

1. Real Assets vs. Financial assets
 - A. Real assets - produce goods or services
 - B. Financial assets - claims on real assets or their income streams.

2. Clientele of financial markets
 - A. Households - interested in a variety of assets
 - i. investment goals
 - ii. tax status
 - iii. risk tolerance
 - B. Business
 - i. Raise money by issuing debt or equity
 - C. Government
 - i. finances expenditures using debt
 - ii. regulates financial markets
 - D. Financial intermediaries
 - i. Institutions such as banks, insurance companies, credit unions, investment houses
 - ii. Intermediaries exist to convert the relatively simple assets provided by firms and government into assets more specialized to meet the needs of the household sector.
 - iii. Services supplied by Financial Intermediaries

Services Supplied by Financial Intermediaries	
Reduce information costs	Reduce transaction costs
Reduce search costs	Denomination intermediation
Credit valuation: reduce adverse selection	Maturity intermediation
Price discovery	Provide payments system
Monitoring: reduce moral hazard	Diversify risk
	Hedge risk

3. **Four types of markets**
 - A. Direct search markets
 - i. Usually real assets
 - B. Brokered markets
 - i. Middle-person gets a commission for reducing search costs
 - ii. Broker does not take a position – stocks, real estate
 - C. Dealer markets
 - i. Middle-person takes a position
 - ii. Makes profit off the bid/ask spread
 - iii. NASDAQ market makers, car dealers
 - D. Auction markets
 - i. All transactors converge in one place to buy and sell
 - ii. NYSE - secondary markets

4. **Markets and Instruments**
 - A. Four sectors of the financial markets
 - i. Money market
 - ii. Capital market
 - iii. Equity market
 - iv. Derivative market

B. The Money market - short term fixed income market - less than one year

i. US Treasury Bills: 3, 6, and 12 month bills

- a) Auctioned every Monday or once a month for 12-month bill
- b) Bills are highly liquid
- c) Low minimum denomination - \$10,000 vs. \$100,000
- d) Exempt from all *but* federal taxes

- e) Three different yields

Bank discount yield - what is quoted in the Bid and Asked columns of the WSJ

$$r_{BD} = \frac{10000 - P}{10000} * \frac{360}{n}$$
$$\Rightarrow P = 10000 * \left[1 - r_{BD} * \left(\frac{n}{360} \right) \right]$$

This is different (lower) than the Effective Annual Rate which should always be used to compare assets.

$$EAR = \left[1 + \frac{APR}{m} \right]^m - 1$$

Where APR is the annual percentage rate and m is the number of compounding periods per year. The APR is the stated period rate times the number of periods.

To make things even more mysterious, the last column in the WSJ is the ask yield and is a bond equivalent yield. This is the holding period yield on a 365 day basis if the bill were purchased at the ask price.

$$r_{BEY} = \frac{10000 - P}{P} * \frac{365}{n}$$

To relate the bank discount yield and bond equivalent yields use

$$r_{BEY} = \frac{365 * r_{BD}}{360 - (r_{BD} * n)}$$

Generally, the bank discount yield is less than the bond equivalent yield, which is less than the effective annual rate.

C. Yield vs Return

- i. Yield comes from a "loan" such as a bond, Certificate of Deposit or a savings account.
Stocks or mutual funds that pay a dividend are also said to have a yield.
- ii. Return is return of capital plus any increased valuation.

- iii. For example, you buy 100 shares of Western Pacific Tectonic Drift Short Term Global Income Fund at \$16 a share. After a year the fund shares sell for \$20 a share - a 25% return.
- iv. If they also paid a dividend of \$0.80 per share, your fund would be said to have a yield of $5\% = \frac{8}{16}$.

When you look in a magazine at an ad for this fund, there will be a "Total Return" identified (which assumes all dividends and gains have been reinvested) as 30% for 1 year.

D. Other Money Market Instruments

- i.
- ii. Certificates of Deposit - CD's
 - a) Time deposits that may not be withdrawn upon demand.
 - b) Insured up to \$100,000
 - c) Large denomination CD's may be sold prior to maturity
- iii. Commercial paper
 - a) Short-term unsecured debt notes - 270 days
 - b) Issued in denominations of \$100,000 but available through mutual funds to small investors.
- iv. Bankers Acceptances
 - a) A postdated check backed by the bank.
 - b) Often used in international transactions.
- v. Eurodollars and Eurodollar CD's
 - a) Large dollar denominated time deposits in foreign banks.
 - b) Maturity is typically less than six months
- vi. Repos and Reverses
 - a) Overnight loan backed by U.S. Treasury securities
 - b) Dealers or Banks who need cash for a short period of time use these.
 - c) Term repos have a maturity of six months or more.
 - d) Reverse repos are the other side of the transaction - dealers with money to loan.
- vii. Federal Funds
 - a) Overnight lending rate between banks to meet reserve requirements
- viii. LIBOR - London Interbank Offered Rate
 - a) Rate at which large banks in London loan to each other.
 - b) Has become a benchmark for many other rates - see your credit card statement.

5. The Capital Market - longer term fixed income securities

A. Treasury Notes and Bonds

- i. Notes range from 1 to 10 year maturities
- ii. Bonds range from 10 to 30 year maturities
- iii. Both pay semi-annual coupons based on a \$1000 face value.
- iv. How are these quoted in the WSJ?
 - a) Rate = annual coupon rate
 - b) Maturity = when the bond matures
 - c) Bid/Ask = prices quoted as a percentage of par
 - d) Change = the change in the closing bid price
 - e) Ask yield = yield to maturity on an APR basis.

