

Stock Valuation

Stock characteristics

Stocks are the “other” major traded security (stocks & bonds). Options are another traded security but not as big as these two.

- Ownership

Stockholders are the owner of the corporation, they make the decisions.

- Voting rights

Stockholders have the right to vote on major matters affecting the firm. Must be a stockholder with an interest in the company (own a significant amount) such as 5%. Stockholders who do not have an “interest” in the firm (significant portion of ownership) are called “outside interest”.

- Preemptive right

Existing stockholders have the first right to purchase any new stock issued Applies to all types of stocks (common, preferred, etc.). Existing shareholders have the right to maintain their percentage of ownership if they choose when new stocks are issued.

Example: Say GE’s total capitalization in the stock market is 1,000,000 shares and I own 10,000 (1%). Now GE plans to issue more stock, another 100,000 shares. They are required to offer me, the stockholder, the opportunity to buy enough stock so that I maintain my percentage of ownership (my 1% holding).

- Dividends

Stockholders receive dividends, which may vary over time. Dividends are not constant, depends on earnings and dividend policy of the firm (retention ratio). Where Bonds promise fixed payments stocks only promise a dividend which changes from time to time.

- Residual claims

In bankruptcy, stockholders are the last to be paid. Stockholders are the residual claimants. Bondholders are always first to be paid and stockholders are the last to be paid (when a firm is in bankruptcy). However, stockholders stand to share in the gains of the firm depending on the amount of their holdings. Bondholders can only earn a fixed amount defined in the bond contract.

Bonds are called **FIXED INCOME SECURITIES**; Stocks are called **VARIABLE INCOME SECURITIES**.

Balance sheet valuation methods

- There are several **balance sheet** concepts that are directly related to firm value

- Book value

Summary of the firm's

- Liquidation value

Value if the firm's assets are sold

- Replacement cost

These 3 measures of value all neglect the value of intangible assets.

Example: similar firms but one has a good manager and one has a bad manager. The firm with the good manager is more likely to pay more dividends because it has made good investment decisions. But this value does not show up in the book value evaluation method.

Example: one firm has a top brand name. This can be a very good indicator.

Example: for two identical firms, firm A has a good NPVGO, firm B does not have this opportunity. This gives firm A an advantage. Manager will take the project and generate more earnings.

The intangible measures of a firm are not reflected in BOOK VALUE. Book Value is backwards looking.

All 3 of the above examples consider only assets which are in place, not investment opportunities.

Firms with good management have higher market value but may have only equal book value compared to another firm. The market value of the firm takes into account the intangible assets such as managers and NPVGO. Market Value is almost always higher than book value.

Liquidation is the value we would get if we stopped operation of the firm and sold off all of its assets. Liquidation takes into account many aspects but brand would not be one of them, we are selling off the assets piecemeal not selling the business to another party.

Replacement Cost: how much will a new startup firm have to spend to reach the position of the firm under consideration. Replacement cost does not take into account all of the intangible assets (such as brand and management).

Book Value Example:

Firm has \$10 Mil in assets, \$3 Mil in debt, \$7 Mil in equity. The book value of the equity is Assets – Debts = \$7 Mil. Now we can find the value of a single stock:

Stock Value = $\frac{\text{Equity}}{\text{\# Stocks Issued}}$. But this is not a good measure.

The market value of a firm will be higher than the firm's book value because market value takes into account intangible assets and investment opportunities. Book value takes neither of these into account.

Market-to-book ratio

Company	Share Price	Book Value Per Share	Market to Book Ratio
Microsoft	26.31	6.78	3.88
FedEx	79.91	29.71	2.69
GAP	18.52	4.94	3.75
Chevron	62.55	25.43	2.46
Ford	9.96	6.23	1.60

Example: for Microsoft the book value is \$6.78 per share. The market value (share price) is \$26.31, 3.88 times the book value. This says that intangible assets are as much as 3.8 times the tangible assets. Most of the value of Microsoft is coming from the intangible assets such as growth and investment opportunities.

