# The Stock Market

This lecture discusses the fundamental theories of the valuation of stock prices, and then examines how expectations about the stock market affect the behavior of that market.

## Computing the Price of a Common Stock

A. Stockholders (Owners of a Company)

1. Stockholders receive any remaining funds from a company after all other claims against the company have been paid (residual claimant).
2. Stockholders receive a periodic payment, usually quarterly, called <u>dividends</u> from the company.
3. A company's board of directors sets the dividend amount.
4. Shareholders have the right to sell their stock.

## B. One-Period Valuation Model

1. Today's stock price is the present value of expected future cash payments (dividends) from the company.

2. Consider the current price of a stock that is expected to be sold in one year.

$$P_t = \frac{D_{t+1}}{(1+k)} + \frac{P_{t+1}}{(1+k)}$$

$P_t$ = current price of the stock

$D_{t+1}$ = dividend received at the end of the year

k = required rate of return on equity investments

$P_{t+1}$ = next year's price of the stock

## C. Generalized Dividend Valuation Model

1. The price for a stock that will be sold in n years.

$$P_t = \frac{D_{t+1}}{(1+k)} + \frac{D_{t+2}}{(1+k)^2} + \cdots + \frac{D_{t+n}}{(1+k)^n} + \frac{P_{t+n}}{(1+k)^n}$$

2. Stock is never sold or is sold so far in the future that $P_{t+n}$ does not matter.

$$P_t = \sum_{n=1}^{\infty} \frac{D_{t+n}}{(1+k)^n}$$

3. Both formulas are also applicable to stocks that do not pay dividends because people expect those companies will pay dividends sometime in the future.

D. Gordon Growth Model

1. Key assumptions of the Gordon Growth model

   a. Dividends grow at a constant rate (g) each year.

   b. The growth rate (g) is less than the required return on equity (k).

2. Calculating the current price in the Gordon Growth model

$$P_t = \frac{D_t \times (1+g)}{(1+k)} + \frac{D_t \times (1+g)^2}{(1+k)^2} + \frac{D_t \times (1+g)^3}{(1+k)^3} + \cdots$$

3. The current price in the Gordon Growth model can be simplified as follows:

$$P_t = \frac{D_t \times (1+g)}{(k-g)}^{*}$$

*See proof at the end of the notes.

## E. How Stock Prices Are Set

1. The investor willing to pay the most sets the price by paying incrementally more than what any other buyer is willing to pay.
2. The market price is set by the investor who can put the asset to its most productive use.
3. The buyer with superior information will have less risk and value an asset more than a buyer with less information.
   a. Stock prices respond to new information about a company because it changes expectations about that company.
   b. Since investors consistently receive new information about a company, its stock price changes frequently.

The Theory of Rational Expectations

A. Rational expectations assumes people's expectations are identical to their optimal forecasts using all available information.

   1. An optimal forecast is one's best guess of the future.

   2. An optimal forecast, however, is not always perfectly accurate.

   3. An expectation may not be rational for two reasons.

      a. People might have all of the information but must expend too much effort to set their expectation to the best guess.

      b. People might not have all of the information, so their best guess might not be accurate.

B. Implications of Rational Expectations

1. If there is a change in the way a variable moves, expectations of how that variable is formed will also change.

2. Forecast errors of expectations will, on average, be zero and cannot be predicted ahead of time.

The Efficient Market Hypothesis

A. Basic concepts

1. This hypothesis is the application of rational expectations to financial markets. Specifically, security prices fully reflect all available information in an efficient market.

2. People's expectations of prices and rates of return ($P^e_{t+1}$ and $R^e_t$) are equal to their optimal forecasts ($P^{of}_{t+1}$ and $R^{of}_t$).

   a. That is, $P^e_{t+1} = P^{of}_{t+1}$ and $R^e_t = R^{of}_t$.

   b. Example: A coupon bond

$$R^{of}_t = \frac{P^{of}_{t+1} - P_t + C}{P_t}$$

3. A security's price will adjust until the optimal forecast of its rate of return ($R^{of}_t$) equals its equilibrium rate of return ($R^*_t$).

   a. The equilibrium rate of return ($R^*_t$) is the rate of return where the quantity demanded of an asset equals its quantity supplied.

   b. That is, $R^{of}_t = R^*_t$.