B. Agencies - federal government programs - usually farm and mortgage

- i. FHLB, FNMA, GNMA, FHLMC, etc.
- ii. Not explicitly guaranteed but ...
- C. Muni's - Bond issues from state and local governments
 - i. *Revenue bonds* are backed by the cash flow generated by the specific project for which they were issued.
 - ii. *Industrial development bonds* are issued to finance private projects.
 - iii. Interest income is exempt from federal taxes.

Note: To compare the rates of a taxable and non-taxable bond use:

$$r(1 - t) = r_m$$

where r = before tax return on taxable bond
 r_m = return on muni
 t = marginal tax rate

Rich people purchase these given their tax exposure.
 What tax bracket would people have to be in to be indifferent between investing in a muni vs. a corporate bond?

- D. Corporate bonds
 - i. Mortgage bonds - collateralized by some specific asset
 - ii. Debenture bonds - no collateral
 - iii. Subordinated debentures - have a lower claim to assets in the event of bankruptcy.
 - iv. Options/provisions on corporate bonds
 - a) Callable - firm can retire the debt at a stipulated price
 - b) Convertible - owner of bond may exchange the bond for a particular number of shares of the companies stock.
 - c) Sinking fund provision
 - (1) Requires a firm to call or buy in the market a certain number of the issue each year in the coming years.
 - (2) Insures the firm does not get in over its head.
 - d) Other provisions
 - (1) Limit on the dividends the firm may pay
 - (2) Require the firm to maintain a minimum level of working capital
 - (3) Limit further borrowing
 - (4) Limit officer's salaries (more common in privately placed debt)
 - v. How are these quoted in the WSJ?
 - a) Bonds column contains the name of the issuing company, the coupon and maturity date.
 - b) Current yield is defined as annual coupon income divided by price.
 - c) Volume gives the number of bonds traded on previous day.
 - d) Close is the closing price as a percentage of par.
 - e) Net change is the difference from the previous days' trade.
- E. Mortgages and Mortgage backed securities
 - i. Fixed rate mortgages
 - ii. Mortgage backed securities (MBS), pass-throughs, securitization.
 - a) An MBS is a claim in a pool of mortgages or an obligation backed by a pool of mortgages.

- b) Mortgage lenders *securitize* loans by packaging them and selling off the cash flows.
- c) The mortgage lenders continue to deal with the loans, they just *pass through* the principle and interest.
- iii. This is a huge and growing business. Banks are securitizing all types of loans now including credit card debt!

6. Equity Market

A. Common Stock:

- i. No dividends required - last to get paid in event of bankruptcy
- ii. Voting rights
 - a) Election of the board of directors - who then appoints the top management
 - b) Vote on changes in charter by-laws
 - c) Mergers and breakups
- iii. Preemptive right - in the event of a new issue if you own 1% of the company you have a right to purchase 1% of the new issue.
 - a) Protects owners from dilution of voting rights
 - b) This may not always be true - in the case of stock issuance for payment of property or a merger.
- iv. Easy transfer of ownership
- v. Limited liability

B. Preferred stock: the hybrid

- i. Next up the ladder for dividends and liquidation payments
- ii. No voting rights
- iii. Stated value - liquidating value
 - a) Usually \$100 and a fixed dividend - i.e. GM 5\$ preferred has a 5% yield or \$6 Citicorp at a price of \$86.50 has a 6.9% yield.
- iv. Company does not *have* to pay the dividend
 - a) But it might be cumulative - carried forward in arrearage.
 - b) Dividends in arrears must be paid before common stock dividends.
- v. Sometimes carry provisions
 - a) convertible into common stock
 - b) callable
 - c) sinking fund
 - d) adjustable rates
- vi. Dividends are not tax deductible by the firm
- vii. Why issue these? No tax breaks, but all the aspects of bonds.
 - a) Control
 - b) Dividends in arrears are not considered debt - holders can't force payment of arrears.

C. Market indexes

- i. Dow Jones Industrial Average (DJIA)
 - a) Began in 1896 with 20 stocks
 - b) 1928 became a 30 stock index
 - c) Stocks are "blue chips"
 - d) Index is **price weighted** - like holding a portfolio of the 30 stocks with one share of each.

- (a) The average began as taking the closing prices of the 30 stocks, adding them up, and dividing by 30.
- (b) The fact that stocks have split, paid large dividends, or been removed from the portfolio has brought the divisor down to around .5 today.
- (c) Hence the very large index numbers seen today.
- (2) Price weighting
 - (a) Gives the average price of the assets in the index.
 - (b) Gives higher weight to higher priced stocks.
- (3) *Keep in mind that the larger the index number the less important are 100 point moves.*

ii. Standard and Poor's - S&P500

- a) Market-value-weighted index of 500 stocks.
- b) Reflects the return an investor would have if she held all the stocks in proportion to their market value.
 - (1) EXCEPT that it ignores dividends

iii. Other indexes

- a) NYSE composite: all NYSE stocks - value weighted
- b) NASDAQ composite: all NASDAQ stocks - value weighted
- c) Wilshire 5000: Value weighted of all exchanges list and NASDAQ
- d) ValueLine: price weighted - geometric average
- e) Russell 2000

iv. Foreign Indexes

- a) Nikkei 225 and Nikkei 300
 - (1) 225: price-weighted average of the largest stocks
 - (2) 300: value-weighted index
- b) FTSE
 - (1) Published by *Financial Times*
 - (2) Value-weighted index of 100 of the largest London Stock Exchange corporations.

v. Purchasing the indexes

- a) Easily done through a mutual fund.
- b) Passive strategy of "investing in the market"

D. Mutual funds

i. Mutual funds pool resources of many investors and purchase securities in large blocks.

