the value-at-risk method.

Stock Risk

Volatility of a Stock or *total risk* serves as a measure of risk because it may indicate the degree of uncertainty surrounding the stock's future returns.

- **Using Standard Deviation to forecast Stock Price Volatility**
 - Using the historical method: a historical period is used to derive a stock's standard deviation of returns, and that estimate is then used as the forecast over the future.

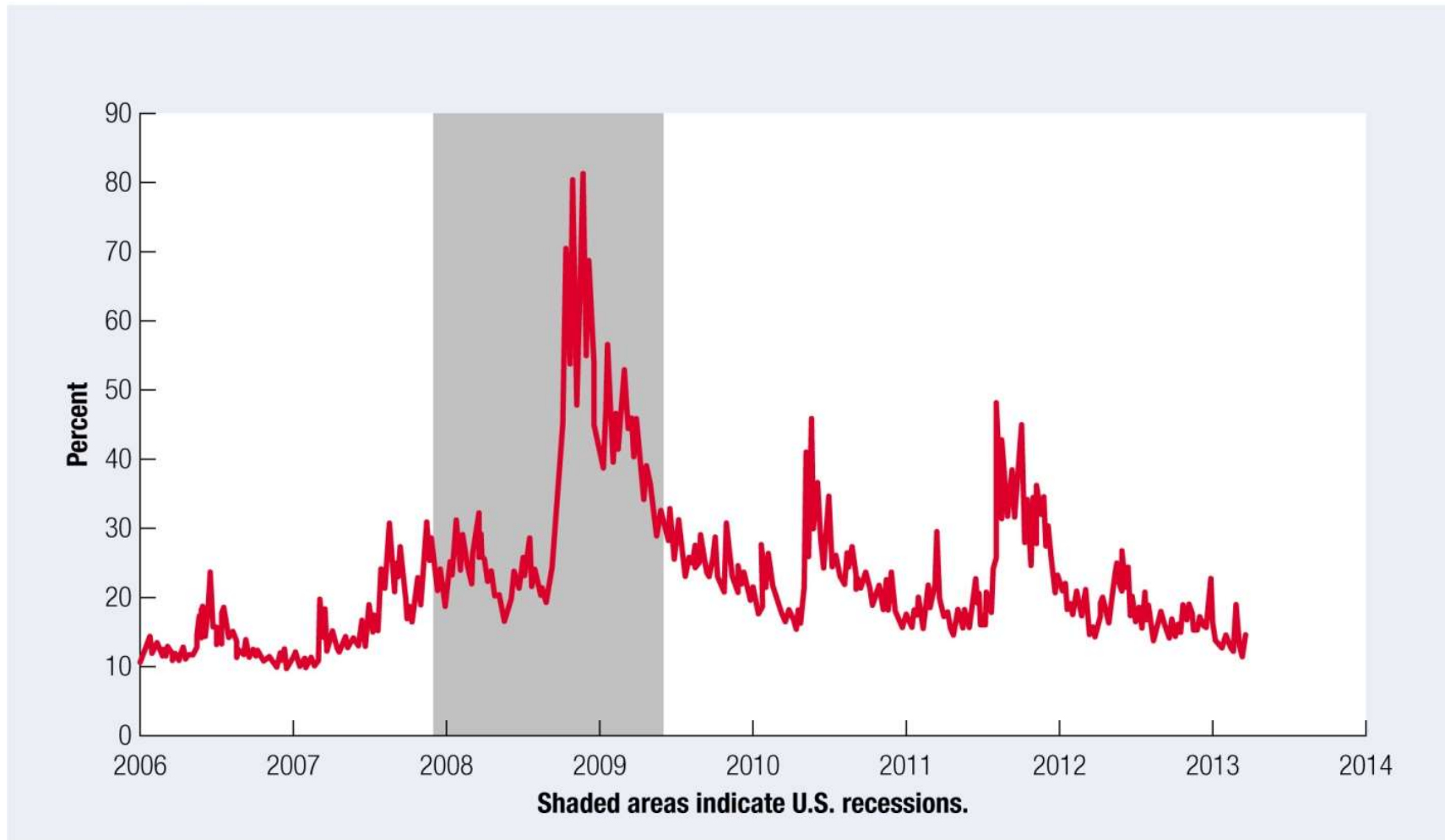
Stock Risk

- **Using Volatility Patterns to Forecast Stock Price Volatility**
 - A time series trend is applied to the SD to account for changes in economic trends during the previous periods.
- **Using Implied Volatility to Forecast Stock Price Volatility**
 - Derive a stock's implied SD from a stock option pricing model.

Stock Risk

- **Forecasting Stock Price Volatility of the Stock Market**
 - Monitor the volatility index (VIX) derived from stock options on the S&P 500 stock at a given point in time.
 - The VIX measures investors' expectation of the stock market volatility over the next 30 days.

Implied Volatility Index for U.S. Stocks



Source: Madura Exhibit 11.3

Stock Risk

- **Volatility of a Stock Portfolio** - The portfolio's volatility can be measured by the standard deviation:

$$\sigma_p = \sqrt{w_i^2 \sigma_i^2 + w_j^2 \sigma_j^2 + \sum_{i=1}^n \sum_{j=1}^n w_i w_j \sigma_i \sigma_j CORR_{ij}}$$