B. The Rationale Behind the Efficient Market Hypothesis

1. "Smart money" (well-informed) investors eliminate any unexploited profit opportunities ($R_t^{of} \neq R_t^*$).

2. Suppose that $R_t^{of} > R_t^*$. "Smart money" investors then increase their demand for the asset, which causes its price ($P_t$) to rise. That higher price lowers $R_t^{of}$ until $R_t^{of} = R_t^*$.

3. Only a modest fraction of investors need to be well informed to eliminate any unexploited profit opportunities.

C. Random Walk Behavior of Stock Prices

1. A <u>random walk</u> describes a situation where future prices are unpredictable because they are just as likely to fall as they are to rise.

2. The efficient market hypothesis implies stock prices should follow a random walk.

## D. The Implications of the Efficient Market Hypothesis for the Average Investor

1. Published reports and hot tips are usually already known by the market, so that information is already contained in the stock price.
2. Stock prices only react to announcements when the information is new and unexpected.
3. Most investors cannot out guess the market, so such a strategy only boosts the income of stock brokers. Hence, most investors should use a "buy and hold" strategy, where stocks are purchased and held for a long period of time.

## Are Financial Markets Efficient?

A. Some economists believe financial markets are efficient and any asset price changes are due to market fundamentals (items that directly impact the future income streams of a security).

B. The existence of market crashes and bubbles are inconsistent with the notion that financial markets are efficient.

C. Behavioral finance uses concepts from social sciences, such as sociology and psychology, to explain movements in security prices that are inconsistent with an efficient market.

   1. According to the efficient market hypothesis, "smart money" should sell stocks borrowed from brokers when stock prices are high and then return back those shares when stock prices are low (short sales).

   a. In reality, very little short selling occurs because people have a pronounced dislike for the possibly of unlimited losses from short sales (loss aversion).
   b. This lack of short selling can explain why stock prices can sometimes become overvalued.
2. Behavior science points to a couple of reasons why stock market bubbles can occur.
   a. Some people believe they are smarter than other investors (overconfidence), so they trade stocks inconsistent with the efficient market hypothesis.
   b. Talk of a booming stock market can encourage other investors to purchase stocks under the impression that stock prices will continue to rise (social contagion).

Proof:

$$\text{Show}\left(\frac{(1+g)\times D_t}{(1+k)}+\frac{(1+g)^2\times D_t}{(1+k)^2}+\frac{(1+g)^3\times D_t}{(1+k)^3}+\cdots\right)=\frac{(1+g)\times D_t}{(k-g)}$$

$$\text{Set: } x=(1+g)/(1+k)$$

$$\text{Formula: } 1+x+x^2+x^3+\cdots=1/(1-x)$$

$$D_t\times\left(1+\left(\frac{1+g}{1+k}\right)+\left(\frac{1+g}{1+k}\right)^2+\left(\frac{1+g}{1+k}\right)^3+\cdots\right)=\frac{D_t}{1-\frac{(1+g)}{(1+k)}}$$

$$D_t\times\left(\left(\frac{1+g}{1+k}\right)+\left(\frac{1+g}{1+k}\right)^2+\left(\frac{1+g}{1+k}\right)^3+\cdots\right)=\frac{D_t}{\frac{1+k-1-g}{(1+k)}}-D_t$$

$$D_t\times\left(\left(\frac{1+g}{1+k}\right)+\left(\frac{1+g}{1+k}\right)^2+\left(\frac{1+g}{1+k}\right)^3+\cdots\right)=\frac{D_t\times(1+k)}{(k-g)}-\frac{D_t\times(k-g)}{(k-g)}$$

$$D_t\times\left(\left(\frac{1+g}{1+k}\right)+\left(\frac{1+g}{1+k}\right)^2+\left(\frac{1+g}{1+k}\right)^3+\cdots\right)=\frac{D_t\times(1+g)}{(k-g)}$$