ii. Open-end funds

- a) Continuously issuing new shares, which sell at net asset value (NAV) plus commission (load) if any, but never below.
- b) $NAV = (\text{Assets} - \text{Liabilities}) / \text{Shares outstanding}$
- c) Load funds are purchased from a broker while no-load funds are purchased directly from the investment company and involve no commissions.

d) Do load funds outperform no-load funds?

iii. Closed-End Funds

- a) Closed end funds do not continuously issue new shares. These funds are traded on the organized exchanges and OTC, at prices that may or may not be the NAV.
- iv. Cost of trading funds:
- a) Front-end load - up front sales commission of 4% to 8.5%.
 - b) Low load - up front sales commission of 1% to 3%.
 - c) No load - no up front commission.
 - d) Back-end load - 5% to 6% when the shares are sold.
7. Futures, Forwards, Options, and Swaps.
- A. Futures and forwards: an *obligation* to trade at a specific price at some future time
 - B. Options: a *right* to trade at a specific price at some time in the future
 - C. Swap: an agreement to exchange duration
8. How Securities are Traded
- A. How firms issue securities: stocks, bonds, and warrants
 - i. Primary market
 - a) Initial public offerings (IPO's)
 - (1) IPO's often under priced. The interested reader should see **Ritter, Jay R., The Long-Run Performance of Initial Public Offerings *Journal of Finance*, March 1991, 3-27.**
 - b) Seasoned offerings
 - c) Both stocks and bonds are issued in the primary market
 - (1) Bonds may be publicly offered or privately placed
 - (a) If privately placed then they are not rated
 - (b) More risk for investor but lower cost for firm since the SEC registration process is avoided.
 - ii. Secondary market: Already issued securities
 - a) A firm might decide to sell the securities themselves - direct securities issue. Largely confined to common stock issues.
 - b) Most firms use Investment bankers: the middle person
 - (1) Specialist in selling the stock for a firm
 - (a) Know investor preferences
 - (b) Help the firm price the securities based on the risk characteristics of the firm.
 - (c) Know the SEC, exchange, and other legal aspects.
 - (d) Most of the requirements deal with disclosure of information on the company's operations and financial condition, ownership by officers and directors of the firm, and any legal problems they may be having.
 - (e) Earn money off the difference between what they pay for the stock and what they sell it for.
 - c) The process:
 - (1) Firm selects an investment banker through negotiation or a bidding process
 - (2) The banker will either buy the securities outright - **underwriting** - and assume the risk or will work on a **agency basis** - sells what he can and works on a commission. Bankers will work on an agency basis if the risk is very low or very high.
 - iii. Other places a firm can get cash
 - a) Banks and life insurance companies for loans and debt.

- b) Foreign investors: issue Eurobonds - less regulation
- c) List on a foreign stock exchange.

B. Where Securities are traded - secondary market

i. **Stock exchanges**

ii. Nine major exchanges:

- a) Most are regional, the two national are the NYSE and the AMEX.
- b) NYSE is the biggest - around 3000 firms with daily volume in the hundreds of millions of shares.

iii. Over-the Counter Market (OTC)

- a) NASDAQ is the computerized system that connects the players in this market.
- b) More than 35,000 issues are traded OTC, but usually at a lower price than issues on the national exchanges.

C. Trading

i. Types of orders:

- a) Market orders - buy or sell at current market price.
- b) Limit orders:
 - (1) Limit-buy: buy if the price falls below a given price.
 - (2) Limit-sell: sell if the price rises above a given price.
- c) Stop orders:
 - (1) Stop-loss orders: sell if the price falls below a given price.
 - (2) Stop-buy orders: buy if the price rises above a given price.

	Price below limit	Price above limit
Buy	Limit buy	Stop buy
Sell	Stop loss	Limit Sell

d) Time limit orders:

- (1) Day orders: ends if not transacted before close of trade.
- (2) Open orders: good for six months unless canceled.
- (3) Fill or kill:

D. Brokers and Dealers

i. Brokers act as a middle-person.

ii. Dealers take a position, they hold an inventory.

iii. Specialists: - Market makers

- a) Broker function: Maintains a "limit order book" - outstanding unexecuted limit orders entered by brokers.
 - (1) Crosses trades by using the highest offered purchase price and lowest offered selling price.
 - (2) An auction market.
- b) Dealer function:
 - (1) Has exclusive right to make the market in a particular stock on the exchange.
 - (2) Must trade from own inventory to maintain a fair and orderly market.
 - (3) Quote bid and ask price for the stock and must take any trades (up to a point) that come in at that price.

- (4) But, they can and do use the limit order book to cover many of these positions.

E. Trading costs

i. Explicit costs:

a) Commissions:

- (1) Full service brokers: Discretionary accounts
- (2) Discount brokers
- (3) Internet Brokers
- (4) What about dividends and capital gains?

ii. Implicit costs:

- a) Bid/Ask Spread
- b) Price concession paid for quantities over the specialists limit.

iii. All these together can be very large - 30%?!

F. Margins

i. Margin is a levered stock investment:

a) Borrowing money from a broker to purchase stocks.

- (1) Brokers borrow it from a bank at the call rate and hold the securities in street name as collateral.

ii. Initial margin:

- a) FRB sets the initial margin requirements at 50% - that is 50% of a stock purchase must be made with the investors money.
- b) Many houses require higher initial margins.
- c) Percentage Margin = $(\text{Equity}/\text{Value of assets}) = (\text{Value of investors portion}/\text{Total value of stock})$

iii. Maintenance margin:

- a) A guarantee for the broker since the value of collateral is changing constantly.
- b) If the percentage margin falls below this level then the broker makes a *margin call*. The investor must supply more cash or securities to bring the percentage margin up.
- c) To find the price that will generate a margin call set the percentage margin equal to the maintenance margin and solve for P.
- d) $(S * P - \text{Loan amount}) / S * P = \text{maintenance margin}$.

iv. Why trade on margins?