Ford has a stock value of only 1.6 times its book value, most of its return comes from physical assets (which have less growth potential). Ford is a lower investment opportunity than Microsoft.

The reason for the difference between Microsoft and Ford's market to book ratio is apparent. Software comes from an intangible source (people's minds) while cars come from a physical source, machines.

High book value means most value comes from growth and investment opportunities. Value of firm is from future activity, not the assets in-place.

Note that both Ford and Microsoft have similar book value per share.

Stock price is forward looking, considers future value of firm. We still have the question of how to value stock but "looking forward" is a good direction to move in.

Balance sheet versus future cash flows

- Balance sheet values are generally **backward** looking
- Stock prices are **forward** looking
- Although balance sheet values give useful information about liquidation value or replacement cost, **analysts must look to future cash flows to estimate the value of the firm as a going concern.**

Present Value of all future cash flows is the value of the stock.

These payments include dividends and cash from the sale of the stock. To estimate the value of the stock we look at the future cash generated by the stock and find the present value of these payments.

The book value is not a good measure of the value of a firm. So the question is “how do we measure the value of the stock”?

Dividend discount models

- Stock investors receive cash flows from two sources:
 - **Cash dividends**
 - **Capital gains (stock price increase)**

Typical investor does not know when to sell their stock. If we do not know when we will sell our stock how can we estimate its value? We want to know (for our estimation of value) how many years to take it out (the stock sale date).

Dividend discount models

- Consider an investor who purchases a stock and holds it for one year
- Assuming the market price is equal to the present value of future cash flows, and the appropriate discount rate is r , the current market price is given by

If we plan to hold the stock for 1 year we can use this estimate. But this estimate is still based on the value at P_1 !

$$P_0 = \frac{D_1}{1+r} + \frac{P_1}{1+r}$$

- But where does P_1 come from?

Dividend discount models

- P_1 is the price that buyers are willing to pay for the stock at time 1
- Thus, P_1 must satisfy the following equation

If we plan to hold the stock for 2 years we can use this estimate. But this estimate is still based on the value at P_2 !

$$P_1 = \frac{D_2}{1+r} + \frac{P_2}{1+r}$$

- Substituting this value for P_1 in the previous equation yields

$$P_0 = \frac{D_1}{1+r} + \frac{D_2}{(1+r)^2} + \frac{P_2}{(1+r)^2}$$

Dividend discount models

- But, where does P_2 come from? Using the logic above recursively, we get

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

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

This takes the series out to infinity. Taking it out this way eliminates the “P” term from the calculation so the value is no longer dependent on the future sale price (or the future sale date) but only on the future dividend payments. So we have a method to value the stock based only on the dividend.

Typically firms must pay a dividend or the stock price will be zero. If the dividend payment is uncertain the discount rate should be higher. Even a company which is currently not paying a dividend will ultimately pay out, the wealth of the company will ultimately be paid out to the owners.

THE PRICE OF THE STOCK SHOULD BE A FUNCTION OF THE FUTURE DIVIDENDS.

Valuation of different types of stocks

- Case 1: **Zero growth**... Firm pays out same amount dividend forever (perpetuity). $D_1 = D_2 = D_3 = \dots$ Not a very realistic case, dividends usually grow.

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

$$= \frac{D_1}{1+r} + \frac{D_1}{(1+r)^2} + \frac{D_1}{(1+r)^3} + \dots$$

$$= \frac{D_1}{r}$$

Valuation of different types of stocks

- Case 2: **Constant growth** ... Grows at a constant rate forever, growing perpetuity. (Gordon model)

$$\begin{aligned}
 P_0 &= \frac{D_1}{1+r} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \dots \\
 &= \frac{D_1}{1+r} + \frac{D_1(1+g)}{(1+r)^2} + \frac{D_1(1+g)^2}{(1+r)^3} + \dots \\
 &= \frac{D_1}{r-g}
 \end{aligned}$$

Requires $r < g$ and growth starts in the second year. (see next page)

Example

- Chevron Corp will pay a dividend of \$3 per share one year from today. The dividend is expected to grow at 10% per year. What is the dividend per share in the next years?

