Lecture 7
Stocks and Their Valuation

- Common Stock & Valuation
  - Dividend Discount Model
  - Relative Value Models
- Preferred Stock & Valuation
- Market Efficiency

Common Stock: Owners, Directors, and Managers

- A share of common stock represents an ownership position in the firm.
- Ownership implies control – voting rights.
- Stockholders elect board of directors.
- Directors hire management.
- Since managers are “agents” of the shareholders (the “principals”), their goal should be to maximize stock price.

Initial Public Offering (IPO)

- A firm “goes public” through an IPO when it issues common stocks to the public for the first time to raise capital.
- Once a firm “goes public” it becomes a public listed company.
- Prior to an IPO, shares are privately owned, typically by the firm’s managers, key employees, and, in many cases, venture capital providers when it was a “start-up”.

Seasoned Equity Offering (SEO)

- A seasoned (or secondary) equity offering occurs when an already publicly-traded company issues additional shares.
- After an IPO or SEO, the shares are traded in the secondary market through such institutions as the NYSE or Nasdaq.

Different Approaches for Valuing Common Stocks

- Dividend Discount Model (also known as the Gordon Growth Model)
- Relative Value Models: use a market-determined multiple of comparable firms
- Free cash flow method (will not be covered in this class)

Dividend Discount Model (DDM)

- The DDM is a widely used approach to value common stocks.
- The **intrinsic value** of a security is simply the *discounted present value* of future cash flow the owner expects to receive.
- If all future cash flow is received in the form of dividend, then the DDM gives the intrinsic, or fundamental, value of a stock.

Stock Value = PV of Expected Dividends

- In this formulation, the *size* and *timing* of expected dividends are important determinants of stock value.

$$P_0 = \frac{D_1}{(1+r_s)^1} + \frac{D_2}{(1+r_s)^2} + \frac{D_3}{(1+r_s)^3} + \ldots + \frac{D_\infty}{(1+r_s)^\infty}$$

- In its simple form, the discount rate r_s is the stock's required rate of return which can be estimated using the SML of CAPM

$$r_i = r_{RF} + \beta_i(r_M - r_{RF}) \ .$$

Constant Growth Dividend

- If dividends are *expected** to grow at a constant rate *g* indefinitely, then

$$D_{t+1} = D_t(1+g),$$

where D_t is the dividend expected at the end of year *t.*

- That is, $D_1 = D_0(1+g)$

$$D_2 = D_1(1+g) = D_0(1+g)^2$$

So $D_t = D_0(1+g)^t$

* *"Expected"* in a probabilistic sense.

Constant Growth Dividend

$$P_0 = \frac{D_1}{(1+r_s)^1} + \frac{D_2}{(1+r_s)^2} + \frac{D_3}{(1+r_s)^3} + \ldots$$

$$= \frac{D_0(1+g)}{(1+r_s)^1} + \frac{D_0(1+g)^2}{(1+r_s)^2} + \frac{D_0(1+g)^3}{(1+r_s)^3} + \ldots$$

$$P_0 = \frac{D_0(1+g)}{r_s - g} = \frac{D_1}{r_s - g}$$

An Example

Consider a stock with D_0 = *$2* (last dividend paid) and grows at a constant rate of g = 6%.

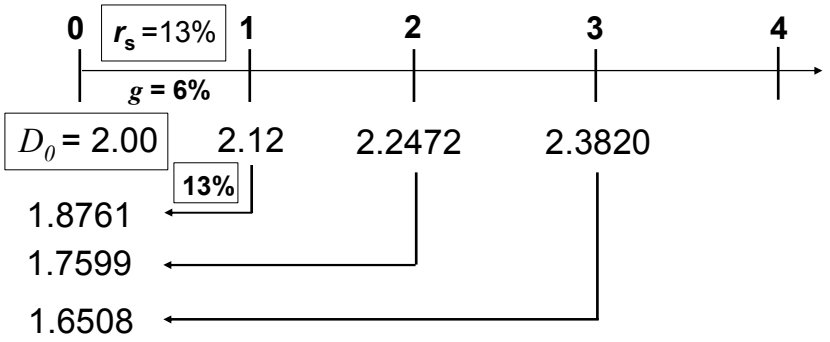
1. Find the expected dividends in the next 3 years and their present value.
2. What is the market value of this stock?
3. What is the expected market value of this stock in one year?
4. What are the expected dividend yield and capital gains yield during the first year?

