ECON 354
Money and Banking

Professor Yamin Ahmad

Lecture 6

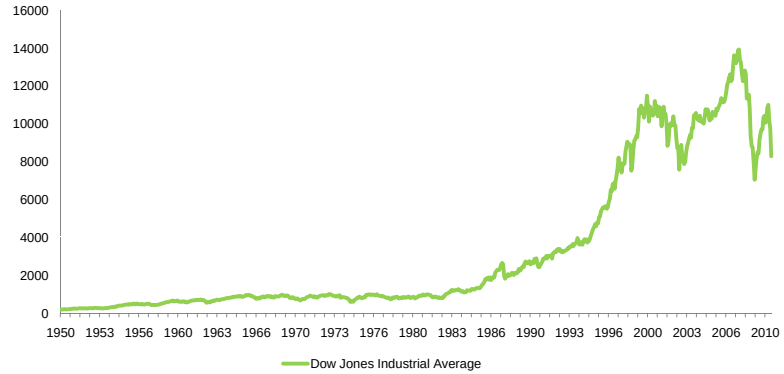
- Stock Market
- Rational Expectations
- Efficient Markets Hypothesis

Big Concepts

- How are Stocks Priced?
  - Gordon Growth Model
- How to incorporate people's expectations about the market…
- … Market Efficiency and the Efficient Markets Hypothesis

Note: These lecture notes are incomplete without having attended lectures

Stock Market: 1950 - 2010



- Recall that stocks are a share of ownership in a corporation or firm.
- Question: What do we hope to gain by holding stocks?

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Computing the Price of Common Stock

- Basic Principle of Finance
  Value of Investment = Present Value of Future Cash Flows
- One-Period Valuation Model

$$P_0 = \frac{Div_1}{(1+k_e)} + \frac{P_1}{(1+k_e)} \qquad (1)$$

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Generalized Dividend Valuation Model

$$P_0 = \frac{D_1}{(1+k_e)^1} + \frac{D_2}{(1+k_e)^2} + \ldots + \frac{D_n}{(1+k_e)^n} + \frac{P_n}{(1+k_e)^n}$$

- Since we do not know in advance what the future price in period will be, we replace it with what we expect it to be, P^e:

$$P_0 = \frac{D_1}{(1+k_e)^1} + \frac{D_2}{(1+k_e)^2} + \ldots + \frac{D_n}{(1+k_e)^n} + \frac{P_n^e}{(1+k_e)^n} = \sum_{t=1}^{n} \frac{D_t}{(1+k_e)^t} + \frac{P_n^e}{(1+k_e)^n} \qquad (2)$$

Generalized Dividend Valuation Model

- Equation 2 is made up of two parts:
  i. "Fundamentals":

$$\sum_{t=1}^{n} \frac{D_t}{(1+k_e)^t} = \frac{D_1}{(1+k_e)^1} + \frac{D_2}{(1+k_e)^2} + \ldots + \frac{D_n}{(1+k_e)^n}$$

  ii. "Bubble": $\frac{P_n^e}{(1+k_e)^n}$

Question…

- Consider the tech stocks in the late 1990's and the "dot-com" phenomena. They offered no dividends.

- Can the generalized dividend model of equation (2) reflect the price of those stocks?

$$P_0 = \frac{D_1}{(1+k_e)^1} + \frac{D_2}{(1+k_e)^2} + \ldots + \frac{D_n}{(1+k_e)^n} + \frac{P_n}{(1+k_e)^n} \qquad (2)$$

Generalized Dividend Model (cont.)

- If we let period "n" be very large, then equation (2) boils down to:

$$P_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+k_e)^t} \qquad (3)$$

- In other words: the price of the stock should be the present discounted value of the stream of dividends it pays out.