Year	1	2	3	4	...
Dividend	\$3	\$3.3	\$3.63	\$3.99	...

This is the cash flow stream.

- Assume the discount rate for Chevron Corp is 15%.
What is the value of one share of Chevron Corp common stock?

$$P_0 = \frac{3}{.15-.1} = \frac{3}{.05} = \$60 \text{ Value of stock.}$$

- The constant growth model is very sensitive to the choice of growth rate

Example

- For example, suppose that the growth rate for Chevron Corp was estimated to be 12.5% instead of 10%. Then,

$$P_0 = \frac{3}{.15-.1} = \frac{3}{.125} = \$120 \text{ so a 2.5% increase doubles the price of the stock!}$$

Therefore, we **need a GOOD ESTIMATION of the growth rate.**

The Gordon Model

- The constant growth dividend discount model is usually called the **Gordon Dividend Discount Model** after Myron Gordon who popularized it

- In this model, P_0 grows to infinity as g approaches r
- P_0 is not defined for $g \geq r$

Gordon model only works when $r > g$. D is the dividend.

GROWTH MUST START IN THE SECOND YEAR

Valuation of different types of stocks

- Case 3: **Differential growth**

This is a valid model for any new company which has a lot of growth opportunity, it will begin by growing at a high rate (g1) but as the firm matures it will grow but at a more moderate rate. The model is often used for firms with a high initial growth rate followed by a lower long run growth rate. (Growth begins in the second period and has power of 1)

$$P_0 = \frac{D_1}{1+r} + \frac{D_1(1+g_1)}{(1+r)^2} + \frac{D_1(1+g_1)^2}{(1+r)^3} + \dots + \frac{D_1(1+g_1)^{T-1}}{(1+r)^T} + \frac{D_1(1+g_1)^{T-1}(1+g_2)}{(1+r)^{T+1}} + \frac{D_1(1+g_1)^{T-1}(1+g_2)^2}{(1+r)^{T+2}} + \dots$$

GROWING ANNUITY

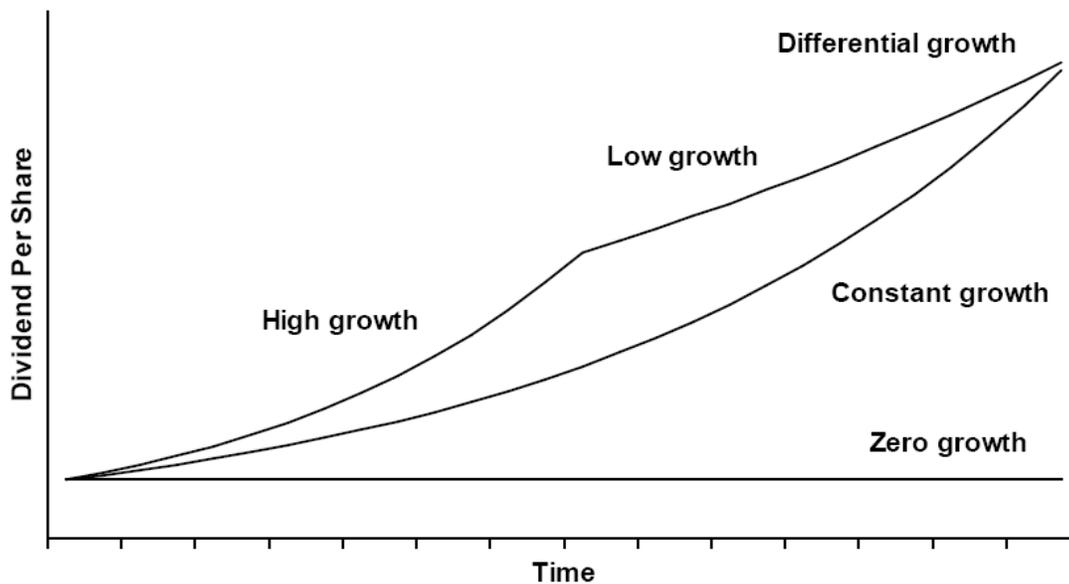
GROWING PERPETUITY

g2 < g1

Company pays a dividend which grows at constant rate g1 for T years (annuity) and then grows at rate g2 (<g1) in perpetuity.