Q1: What are the expected dividends for the next 3 years and their PV?

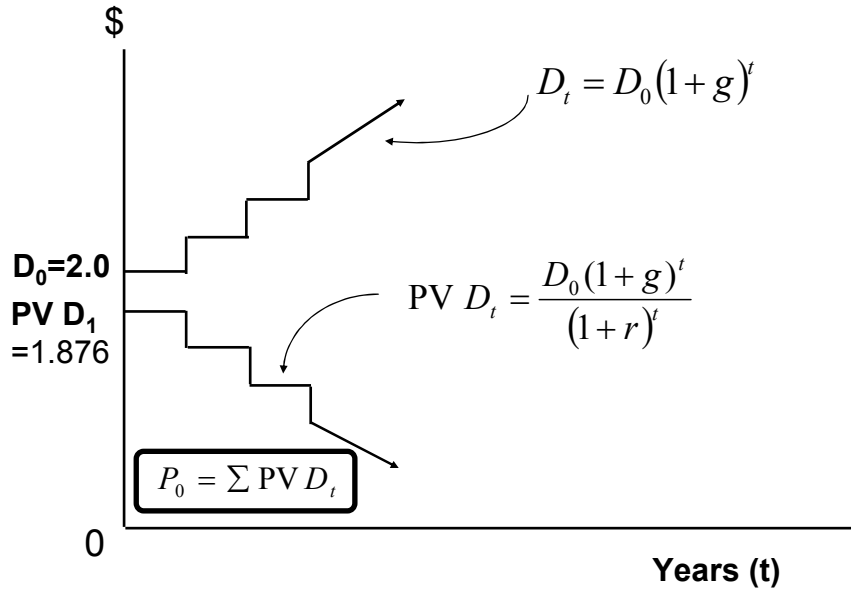
- First we need to find the required rate of return (as the discount rate).
- Suppose β = 1.2, r_{RF} = 7% and r_M = 12%.
- Using the SML, the required return on the stock is

$$r_s = r_{RF} + \beta_i(r_M - r_{RF})$$
$$= 7\% + 1.2(5\%)$$
$$= 13\%$$

Q1: What are the expected dividends for the next 3 years and their PV?



Note: D_0 is the last dividend paid.



Q2: What is the Current Market Value of the Stock?

- Given D_0 = 2.00, r_s = 13%, g = 6%.

$$P_0 = \frac{D_0(1+g)}{r_s - g} = \frac{D_1}{r_s - g}$$
$$= \frac{\$2.12}{0.13 - 0.06} = \frac{\$2.12}{0.07}$$
$$= \$30.29$$

Q3: What is the Expected Market Value of the Stock one year from now?

- Given D_2 = 2.2472, r_s = 13%, g = 6%.

$$\hat{P}_1 = \frac{D_1(1+g)}{r_s - g} = \frac{D_2}{r_s - g}$$

$$= \frac{\$2.2472}{0.07} = \$32.1.$$

Q4: What are the expected Dividend Yield and Capital Gains (CG) Yield during the first year?

$$\text{Dividend yield} = \frac{D_1}{P_0} = \frac{\$2.12}{\$30.29} = 7.0\%.$$

$$\text{CG Yield} = \frac{\hat{P}_1 - P_0}{P_0} = \frac{\$32.10 - \$30.29}{\$30.29}$$

$$= 6.0\%.$$

Finding the Expected Rate of Return during the first year

- Expected Rate of Return

$$\hat{r}_s = \frac{D_1 + \hat{P}_1 - P_0}{P_0}$$

$$= \frac{D_1}{P_0} + \frac{\hat{P}_1 - P_0}{P_0}$$

= Dividend yield + Capital gains yield.

= 7% + 6% = 13%.