- Note:
  - The price of the stock is accurately reflected in terms of its fundamentals.
  - The presence of a bubble distorts the relationship above

Gordon Growth Model

- Assuming dividend growth is constant, Equation 3 can be written as

$$P_0 = \frac{D_0 \times (1+g)^1}{(1+k_e)^1} + \frac{D_0 \times (1+g)^2}{(1+k_e)^2} + \ldots + \frac{D_0 \times (1+g)^\infty}{(1+k_e)^\infty} \quad (4)$$

- Assuming the growth rate is less than the required return on equity, Equation 4 can be written as

$$P_0 = \frac{D_0 \times (1+g)}{(k_e - g)} = \frac{D_1}{(k_e - g)} \quad (5)$$

How the Market Sets Prices

- The price is set by the buyer willing to pay the highest price
- The market price will be set by the buyer who can take best advantage of the asset
- Superior information about an asset can increase its value by reducing its perceived risk

Example: Pricing Microsoft Stock

- Suppose that you are considering purchasing stock in Microsoft (MSFT).
- Suppose that their projected dividends (per share) are: $0.13 per share per quarter (click here for current projected dividends)
- Consider what kind of return you would like to get from holding microsoft stock (i.e. k_e)
- Suppose that the economy is projected to grow at 2% this year.

Example: Pricing Microsoft Stock

- Compute the price (per share) you should be willing to pay for shares in Microsoft.
- The current price for microsoft shares are:
- Should you buy?

How the Market Sets Prices

- Information is important for individuals to value each asset.
- When new information is released about a firm, expectations and prices change.
- Market participants constantly receive information and revise their expectations, so stock prices change frequently.

Application: The Subprime Financial Crisis and the Stock Market

- Financial crisis that started in August 2007 led to one of the worst bear markets in 50 years.
- Downward revision of growth prospects: $\downarrow g$.
- Increased uncertainty: $\uparrow k_e$
- Gordon model predicts a drop in stock prices.

Expectations…

- Key Question: How are Expectations Formed?
- Types of Expectations
  - Adaptive Expectations
  - Rational Expectations
  - Other types of expectations…
- Here we focus on Rational Expectations

Adaptive Expectations

- Expectations are formed from past experience only.
- Changes in expectations will occur slowly over time as data changes.
- However, people use more than just past data to form their expectations and sometimes change their expectations quickly.

Theory of Rational Expectations

- Rational Expectations (Muth): People use available information efficiently, including how the economy works.
- In practice this boils down to assuming agents use the same model of the economy as the researcher ("model-consistent" expectations).
- People can make mistakes, but they do not make systematic forecasting errors.

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Theory of Rational Expectations

Definition:

Rational expectation (RE) = Expectation that is optimal forecast (best prediction of future) using all available information:

Expectations Operator

Information Set

i.e., RE

⇒

$$X^e = X^{of} = E_t[\, X \mid \Omega_t \,]$$

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Rational Expectations (cont…)

- Two reasons Expectations may not be rational
  - Not best prediction
  - Not using available information
- Rational expectation, although optimal prediction, may not be accurate
- Rational expectations makes sense because is costly not to have optimal forecast

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Implications of Rational Expectations

Implications:

1. If there is a change in the way a variable moves, then the way expectations are formed also changes
2. Forecast errors on average = 0 and are not predictable

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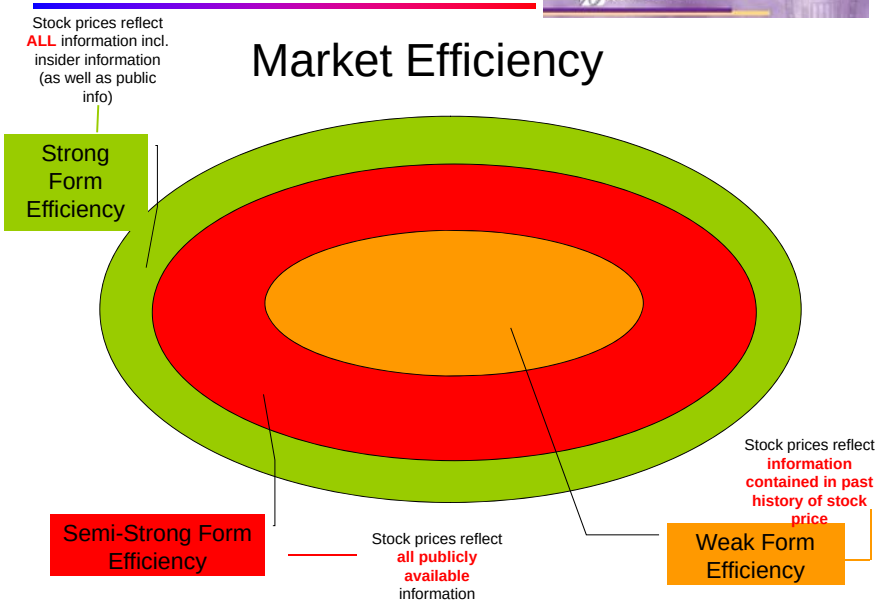
Types of Market Efficiency