Present Value for this on next page.

Zero, constant and differential dividend growth patterns



Constant growth is not linear due to effect of compounding.

Differential dividend growth model

- If dividends are expected to grow at the rate g_1 for years 2 through T , and at the rate g_2 for years $T+1$ forward, then P_0 is given by

$$P_0 = \sum_{t=1}^T \frac{D_1(1+g_1)^{t-1}}{(1+r)^t} + \frac{D_{T+1}}{(1+r)^T \frac{r-g_2}{r-g_2}}$$

$$= \frac{D_1}{r-g_1} \left(1 - \left(\frac{1+g_1}{1+r} \right)^T \right) + \frac{D_{T+1}}{(1+r)^T} \frac{r-g_2}{r-g_2}$$

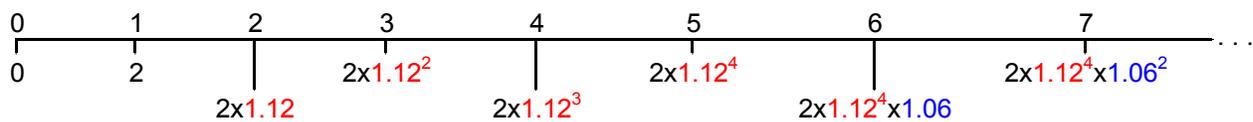
GROWING ANNUITY
GROWING PERPETUITY

First we have a growing annuity at rate g_1 for T years and then a growing perpetuity at rate g_2 . The growing perpetuity begins after $T+1$ years as opposed to after 1 years. This means we must bring it back to the present with $(1+r)^T$.

Example

- A company is enjoying rapid growth
- The dividend per share payable 1 year from today will be \$2.00
- In years 2 through 5, the dividend is expected to grow at 12% per year ($g_1 = 12\%$)
- After year 5, the dividend is expected to grow at 6% per year ($g_2 = 6\%$)
- The appropriate discount rate is 15% per year
- The value of a single stock is

Using the formula on the last page for growing annuity and perpetuity.



$$P_0 = \frac{2}{.15 - .12} \left[1 - \left(\frac{1.12}{1.15} \right)^5 \right] + \frac{2 \times 1.12^4 \times 1.06}{\frac{0.15 - 0.06}{1.15^5}} = 8.25 + 18.43 = \$26.68$$

5 because formula says growth begins in the second year.

Where does g come from?

$$\begin{array}{rcccl}
 \textit{Earnings} & & \textit{Earnings} & & \textit{Retained} & \textit{Return on} \\
 \textit{Next} & = & \textit{This} & + & \textit{Earnings} & \textit{Retained} \\
 \textit{Year} & & \textit{Year} & & \textit{This Year} & \textit{Earnings} \\
 & & & & \underbrace{\hspace{10em}} & \\
 & & & & \text{Increase in Earnings} &
 \end{array}$$

An accurate estimate of g is very important. Dividend comes from earnings and dividend grows when earnings grow. So when do earnings grow?

- The increase in earnings is a function of both retained earnings and the return on retained earnings

Example:

Firm has 5 machines. Each machine generates \$10 profit every year. Current year earnings is \$50. Now the firm upgrades machine #5 so that in the next year machine #5 will generate \$12. Now next years earnings are

$$10+10+10+10+12=\$52=\text{Current Earnings}+\text{Investment*Return} = 50+10*.2 =52.$$

This is an example of return on retained earnings. Here we realized a 20% return on machine #5 upgrade.

Where does g come from?