- a) Increases payoffs (both positive and negative)

Example: Upside only (This same affect occurs on the downside!)

No margin:

- Purchase 100 shares @ \$50.
- Sell 100 shares @ \$70 in 1 year.
- Profit = \$2000
- Return = $\$2000/\$5000 = 40\%$

Margin:

Purchase 200 shares @ \$50 by borrowing \$5000 at 9%.
 Interest = \$450.
 Sell 200 shares @ \$70 in 1 year.
 Profit = \$3550
 Return = $\$3550/\$5000 = 71\%!!!$

G. Short sales

- i. A contrarian strategy. - The market is bullish but investor is bearish.
- ii. The process:
 - a) Put 50% of short sale down as deposit (a margin) with a broker.
 - b) Borrow the stock from the broker and sell it.
 - c) Wait for the price to go down.
 - d) Close the position by buying the stock in the market and returning it to the broker along with any dividends that were paid during the time period.

Notes:

- (1) A short sale may only take place if the last recorded price was an uptick.
- (2) Proceeds from short sales must be kept on account with the broker.

Table: Characteristics of the primary financing sources for firms

Debt	Preferred stock	Common stock	Retained earnings
Firm must pay back money with interest.	Pays dividends limited to rate specified in agreement (like interest rate)	Money is raised by selling ownership rights	Lowers amount of money available for current dividends but can increase future dividends
Interest rate is based on risk of principal and interest payments as perceived by lenders.	Dividends: not legally required paid before common cumulative if passed for several years, may give voting rights	Investors determine value of stock.	Stockholders forego dividend income, but keep ownership rights
Amount of money to be repaid is specified by debt contract.	No maturity but usually callable.	Dividends are not legally required.	Funds are internal so no need for external involvement.
Lenders can take action to get money back.	Usually no voting rights.	Creates change in ownership.	Cost of issuing securities is avoided.
Lenders get preferred treatment in liquidation.	Dividends are not tax deductible.	Shareholders have voting rights.	
Interest payments are tax deductible.		Common dividends are not tax deductible.	

9. Pricing equity:

A. Balance sheet methods

i. **Book value method**

- a) $P_0 = (\text{net worth of firm on balance sheet}) / (\text{number of shares outstanding})$
- b) *Problem*: Book value is an arbitrary accounting number - has little to do with true value.

ii. **Liquidation value method**

- a) $P_0 = (\text{liquidation value of firm}) / (\text{number of shares outstanding})$
- b) Liquidation value is the amount of money allocated to each share of stock if the firm were broken up, sold off, and debt holders paid off.
- c) *Problem*: does not value assets such as human capital

iii. **Replacement cost method**

- a) $P_0 = (\text{replacement value of assets less liabilities}) / (\text{number of shares outstanding})$
- b) *Problem*: Difficult to calculate the replacement value of all assets

B. **Gordon Growth Model of asset prices**

- i. Also known as the *Firm foundation*, *Fundamental*, or *Rational expectations* model of stock prices

Price of any financial assets is the present value of the expected future cash flows.

C. A quick review of the *Time Value of Money*

- i. Money has time value: the sooner received, the better
 - a) Why?

ii. **Future Value**

Future Value (FV) = the amount an investment is worth after one or more periods
Single period $FV = PV(1 + k)$; k is the interest rate

- a) How much is \$100 worth after one year at 10%/year
 - $FV = \$100(1 + 0.10) = \110
 - Interest earned = \$10

Compounding: interest on interest
Multi-period $FV = PV(1 + k)^n$
 n = number of years

- b) How much is \$100 worth after three years at 10%/year
 - $FV = \$100 * (1 + 0.10) * (1 + 0.10) * (1 + 0.10)$
 - $FV = \$100 * (1 + 0.10)^3$
 - $FV = \$133.10$

- (1) So what can we do with this? Let the present value of an investment be $PV = \$400$ and the appropriate interest rate be $k = 12\%$.

How much will you have in 7 years?

After 7 years: $\$400 * 1.12^7 = \$400 * 2.207 = \$884.27$

How long will it take to double your money? Let n = number of years.

$FV = \$800 = \$400(1.12)^n$

$$2 = 1.12^n$$

$$\ln(2) = n(\ln(1.12))$$

$$.69 = n(.113)$$

$$6.13 = n$$

iii. Cute tricks: Rule of 72 and rule of 69: approximations for how long it takes to double your money.

$$72/(\text{interest rate in percent})$$

$$.35 + 69/(\text{interest rate in percent})$$

If the investment compounds m times per year (e.g. quarterly compounding $\Rightarrow m=4$) then the formula becomes

$$FV = PV(1 + k/m)^{nm}$$

iv. **Present value and Discounting: Key to pricing stock**

Present Value (PV) = The current value of future cash flows discounted at the appropriate discount rate. Instead of **compounding** the money forward into the future, we **discount** it back to the present.

$$PV = FV/(1+k)^n$$

k = *discount or market capitalization rate* (rate of return or return on investment)

a) Example: $FV = \$1000$, $k = 15\%$, $n = 3$ years

$$PV = 1000/(1+0.15)^3 = 1000/1.5209 = \$657.52$$

b) So what can we do with this?

(1) Evaluate an investment opportunity: Buy an asset for \$335 and sell it in three years for \$400. If the interest rate appropriate for the risks involved is 10%, is this a good investment or not?