- Define: Market Efficiency – how quickly do markets reflect *new* information?

- 3 Types of Market Efficiency:
  - Weak form efficient
  - Semi-strong form efficient
  - Strong form efficient

Note: These **do not** refer to the degree to which markets are efficient. They refer to the type of efficiency that exists in markets

Market Efficiency



Market Efficiency

- Recall: We are asking how quickly do markets respond to new information?

- Response to new information can cause:-
  - A delayed reaction
  - An efficient market reaction
  - An overreaction and correction

Efficient Markets: Application of Rational Expectations

Recall

The rate of return from holding a security equals the sum of the capital gain on the security, plus any cash payments divided by the initial purchase price of the security.

$$R = \frac{P_{t+1} - P_t + C}{P_t}$$

$R =$ the rate of return on the security

P_{t+1} = price of the security at time $t + 1$, the end of the holding period

P_t = price of the security at time t, the beginning of the holding period

C = cash payment (coupon or dividend) made during the holding period

Efficient Markets (cont'd)

At the beginning of the period, we know P_t and C.

P_{t+1} is unknown and we must form an expectation of it.

The expected return then is

$$R^e = \frac{P^e_{t+1} - P_t + C}{P_t}$$

Expectations of future prices are equal to optimal forecasts using all currently available information so

$$P^e_{t+1} = P^{of}_{t+1} \Rightarrow R^e = R^{of}$$

Supply and Demand analysis states R^e will equal the equilibrium return R^*, so $R^{of} = R^*$

Efficient Markets

- Current prices in a financial market will be set so that the optimal forecast of a security's return using all available information equals the security's equilibrium return
- In an efficient market, a security's price fully reflects all available information

Rationale

$$R^{of} > R^* \Rightarrow P_t \uparrow \Rightarrow R^{of} \downarrow$$

$$R^{of} < R^* \Rightarrow P_t \downarrow \Rightarrow R^{of} \uparrow$$

until

$$R^{of} = R^*$$

Note:

1. All unexploited profit opportunities eliminated
2. Efficient Market holds even if are uninformed, irrational participants in market

Evidence on Efficient Markets Hypothesis

Favorable Evidence

1. Investment analysts and mutual funds don't beat the market
2. Stock prices reflect publicly available information: anticipated announcements don't affect stock price
3. Stock prices and exchange rates close to random walk

   If predictions of ΔP big, $R^{of} > R^* \Rightarrow$ predictions of ΔP small
4. Technical analysis does not outperform market

Evidence on Efficient Markets Hypothesis

Unfavorable Evidence

1. Small-firm effect: small firms have abnormally high returns
2. January effect: high returns in January
3. Market overreaction
4. Excessive volatility
5. Mean reversion
6. New information is not always immediately incorporated into stock prices

Overview

Efficient Markets Hypothesis:

$\Rightarrow$

Reasonable starting point but not whole story

Implications for Investing

1. Published reports of financial analysts not very valuable
2. Should be skeptical of hot tips
3. Stock prices may fall on good news
4. Prescription for investor
   - Shouldn't try to outguess market
   - Therefore, buy and hold
   - Diversify with no-load mutual fund

Evidence on Rational Expectations in Other Markets

1. Bond markets appear efficient
2. Evidence with survey data is mixed
   - Skepticism about quality of data
3. Following implication is supported: if there is a change in the way a variable moves, then the way expectations are formed also changes