- Note that the expected Rate of Return = the required rate of return r_s (= 13%)

Finding Expected Rate of Return: An Alternative Method

- We can also find the Expected Rate of Return by rearranging the stock valuation formula

$$P_0 = \frac{D_1}{r_s - g} \quad \Rightarrow \quad \hat{r}_s = \frac{D_1}{P_0} + g.$$

i.e. dividend yield + growth rate.

- In our example,

$\hat{r}_s$ = \$2.12 / \$30.29 + 0.06
= 0.07 + 0.06 = 13%.

Finding Future Prices

- Note that *for constant growth stocks*, all the capital gains come from the dividend growth:

  Capital gains yield = g (= 6%)

  i.e. $P_{t+1} = P_t(1+g) \rightarrow P_t = P_0(1+g)^t$

- In the example above P_0 = 30.29, so

$$\hat{P}_1 = P_0(1+g) = 30.29(1.06) = \$32.1$$

$$\hat{P}_2 = P_0(1+g)^2 = 30.29(1.06)^2 = \$34.0338.$$

The Constant Growth Rate Assumption

- Is the assumption that "the growth rate of dividends is constant over time" too strong to be realistic?
- Not necessarily. If the **average** growth rate is close to a stable growth rate, there is very little real effect on the valuation.
- Example: A cyclical firm may have year to year swing in growth rates but has an average growth rate of 5%.
- Dividends are less likely to be affected by year to year changes in earning growth.

Estimating the Growth Rate g

- One way to estimate g is to use the Earning Retention Method:

$$g = b(\text{ROE})$$

where b = Retention Ratio (the % of profit not being paid out as dividend)
ROE = Return on Equity

Earning Retention Method

- Suppose the company has been
  - earning 15% on equity (i.e. ROE = 15%)
  - retaining 35% (= b)

  and this situation is expected to continue.
- Retention growth rate:

$$g = b(\text{ROE}) = 0.35 \times 15\% = 5.25\%.$$

Is it possible to have $g > r_s$?

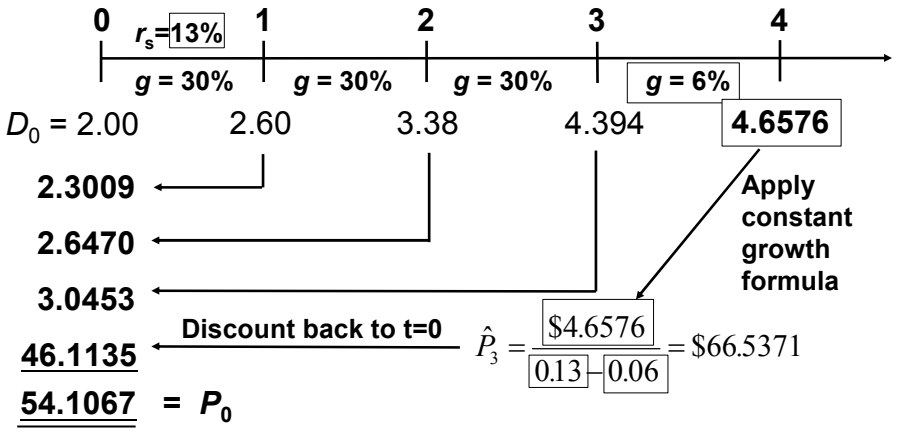
$$P_0 = \frac{D_1}{r_s - g} \text{ requires } r_s > g.$$

- If $g > r_s$, the stock price will be negative, which is not possible.
- Therefore, we can't use this model unless
  - $g < r_s$ and
  - g is expected to be constant forever.
- Because g is a long-term growth rate, it cannot be $> r_s$.

Two-Stage Growth Model

- Suppose a firm has supernormal growth of 30% for 3 years, then a long-run constant growth rate of g = 6%.
- Assume r_s remains at 13%. What is P_0?
- Cannot use constant growth model directly.
- But we can use a 2-Stage growth model since growth is expected to be constant after 3 years.

Two-Stage Model: Supernormal growth followed by constant growth



What is the expected dividend yield and capital gains yield at *t* = 0? At *t* = 3?