(a) From a future value view if we invest at 10% we are not going to get paid a fair value for the investment. $\$335(1+0.10)^3 = \$445.89 > \$400$

(b) From a present value view, we are paying too high a price for the asset. $\$400/(1+0.10)^3 = \$300.53 < \$335$

(2) Find the rate of return (discount rate) = solving for k

(a) Invest \$1,250 and get \$1,350 in one year. What is your rate of return?

$$\$1250 = \$1350/(1+k)^1 \Rightarrow k = 8\%$$

(b) If you invest \$100 and want to double your money in eight years, what interest rate will you need to have.

$$\$100 = \$200/(1+k)^8$$

$$2 = (1+k)^8$$

$$2^{1/8} = (1+k)$$

$$1.09 = 1+k$$

$$k = 9\%$$

If the investment compounds m times per year (e.g. quarterly compounding $\Rightarrow m=4$) then the formula becomes

$$PV = FV/(1 + k/m)^{nm}$$

Note that as $m \rightarrow \infty$, $1/(1 + k/m)^{nm} \rightarrow e^{-kn}$
 This is known as *continuous discounting*.

10. Valuing Annuities

A. Annuity = a series of periodic payments or receipts of equal amounts. We will always assume payments or receipts are made at the end of a period.

i. FV and annuities

$$FV = A \left[\frac{(1+k)^n - 1}{k} \right]$$

ii. PV and annuities: *key to pricing bonds*

$$PV = A \left[\frac{1 - (1+k)^{-n}}{k} \right]$$

B. Present value and Stocks: Variable income securities

i. Since the market price of any security = PV of future cash flows then the price of a common stock should be the present value of the dividend stream.

$$\text{Price} = D_1/(1+k) + D_2/(1+k)^2 + \dots + (D_n + P_n)/(1+k)^n$$

The price of a stock is the present value of both the dividends and the price the stock is eventually sold at.

ii. The text calls this the *intrinsic value of the stock* found using the *discounted dividend model* (DDM)

iii. The problems with this model are glaring

- a) What is the correct k to use?
- b) What are D_1, \dots, D_n going to be?

iv. Three variants of the model.

No growth model: assume dividends are constant over time

$$\text{Price} = D / k$$

I.E. The Ave Copy Center pays \$10 per share every year. If the required return is $k=20\%$ then

$$P_0 = \$10 / .20 = \$50$$

The constant growth model: assume dividends grow at a constant rate “ g ”. This technique requires that we price an infinite stream of cash flows. Assuming that $g < k$, it is straightforward to derive a formula for constantly growing dividends.

$$P_t = D_{t+1} / (k - g)$$

I.E. Suppose the Ave Copy Center dividends are expected to grow at $g=15\%$ forever and a dividend of \$10 has just been paid. In general the dividend at any time t , can be found by $D_t = D_0(1+g)^t$, where D_0 is the dividend just paid.

$$D_0 = D_0(1+g)^0 = \$10(1.15)^0 = \$10 \text{ and}$$

$D_1 = D_0(1+g)^1 = \$10(1.15) = \11.5 and
 $D_2 = D_0(1+g)^2 = \$10(1.15)^2 = \13.25 and so on forever.
 But the present value of this stream of cash flows is

$$P_0 = D_1 / (k - g) = \$11.50 / (.20 - .15) = \$230 \text{ per share.}$$

Variable growth model: most realistic assumption

- a) Most firms follow a cyclical pattern as they evolve. Fast growth when young and slower growth as time goes on. Of course growth may be interrupted from time to time because of downturns in the economy or special problems in the firm or industry.
- b) In particular, it may be safe to assume that the firms' dividends grow at a high rate for a while and then at a lower rate forever.

Example:

First dividend = \$1.00 Required rate of return by investors is 12%		
Date	Growth rate during previous period	Dividend per share
0 (now)		\$1.00
1	40%	\$1.00(1.4) = \$1.40
2	40%	\$1.40(1.4) = \$1.96
3	40%	\$1.96(1.4) = \$2.74
4	8%	\$2.74(1.08) = \$2.96
5	8%	\$2.74(1.08) ² = \$3.20
6 and on	8%	

Notice that the dividends grow at two different constant rates, 40% and 8%. We can use the constant growth model for the 8% growth because once it hits 8% we expect constant growth from then on. The constant dividend of \$2.74 begins in period 3 so we can calculate the price in period two as

$$P_2 = D_3 / (k - g) = \$2.74 / (.12 - .08) = \$68.50$$

Now just value the first two dividends and the price two periods from now.

$$\begin{aligned}
 P_0 &= D_1 / (1 + k) + D_2 / (1 + k)^2 + P_2 / (1 + k)^2 \\
 P_0 &= \$1.40 / (1.12) + \$1.96 / (1.12)^2 + \$68.50 / (1.12)^2 \\
 P_0 &= \$1.25 + \$1.56 + \$54.61 \\
 P_0 &= \$57.42
 \end{aligned}$$

Back to The constant growth model: assuming dividends grow at a constant rate "g" is fine but where do we get g? Furthermore, where can we get our expected dividend? Here is a formula that has both of these questions answered.

$$P_0 = E_1(1-b) / [k - (ROE * b)]$$

The idea here is that we form our forecasts of future dividends based on forecasts of earnings (E) and plowback (b). Plowback is simply how much of earnings the

company is reinvesting. We determine the growth rate (g) by the return on equity times the plowback.