- Divide both sides of the equation on the previous page by Earnings this Year to get

$$\frac{\text{Earning Next Year}}{\text{Earnings This Year}} = 1 + \frac{\text{Retained Earnings This Year}}{\text{Earnings This Year}} \times \text{Return on Retained Earnings}$$

$\xrightarrow{1+g}$

$$\longrightarrow g = \text{Retention Ratio} \times \text{Return on Retained Earnings}$$

Example

- Acme Corp. reported earnings of \$2 million last year
- They plan to retain 40% of their earnings and their return on retained earnings is 16%
- How much will earnings grow over the coming year?
- First, let's do the calculation the long way:
 - Acme will retain \$800,000 = 2,000,000 * .4
 - The anticipated increase in earnings is 16% of 800,000 = 128,000
 - The percentage change in earnings is $g = \frac{128,000}{2,000,000} = 6.4\%$
- Next, let's verify the result using the growth rate formula:

g = retention ratio x return on retained earnings

$$g = 40\% * 16\% = 6.4\%$$



Stock prices and investment opportunities

The growth rate g is greatly effected by the investment opportunities the firm has. No investment opportunities means no investment means $g=0$! Many good investment opportunities along with a high retention ratio means g will be large.

- Consider 2 companies, Cash Cow (which has no growth opportunities) and Growth Prospects (lots of growth opportunities).
- Both expect earnings of \$5 per share and could pay a \$5 dividend in perpetuity
- If the discount rate for these firms was 12.5%, they both would be valued at

$$P_0 = \frac{5}{.125} = \$40 \text{ (perpetuity) for both companies.}$$

- Now suppose Growth Prospects has investment opportunities that generate a return on investment of 15% (higher than the cost of capital)
- Suppose Growth Prospects reduces its dividend payout ratio from 100% to 40% (i.e., it increases its earnings retention ratio from 0% to 60%)

DIVIDEND PAYOUT RATIO = 1 – RETENTION RATIO

This is a change in policy of the firm, every year from now on it will repeat the process. Thus **constant growth**.

- Dividends will fall from \$5 to \$2, but what will happen to the stock price?
(40%*\$5=\$2)

This is now a growing perpetuity, we need to calculate g .

$$g = \text{retention ratio} \times \text{return on retained earnings} = .60 \times .15 = .09$$

$$P_0(\text{GP}) = \frac{D_1}{r - g} = \frac{2}{.125 - .09} = \frac{2}{.035} = \$57.14$$

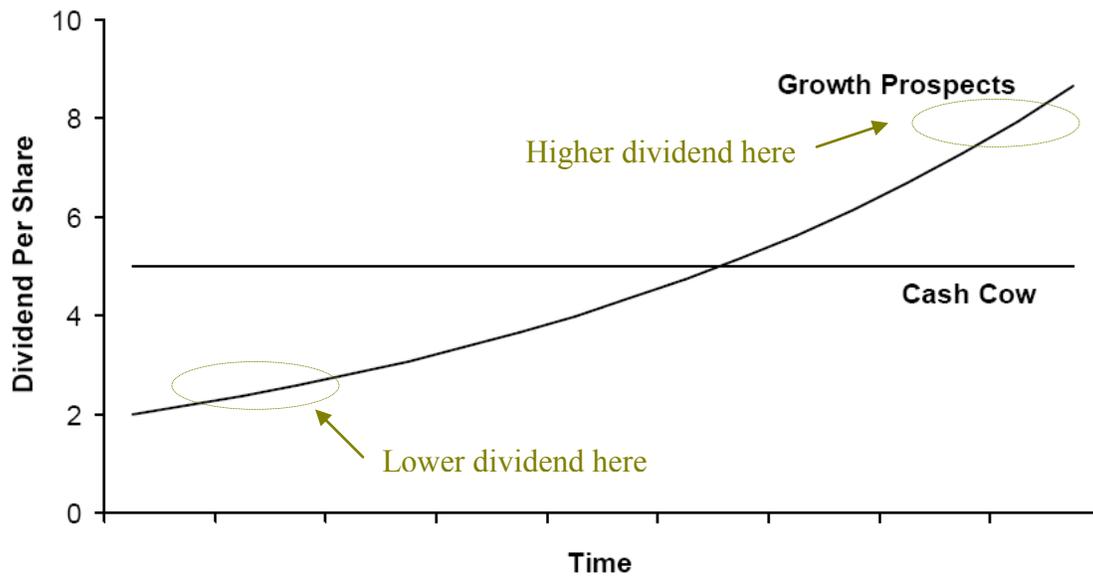
So this P_0 is the new price of the stock for as long as the reinvestment policy continues. The stock price has gone up while the dividend has gone down.