At *t* = 0 (during the first year):

$$\text{Dividend yield} = \frac{D_1}{P_0} = \frac{\$2.60}{\$54.11} = 4.8\%.$$

CG Yield = 13.0% – 4.8% = 8.2%.

Note: If current growth is greater than the constant rate g, current CG yield is greater than g.

At t = 3 (during the fourth year):

- We know if the growth rate is constant, the capital gains yield = g.

  Since after t = 3, g = constant = 6%, at t = 3 the CG Yield = 6%.

- Because r_s = 13%, at t = 3 the dividend yield = 13% – 6% = 7%.

  Check: D_4 = 4.6576, P_3 = $66.5371

  dividend yield = D_4 / P_3 = 7%

Are stock prices based on short-term or long-term growth?

- The current stock price is $54.11.
- The PV of dividends beyond year 3 is $46.11 ($\hat{P}_3$ discounted back to t = 0).
- The percentage of stock price due to "long-term" dividends is:

$$\frac{\$46.11}{\$54.11} = 85.2\%.$$

- Conclusion: The value of a stock is due largely to long-term growth.

Why many managers focus on quarterly earnings?

- If most of a stock's value is due to long-term cash flows, why do so many managers focus on quarterly earnings?
- Sometimes changes in quarterly earnings are a signal of future changes in cash flows. This would affect the current stock price.
- Managers of some corporations have their bonuses tied to quarterly earnings.

Zero-Growth Dividend

- If dividends are not expected to grow in the future (i.e. the growth rate g = 0), then

  $D_1 = D_2 = D_3 = \ldots = D$ (a constant)

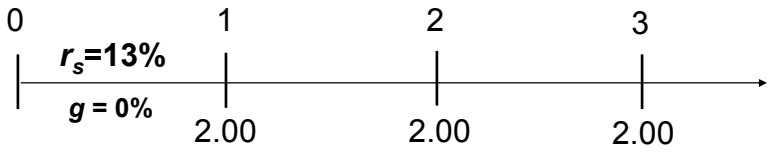
- The dividend stream is a simple perpetuity

$$P_0 = \frac{D}{(1+r_s)^1} + \frac{D}{(1+r_s)^2} + \frac{D}{(1+r_s)^3} + \ldots$$

$$= \frac{D}{r_s}$$

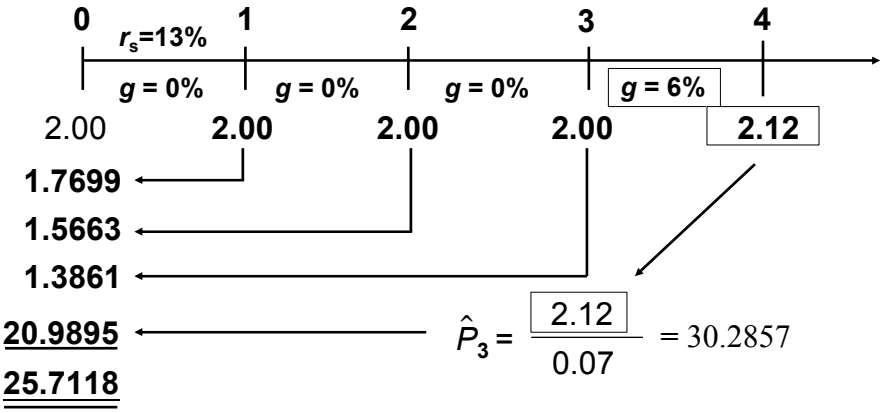
Stock Valuation if $g = 0$

Example: Suppose $D = \$2.00$ and $r_s = 13\%$



$$P_0 = \frac{D}{r_s} = \frac{\$2.00}{0.13} = \$15.38.$$

Suppose $g = 0$ for $t = 1$ to 3, and then g is a constant 6%. What is P_0?



What is dividend yield and capital gains yield at $t = 0$ and at $t = 3$?

$t = 0$:

Dividend Yield = $\frac{D_1}{P_0} = \frac{2.00}{\$25.72} = 7.8\%$.

CGY = 13.0% – 7.8% = 5.2%.