There is an obvious connection here with the P/E ratio (multiple) you hear so much about.

$$P_0/E_1 = (1-b)/[k-(ROE*b)] = (1-b)/(k-g)$$

So P/E goes up when ROE is up iff $ROE > k$ and P/E goes up when b goes up.

Alternatively, we can think of the price of a share of stock as the no growth value plus the pv of the future growth.

$$P_0 = E_1/k + PVGO$$

or

$$P/E = 1/k[1+PVGO/E/k]$$

So we can interpret P/E ratios as measures of future growth of the firm. High P/E ratios are associated with more growth opportunities.

11. Pricing Fixed Income Securities

- A. **Bonds:** an interest-only loan (principal is paid at maturity), an IOU.
 - i. Provides a fixed stream of cash payments to owner by the issuer at the time the security was issued.
 - ii. Types:
 - a) Corporations,
 - b) Governments,
 - c) Agencies,
 - d) Municipalities,
 - e) Individuals
- B. Attributes:
 - i. coupon = stated interest payments made on the bond
 - ii. face value (par value) = principal amount that is repaid at maturity
 - iii. coupon rate = annual coupon divided by the face value of a bond
 - iv. maturity = date at which the principal amount of a bond is paid
 - v. semi-annual interest payments
 - vi. YTM, market rate, discount rate, yield
- C. Bills: (zero's)
 - i. A bond with only one coupon payment occurring at maturity
- D. Note:
 - i. Bonds sell at a premium when the price > face or coupon > yield
 - ii. Bonds sell at a discount when the price < face or coupon < yield
 - iii. Bonds sell at par value when the price = face and coupon = yield
- E. Bonds vs mortgages: when is the principal paid?

12. Present Value and Bond Prices

- A. The ***market price of any security = PV of future cash flows.***

Price of a bond = PV of the coupons + PV of the face amount

- i. Assumptions used when pricing a bonds:

- a) Cash flows are certain (no risk) and there is only one interest rate that applies in the market today
- b) Bonds pay interest every six-months, divide the coupon and the market rate by 2 and double the number of payments

Examples:

Let the face value = \$1000 and the market interest rate = 6%

One-year bill (zero)

$$\text{Price} = \text{PV} = \$1000/(1+.06)^1 = \$943.40$$

Five-year note with a 7% coupon rate

$$\text{Annual Coupon} = \$1000 \cdot .07 = \$70$$

$$\text{Price} = \$35/(1+.03)^1 + \$35/(1+.03)^2 + \dots + \$1035/(1+.03)^{10}$$

$$\text{Price} = \text{PVA}(\$35, 3\%, 10 \text{ periods}) + \text{PV}(\$1000, 3\%, 10 \text{ periods})$$

$$\text{Price} = \$298.56 + \$744.09 = \$1042.65$$

Twenty-year bond with a 5% coupon rate

$$\text{Annual Coupon} = \$1000 \cdot .05 = \$50$$

$$\text{Price} = \$25[(1-(1+.03)^{-40})/.03] + \$1000[1/(1+.03)^{40}] = \$884.40$$

13. Yields

A. Yield to maturity (YTM)

YTM = The interest rate (k) that satisfies the pricing equation given the price of the bond.

Interpretation: *The return from purchasing the bond at the stated price and holding the bond to maturity.*

i. Price of a bond = PV of the coupons + PV of the face amount

$$\text{Price of a bond} = \sum_{t=1}^T \frac{\text{Coupon}}{(1+k)^t} + \frac{\text{Par value}}{(1+k)^T}$$

Example: Suppose the ask price of an 8% 30 year Treasury is \$1,276.76. The YTM is the rate that satisfies the following

$$\$1,276.76 = \sum_{t=1}^{60} \frac{\$40}{(1+k)^t} + \frac{\$1000}{(1+k)^{60}}$$

k = 3% per half a year.

k = 6% per year.

ii. YTM's are reported on annualized basis as an annual percentage rate (APR) or Bond Equivalent Rate.

B. APR = the number of periods per year times k

Interpretation: *The stated yield required by law*

C. Effective annual yield

- i. The problem with the APR is that it ignores the compounding that goes on within a year. This makes it confusing when trying to compare different assets with different compounding rates and maturities.

Effective annual yield = $(1 + (\text{APR}/m))^m - 1$
 where m is the number of compoundings per year.
 Interpretation: *A standardized yield to use when comparing assets with different compounding periods*

Effective annual yield = $(1.03)^2 - 1 = 0.0609$ or 6.1%

D. Ask vs. current yield

- i. Treasury securities post an “ask yield”
 - a) Ask yield is the yield to maturity based on the ask price.
 - b) Ask yield is quoted in the paper as the YTM for discount bonds and YTC for premium bonds

- ii. Corporate bonds post a “current yield”

Current yield = $(\text{annual coupon}/\text{current price}) * 100$
 Interpretation: *The annual interest income as a percent of the price of the bond*

- iii. For comparison, the current yield for the example bond is
 $\$80/\$1276.76 = .0627$ or 6.27%

E. Yield to call

YTC = YTM calculated using the time to call rather than the time to maturity

- a) The *ask yield* when the bond is selling at a premium

F. Realized compound yield

- i. This is essentially the YTM assuming that the coupons are reinvested at some interest rate.
- ii. Not very useful since future interest rates are uncertain.

G. Holding period return

Holding period return = $(FV - PV + CF)/PV$
 Interpretation: *return earned over a given period of time - this is what is typically thought of as “the rate of return”*

Example: Suppose an investor purchases a 8% bond selling at par, holds it for one year and then sells it for \$1050.

Holding period return = $(1050 - 1000 + 80)/1000 = 13\%$.