where

σ_i = standard deviation of returns of the i th stock

σ_j = standard deviation of returns of the j th stock

$CORR_{ij}$ = correlation coefficient between the i th and j th stocks

w_i = proportion of funds invested in the i th stock

w_j = proportion of funds invested in the j th stock

Stock Risk

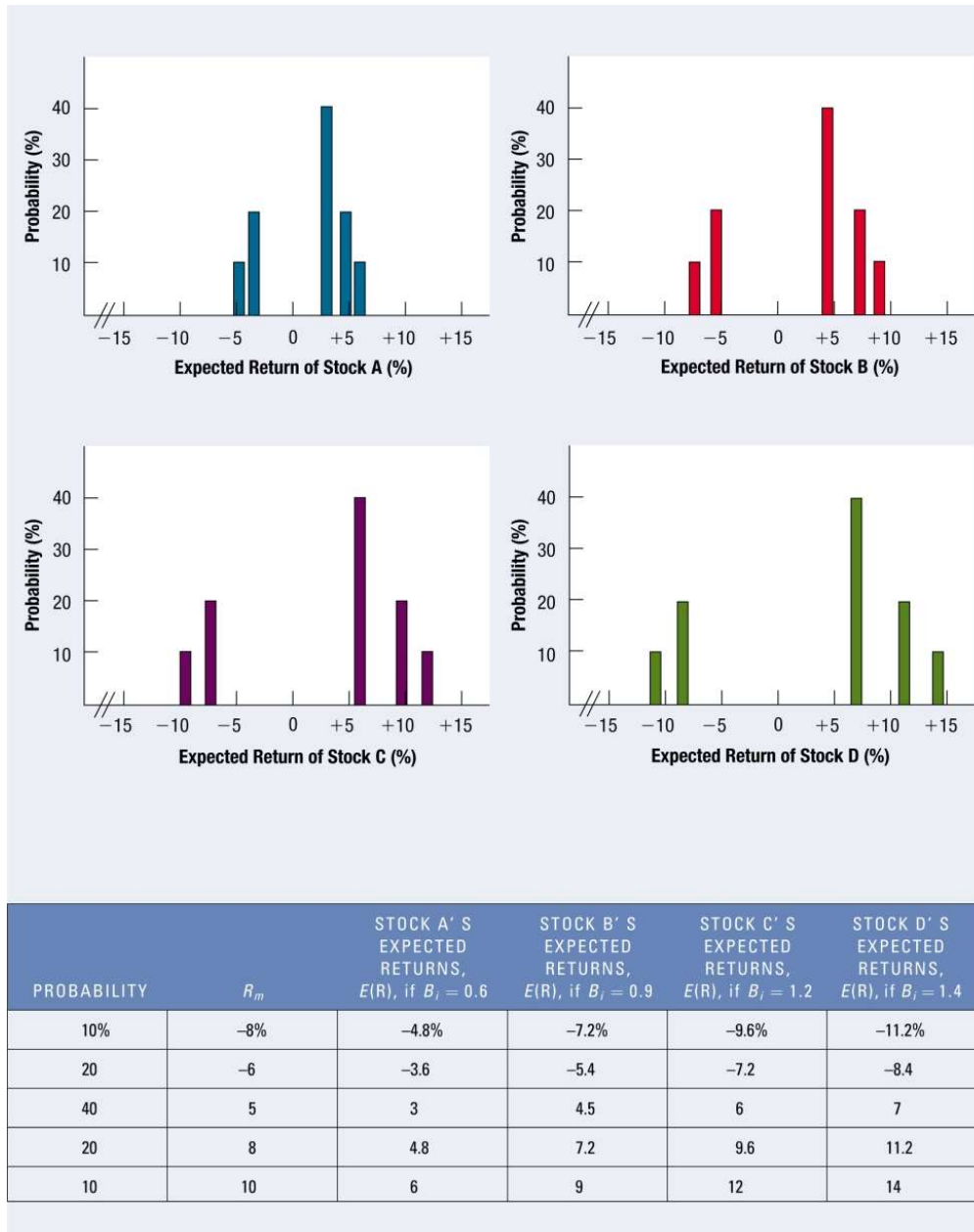
Beta of a Stock - measures the sensitivity of its returns to market

- **Beta of a Stock Portfolio** can be measured as the weighted average of the betas of stocks that make up the portfolio

$$\beta_p = \sum w_i \beta_i$$

- High-beta stocks are expected to be relatively volatile because they are more sensitive to market returns over time.
- Likewise, low-beta stocks are expected to be less volatile because they are less responsive to market returns.

How Beta Influences Probability Distributions



Source: Madura Exhibit 11.4

Stock Risk

Value at Risk

- VaR estimates the largest expected loss to a particular investment position for a specified confidence level.
- It is intended to warn investors about the potential maximum loss that could occur
- It is commonly used to estimate the risk of a portfolio

Stock Risk

- **Application Using Historical Returns**
 - E.g. an investor may determine that out of the last trading 100 trading days, a stock experienced a decline of greater than 7% on 5 different days.
 - The investor could infer a maximum daily loss of no more than 7% for that stock based on a 95% confidence level.
- **Application Using the Standard Deviation**
 - measure the SD of daily returns over the previous period
 - then apply it to derive boundaries for a specific confidence level.

Stock Risk

Sharpe Index

The reward-to-variability ratio, or Sharpe Index, measures risk-adjusted returns when **total variability** is the most appropriate measure of risk.

$$\text{Sharpe Index} = \frac{\bar{R} - \bar{R}_f}{\sigma}$$

where \bar{R} = average return on the stock

\bar{R}_f = average risk - free rate

σ = standard deviation of the stock's return

This index measures the excess return above the risk-free rate per unit of risk.

Stock Market Efficiency

Forms of Efficiency

- **Weak-Form Efficiency** - suggests that security prices reflect all market-related information, such as historical security price movements and volume of securities trades.
- **Semistrong-Form Efficiency** - suggests that security prices fully reflect all public information, such as firm announcements, economic news, or political news.
- **Strong-Form Efficiency** - suggests that security prices fully reflect all information, including private or insider information.