$t = 3$: Now have constant growth g = 6%

- Capital Gains yield = 6% and
- Dividend Yield = 13.0% – 6% = 7%.

Stock Valuation if $g < 0$

- If g = -6%, would anyone buy the stock? If so, at what price?
- The firm still has earnings and still pays dividends, so $P_0 > 0$:

$$P_0 = \frac{D_0(1+g)}{r_s - g} = \frac{D_1}{r_s - g}$$

$$= \frac{\$2.00(0.94\quad)}{0.13 - (-0.06)} = \frac{\$1.88}{0.19}$$

$$= \$9.89.$$

Dividend Yield and Capital Gains Yield

Capital gains yield = g = -6.0%.

Dividend yield = 13.0% – (-6.0%)
= 19.0%.

Both yields are constant overtime, with the high dividend yield (19%) offsetting the negative capital gains yield.

Limitations of the DDM

- The constant growth model is best suited for firms experiencing long-term stable growth.
- The model is sensitive to the assumptions made regarding growth rates, time frame, and the required rate of return.
- Intangible assets such as patents and brand names are ignore → tends to understate the intrinsic value of the firm.

Relative Value Models

- Some companies either do not pay dividends or their dividends are unpredictable.
- In these cases, we need to use other methods of stock valuation.
- Relative Value Models determine the value of a stock based on how similar stocks are valued or priced in the market.
- Idea: Apply a "market-determined" multiple to such measures as the *price-earnings ratio* (*P/E*), the *price-sales ratio* (*P/S*) etc.

Using Market Multiples to Estimate Stock Price

- Analysts often value stocks of a firm relative to other firms in the industry using
  - the P/E multiple (price per share divided by earnings per share)
  - the P/CF multiple (price per share divided by cash flow per share, which is the earnings per share plus the dividends per share)
  - The P/S multiple (price per share divided by sales per share)

The P/E Multiple Approach

- Analysts often assume that a stock is worth some "justified" P/E ratio times the firm's expected earnings.
- This justified P/E may be based on the industry average P/E, the company's own historical P/E, or some other P/E that the analyst feels is justified.
- To calculate the stock value of a firm, we simply multiply its expected earnings next year by this justified P/E:

$$V_{CS} = P/E \times EPS_1$$

Example: Using the P/E Multiple

- Suppose the forecasted earning per share of a company is $7.5.
- The average *P/E* ratio (the price per share divided by the earnings per share) for similar listed companies is 6.8.
- Using the market *P/E* multiple approach, the company's stock value estimate is simply

  P = P/E x EPS

  = 6.8 x $7.5 = $51 per share.

The P/S Multiple Approach

- Some companies may not be earning money currently so the *P/E* approach cannot be applied (because E = 0).
- We can estimate the value of the stock as some multiple of sales (Price/Sales ratio)

$$V_{CS} = P/S \times Sales$$

- The "justified" *P/S* ratio may be based on historical *P/S* of the company, average *P/S* of the industry, or some other estimates.

Problems with Relative Value Models

- Companies are rarely perfectly comparable even within an industry.
- The average ratio of comparable firms often has a wide range.
  - For example, the average P/E ratio might be 20, but the range could be from 10 to 50. How do you know whether your firm should be compared to the low, average, or high performers?
- There is no way to know for sure what the "correct" price multiple is.

Why are stock prices volatile?

$$\hat{P}_0 = \frac{D_1}{r_s - g}$$

- $r_s = r_{RF} + (MRP)\beta_i$ could change due to changes in
  - Inflation expectations
  - Risk aversion
  - Company risk
- Also, g could change over time.

Stock value vs. changes in r_s and g

Suppose D_1 = \$2, r_s = 10%, and g = 5%

$P_0 = D_1 / (r_s - g)$ = \$2 / (0.10 - 0.05) = \$40.

What if r_s or g changes?

r_s	g = 4%	g = 5%	g = 6%
9%	40.00	50.00	66.67
10%	33.33	40.00	50.00
11%	28.57	33.33	40.00

Are volatile stock prices consistent with rational pricing?