14. Three types of risk associated with fixed income securities:

- A. default,
- B. interest rate, and
- C. prepayment
 - i. Default risk: a form of cash flow risk: cash flows may not equal the cash flow the investor expected to receive.
 - a) Ratings system of Moody’s and S&P page 394.
 - ii. Prepayment risk

- a) Applies mainly to mortgages and CMO's
- b) Another kind of cash flow risk
- iii. Interest rate risk: the variability of interest rates
 - a) For a given bond, the interest rate risk depends on how sensitive its price is to interest rate changes.
 - b) Longer time to maturity means more risk
 - c) Lower coupon rate means more risk
 - d) A bond with the higher coupon has a larger cash flows early in its life, so its value is less sensitive to changes in the discount rate

Average rates of return on selected securities 1926-2002

Security	Average annual rate of return	Risk premium relative to Treasury bills
Large Stocks	11.44	7.71
Long-Term Corporate bonds	5.98	2.25
Gov't bonds	5.60	1.88
Gov't bills	3.73	0

Source: Stocks, Bonds, Bills and Inflation, 2003 Yearbook, Ibbotson Associates
 This table shows how investors are risk averse - they must be compensated for risk

15. Efficient market hypothesis: information spreads quickly in the market and is reflected immediately in security prices.

- A. What is the behavior of stock prices over time? What determines stock prices? How are expectations affected by information? Do investors with superior knowledge get better returns? Do insider traders get better returns? Can a dartboard really beat the Wall Street professionals?
- B. One idea of the EMH is that stock prices respond immediately to new information. How efficient the market is depends on how fast prices respond to news.
- C. Another aspect of the EMH is that if arbitrage opportunities are found they will disappear quickly.

16. The three forms of Market Efficiency

Weak form efficiency: implies that knowledge of the past price trends of stocks cannot be used to pick those stocks that will turn out, in the future, to generate extraordinarily high returns.

In English this implies that you can't use past prices to predict future prices.
 Why? Everyone knows about past price trends so the current price must already reflect the information used by investors in deciding what stocks are worth.

Semi-strong form efficiency: implies that even knowledge of ALL PUBLICLY available information will provide no advantage.

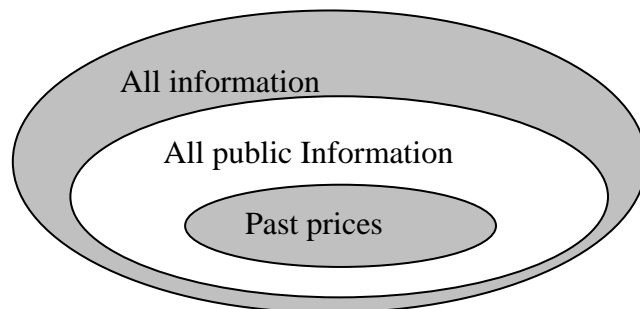
Since all public information is incorporated in the price only new information will affect the price. Also implies that new information will be incorporated into prices quickly.

Strong form efficiency: implies that ALL information is incorporated into the price.

Even insiders can't profit with the information they have. How can that be? There are two different kinds of "insiders": Legal and illegal insiders. Legal insiders are watched

closely by other market participants. Illegal insiders are a different story and this is where the strong form of the EMH fails.

I like to keep this picture in mind when trying to keep the different forms of efficiency straight.



A. Implications of these theories

- i. If you want to work as a security analyst or portfolio manager then you had better convince someone that markets are inefficient. In fact, why not fire all analysts? Marginal versus total value to society of security analysts.
- ii. Accounting manipulations will not fool the market. Changing depreciation methods or taking deferred charges will not affect the stock price.
- iii. No one should try to outsmart the market; on average you won't beat the market.
- iv. Mergers should not be done to provide diversification; investors can do that on their own.
- v. Things like stock repurchases or call options on corporate debt just don't make much sense.
- vi. Stock prices follow a random walk or are unpredictable so charting techniques are nothing but junk.
- vii. Statements like the "market is depressed" just don't make sense since the price of a stock is the present value of the best estimate of future cash flows made using all available information.

What is a random walk anyway?

17. Continuous time models of stock prices

A. Gaussian White Noise:

- i. Define ε_t as a draw from a normal distribution with mean = 0 and variance = σ^2 at time t.
- ii. A white noise process is a time-series of these ε 's, $\varepsilon_t, \varepsilon_{t+1}, \dots, \varepsilon_T$, where each time period the draw is independent from the previous draw.

B. Discrete time **Random Walk**: Simplest stochastic model of stock prices. The model is stochastic because of the randomly distributed epsilon term. (*Stochastic = random*)

$$P_{t+1} = P_t + \varepsilon_{t+1}$$

P_t = price of the stock at some time t

- i. In words, the model says that the price of a stock one period ahead is nothing more than what the price is today plus a random number drawn from a normal distribution.

- ii. It is important to note that the successive draws of epsilon are independent. That is, one draw does not influence another draw. Also, all the draws are from a $N(0, \sigma^2)$. These two statements are what the term iid means.
- iii. If $P_0 = 0$, then P_{t+1} is just the accumulation of a bunch of the noise terms.
 - a) The implication is that past information about the price of a stock will be of no value when it comes to trying to figure out what the price will be tomorrow, i.e. $E(P_{t+1}) = 0$.
 - b) Another way to think about this implication is to consider that all the information about the value of the stock is already incorporated into the stock price.
 - c) This is consistent with the idea of strong form market efficiency.

C. Now define the time between t and $t-1$ as Δt and consider a slightly different process.

$$P_{t+1} = P_t + \gamma_{t+1}$$

- i. This model has all the properties of the above model except that $\gamma \sim N(0, \Delta t)$
- ii. But $\gamma \sim N(0, \Delta t)$ is equivalent to $\varepsilon(\Delta t)^{1/2}$ when $\varepsilon \sim N(0, 1)$, so we could write

$$P_{t+1} = P_t + \varepsilon(\Delta t)^{1/2}$$

Or

$$\Delta P = \varepsilon(\Delta t)^{1/2}$$

- iii. This is a model of the *change* in the stock price and is known as *wiener* process.
- iv. This model says that the change in the stock price is distributed normally with the expected change in the stock price being 0 and the variance of the change in the stock price as Δt .

D. Now, let Δt go to dt .

- i. What that means is that we are letting the change in time become infinitesimally small, i.e. Δt is going to zero.
- ii. We are going to model the *instantaneous* change in the stock price.

$$dP = \varepsilon(dt)^{1/2}$$

The type of *continuous time* process is called a **Wiener process** and is a special type of Markov process.

- iii. Since $dP = P_{t+dt} - P_t$, the model suggests that instantaneous changes in stock prices are nothing but **white noise**.
- iv. The implication is the same as above. The price of a stock is simply the starting value of the stock plus the sum of all the white noise terms.

$$P_t = P_0 + \int_0^t dP_u$$

Problem: The big drawback with this model is that it allows for negative stock prices. Not a good thing.

E. **Geometric Brownian motion**

$$dP_t = \mu P_t dt + \sigma P_t dz$$

Here μ is the instantaneous expected rate of return

σ is the volatility of the stock price and

$dz = \varepsilon(dt)^{1/2} \sim N(0,dt)$ since $\varepsilon \sim N(0,1)$

- i. This model eliminates the problem of negative stock prices except in extreme circumstances.
- ii. Another nice aspect of this model is that we can use it to model returns too. Just divide both sides by P_t .

$$dP_t/P_t = \mu dt + \sigma dz$$

$dP_t/P_t =$ the holding period return.

- F. Using Geometric Brownian motion to price stocks.
 - i. All we need to forecast a stock price is to estimate the parameters of this model.
 - ii. We can estimate μ by the historical average price of the stock and σ by the historical standard deviation.

For example, suppose we have estimates of these parameters on an annual basis with continuous compounding as follows:

$$\mu = .12 \text{ and } \sigma = .25$$

We can approximate the dt term by some small interval of time, say Δt is one week. That means $\Delta t = 7/365 = .0192$

If the current price of the stock is \$100 then we have

$$dP_t = .12(100)(.0192) + .25(100)(.0192)^{1/2}\varepsilon$$

$$dP_t = .2304 + 3.46\varepsilon$$

All we need to do is use excel to generate a random number for ε from a normal distribution with mean zero and variance of one. Do this by going to the tools menu selecting data analysis then random number generation.

I did this and got $\varepsilon = -.8801$

That means the model predicts that

$$dP_t = .2304 + 3.46(-.8801)$$

$$dP_t = -2.84$$

Hence, the stock price will be $100 - 2.84 = 97.16$.

We could draw a whole bunch of epsilons and get an entire path for the stock price out into the future.

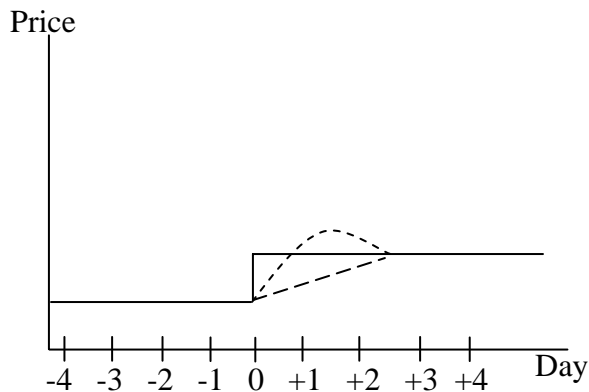
18. So what should an efficient market be like?
 - A. Security prices should respond quickly and accurately to the receipt of new information that is relevant to valuation.
 - B. The changes in expected security returns from the one period to the next should be related only to changes in the level of the risk-free rate and changes in the level of the risk premium associated with the security.

- C. It should be impossible, by examining the characteristics of current investments, to discriminate between profitable and unprofitable investments in the future. We are talking about economic profits here.
- D. There should not be a significant difference between the performance of the “average” and “informed” investors.

19. Event Studies

- A. So how can we measure how fast a stock price reacts to news?
 - i. If markets are efficient, stock prices should reflect any announcement about the firm quickly and correctly, i.e. there should be no lag or overreaction in the stock price.
 - ii. Financial economists use something called an event study to get at this information.

Suppose you follow the price of Widgets Inc. stock. Also suppose that Widgets Inc. has a CEO who was at one time very good but as he gets older is going a little crazy and is making some very unprofitable decisions for a company that would otherwise be making a bunch of money. Both management and other stockholders have been trying to get this guy to quit for a while so that the firm will start making some money again. Now suppose that the CEO gets run over on Wednesday. What do you think happens to the price of Widgets Inc. when the market finds out that Widgets Inc. will be getting a new CEO? It should go up!



We can plot the stock price for the days around the “event day” to see if the market is efficiently pricing this stock.

If the price of the stock moves along the solid line, then we could say that the market quickly and efficiently adjusted the price to reflect the new information.

If the market overreacts to the news and then readjusts the stock price would follow the humped shaped line around the event day. Overreaction is a sign of inefficient markets.

If the market is slow to react, then the price would gradually increase over several days until the price reflected the new information. Slow reaction to significant news is a sign of inefficient markets.

So how do real stocks react to news announcements?