- Small changes in expected g and r_s could cause large changes in stock prices.
- As new information arrives, investors continually update their estimates of g and r_s.
- If stock prices aren't volatile, then this means there isn't a good flow of information! (more on this later)

Preferred Stock

- A hybrid security with characteristics of both debt and equity.
- Like bonds, preferred stock has a par value and pay a fixed dividend which must be paid before dividends can be paid on common stock.
- Unlike bonds, preferred stock dividends can be omitted without fear of pushing the firm into bankruptcy.
- Since preferred stock pays a fixed dividend every period forever, it is essentially a perpetuity.

Advantages of Preferred Stock

Advantages of financing using preferred stock rather than common stock:

- Control of the firm is not diluted because preferred shares usually do not have voting rights.
- Dividends paid can be deducted as expenses in some cases if they are required payments to the firm.

What's the expected return on preferred stock with V_{ps} = \$50 and annual dividend = \$5?

Since preferred stock pays a fixed dividend (g = 0), it's like a perpetual bond

$$V_{ps} = \frac{D}{\hat{r}_{ps}}$$

$$\$50 = \frac{\$5}{\hat{r}_{ps}}$$

$$\hat{r}_{ps} = \frac{\$5}{\$50} = 0.10 = 10.0\%.$$

Suppose r_{ps} = 8%, the par value of the preferred stock is $120 and has a stated dividend of 10% par

What is the market value of the preferred stock?

- First compute the dividend

  10% x 120 = $12

- Then apply the perpetuity formula

  $V_{ps} = D / r_{ps} = 12 / 0.08 = \$150.$

Efficient Market Hypothesis

What is Market Efficiency?

- Market Efficiency is about how prices of financial assets respond to new information.
- Information is not always "distributed" evenly
  - Public Information: the same information is available to everyone (symmetric information)
  - Private Information: some people are better informed than others (asymmetric information)
- Information that is available to everyone does not mean that everyone will get the same information, at the same time, or interpret it the same way.

Information and Security Prices

Examples of how information can affect security prices:

- The Fed decides to cut interest rates

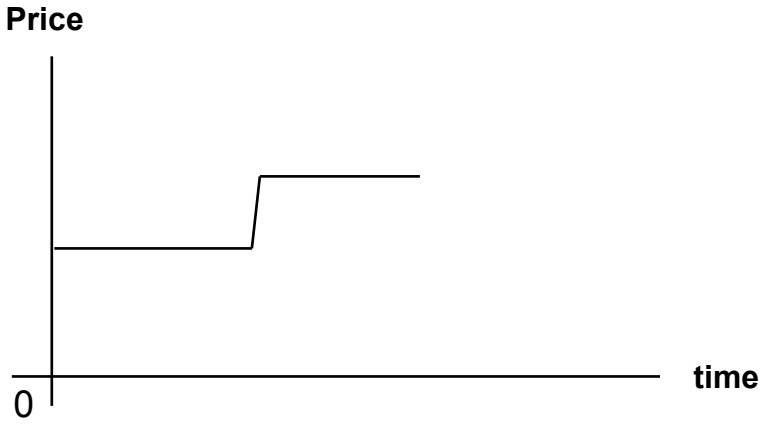
  → bond prices ↑
- Rumors of a take-over bid

  → Share price of target company ↑
- A car manufacturer announces a major recall

  → Share price of the company ↓

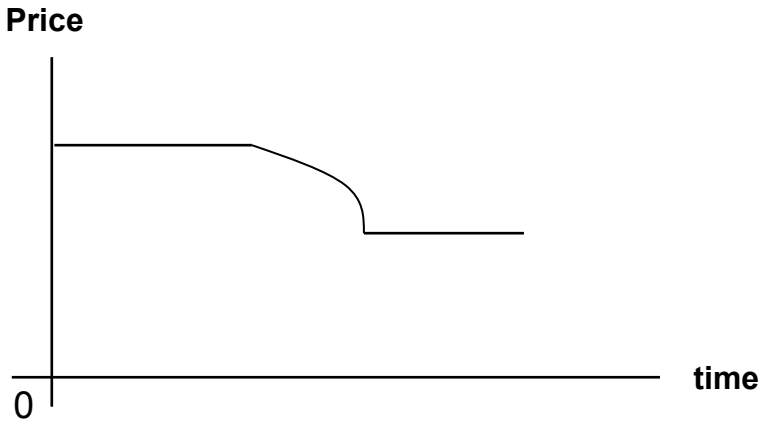
How Prices Respond to News

- Example: Unexpected “good news”



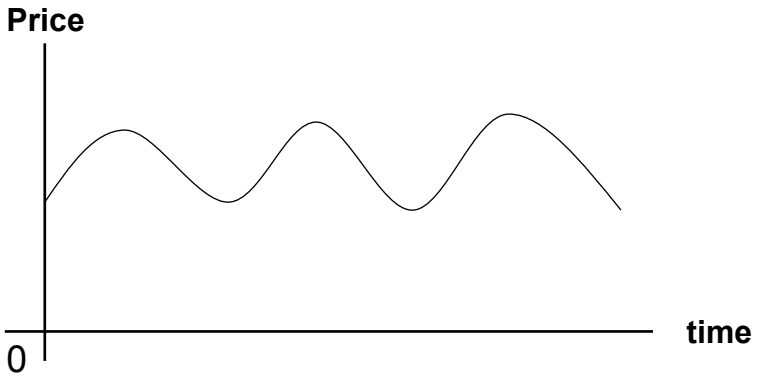
How Prices Respond to News

- Example: Anticipated “bad news”



How Prices Respond to News

- Would you expected to see this kind of price movement over an extended period of time?



Market Efficiency

- In other words: “Are there *patterns* in the movement of stock prices?”
- Suppose there are, and you happen to spot a pattern in the price movement of a stock.
- What would you do?
  - Buy the stock when the price is low and sell it when the price is high (“buy low, sell high”)
  - Borrow money if you have to!

Market Efficiency

- Clearly, any pattern in price movement will give rise to [extremely] profitable trading opportunities.
- We call those *arbitrage opportunities*:
  - opportunities for riskless profits, or
  - the risk is low relative to the expected profits.
- Market efficiency is about the absence of arbitrage opportunities.

Why Market Should be Efficiency?

- The process of exploiting the pattern of stock price movements, paradoxically, will destroy such pattern and any arbitrage opportunities because it would
  - bid up the price of a stock that is supposedly undervalued → its expected return ↓
  - drive down the price of a stock that is supposedly overvalued → its expected return ↑
- The question is: How fast will prices adjust?

Some Facts

- There is literally an “army” of intelligent, well-informed security analysts and traders who make their living hunting for mis-priced securities or security prices that follow a pattern based on currently available information.
- They have access to the most up-to-date data and / or information, hi-tech computers, sophisticated computer software etc.
- They are the ones who help make the financial market efficient (we’ll explain later).

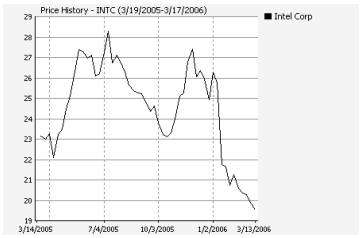
Implications

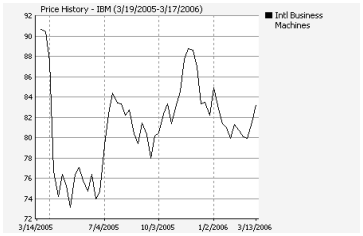
- Intense search for mis-priced (under- or over-valued) stocks by professional investors who can and will assimilate and act on information very quickly will drive the price of all assets to fully reflect any new information and compete away any above-normal profit opportunities.
- Implications:
  - Market will adjust rapidly to new information, so current stock prices should have reflected all available information.
  - Future stock prices should be unpredictable.

Unpredictability

Prices are unpredictable in the sense that:

- Stock prices should have reflected “all available information”.
- Stock prices change only if there is “new information” which comes to the market in a random fashion.
- The fact that stock prices only react to “random news” is what make them unpredictable.





Mis-pricing & Information Adjustment

- In an efficient market where prices reflect all available information, mis-pricings are created by the arrival of new information.
- Mis-pricings create arbitrage opportunities.
- How quickly do mis-pricings and the profit opportunities go away depends on how quickly the new information is “priced-in” (reflected in security prices).
- So market efficiency is about how quickly new information is reflected in security prices.

Efficient Capital Market

What does it mean by an Efficient Capital Market?

- "*A market in which prices always 'fully reflect' available information is called efficient."* Eugene Fama (1970)
- "*A capital market is said to be efficient if it fully and correctly reflects all relevant information in determining security prices."* Burton Malkiel (1992)

The Efficient Market Hypothesis (EMH)

- In an efficient capital market, security prices adjust rapidly to the arrival of new information, therefore the current prices of securities reflect all information about the security.
- One cannot consistently "beat the market" (make above normal risk-adjusted returns) except through good luck or inside information.
- In other words, don't bother poring through research reports looking for under-valued stocks.

Efficient Market Hypothesis

The Efficient Market Hypothesis (EMH) has three different "forms", depending on the assumptions about what information is available to investors.

- Weak Form Efficiency – prices reflect all security market information
- Semi-strong Form Efficiency – prices reflect all public information
- Strong Form Efficiency – prices reflect all public and private information

Weak Form Efficiency

- Current prices already reflect all information contained in the history of past trading – historical sequence of prices, rates of return, trading volume data, and other market-generated information.
- Implication: past rates of return and other market data would not be useful in finding undervalued stocks.
- Evidence supports weak form efficiency, but "technical analysis" is still widely used.

Semi-Strong Form Efficiency

- Current security prices reflect not only information from past trading history, but also all publicly available information.
- Public Information: financial statements, annual reports, news reports, etc.
- Examples of public information: global recall of a product, takeover bid, lawsuit filed against a company, announced information relating to the state of the economy, and any other public information relevant to the valuation of the firm.
- Implication: Trading strategies using publicly available information should not be useful in finding undervalued stocks.

Strong Form Efficiency

- Stock prices fully reflect all information from private (insider) as well as public sources.
- This implies that no group of investors should be able to consistently derive above-average risk-adjusted rates of return.
- This assumes perfect markets in which all information is costless and available to everyone at the same time.
- Note: Security laws against insider trading preclude markets from being completely strong-form efficient.

Conditions of an Efficient Market

1. A large number of independent investors searching for arbitrage opportunities.
2. New information arrives in a "random" fashion.
3. Security prices adjust rapidly to reflect new information.

- Efficiency does NOT require that everyone gets the same information at the same time.

Implications of Market Efficiency

- No investor (or group of investors) should be able to *consistently* "beat the market".
- Technical Analysis is useless – don't bother poring through research reports looking for under-valued stocks (weak form).
- Fundamental Analysis is useless – no one should be able to make above-average profits from new information after it becomes public (semi-strong form).
- [Most financial economists do not take the "strong form" seriously.]

Implications of Market Efficiency

Market Efficiency does NOT imply that

- stock prices will never deviate from their true values. (The only requirements are that the deviations be "random" and that the prices will adjust and return to their true value quickly.)
- no investor will be able to "beat the market" at any point in time. (The only requirement is that no one be able to **consistently** make higher than average returns.)

Implications For Investors

- Published reports of financial analysts have very little value
- Be skeptical of "hot tips"
- Stock prices may fall on good news
- Prescription:
  1. Don't try to outguess the market
  2. Diversify with index funds
  3. Best strategy: buy and hold

Some Remarks

- Capital markets are neither purely efficient nor purely inefficient.
- The right question to ask is “What is the degree of efficiency in capital market?”
- That is, “How quickly do prices adjust to reflect any new information?”
- Price movements are random, but it does not implies that prices are random. The driving force to their random movements is that news comes randomly.

Conclusion

- Are markets really efficient?
  - Financial markets are, by and large, highly efficient in the sense that it is difficult to make money from trading.
- If it is impossible to “beat the market” in an efficient market, why are so many people searching for undervalued stock?
  - Think of an efficient market as a self-correcting mechanism, where inefficiencies appear from time to time but disappear almost instantaneously as investors find them and trade on them.