Stock prices and investment opportunities

- Growth Prospects dividend growth rate will be given by

$$g = \text{retention ratio} \times \text{return on retained earnings}$$

and its stock price will rise to (plot of result from last page):



- When Growth Prospects pursued a no-growth policy, its value was \$40. When it reduced dividends and plowed money back into the company, its high growth rate increased firm value

- The difference between the no-growth price of **\$40** and the actual price of **\$57.14** is attributable to the **value of Growth Prospects' investment opportunities**

Growth Prospects:

$$\begin{aligned} \text{PV Growth Opportunities} &= \text{PV with Growth Oppor.} - \text{PV no growth Oppor.} \\ &= \$57.14 - \$40 = \$17.14 \end{aligned}$$

Could also calculate this difference using the PV of a similar firm which does not pursue growth opportunities.

In General:

Stock Price = value of the Stock assuming No Growth (value of the assets in place) + Present Value of the growth opportunities

In this example:

$$\text{Stock Price} = 40 + 17.14 = \$57.14$$

Firm exercises good investment opportunities and the stock price goes up.

Stock prices and investment opportunities

- We can think of

share price = no-growth value + the present value of the investment opportunities

(PVGO: Present Value of Growth Opportunities)

$$P_0 = \text{no-growth value} + \text{PVGO}$$

$$= \frac{E_1}{r} + \text{PVGO}$$


$$P_0 (\text{no growth}) = \frac{5}{.125} = \frac{D}{r}$$

In this example $P_0 = \$40 + \$17.14 = \$57.14$

(\$17.14 is the amount of growth from the project, the amount over and above the \$40 they would have otherwise made.)

Stock prices and investment opportunities

- Suppose Cash Cow also cut its dividend (thinking that the market values growth), but its return on investment is only 10% (less than cost of capital which is 12.5% in this example) (they are investing in a project which does not return the cost of capital).

- What will happen to Cash Cow's stock price?

$$g = .6 \times .1 = 6\% \qquad P_0 = \frac{D_1}{r-g} = \frac{2}{.125-.06} = 30.77 < 40 !$$

REJECT

Return on Investment (ROI) < Cost of Capital, money cost more to borrow than the project can generate! Good managers would not invest in a project to earn 10% at a cost of 12.5%. Return must be higher than cost.

- Cash Cow's dividend growth rate will be given by

$$g = \text{retention ratio} \times \text{return on retained earnings}$$

Cash Cow should reject their project and Growth Prospect should take their project. Assumption in market is that only good projects are taken.

- And Cash Cow's stock price will be

$$P_0(\text{GP}) = \$57.14$$

$$P_0(\text{Cash Cow}) = \$40 \text{ (they will reject)}$$

Market assumes rational managers, only good investment opportunities will be taken.

The market values grow only if the firm can generate a return higher than its cost of capital

Price-Earnings ratio

Firms which generate more earnings generally will have a higher stock price. However, it does not mean that the P-E ratio is constant for all firms, if it were the case it would be very easy to estimate the price of the firm. The P-E ratio varies from firm to firm and is very much effected by the firms investment opportunities.

- Much real-world discussion of stock market valuation concentrates on the price-earnings ratio or price-earnings multiple – the ratio of price per share divided by earnings per share

$$\text{P-E multiple} = \frac{\text{price per share}}{\text{earnings per share}} \quad (\text{earnings, not the same as dividend})$$

P-E Ratio varies between firms and opportunities. From the previous example:

$$\text{Growth Prospects: P-E} = \frac{57.14}{5} = \$11.4 \quad \text{Cash Cow: P-E} = \frac{40}{5} = \$8$$

Value from investment opportunities



- If somehow you knew the appropriate P-E multiple for a company, you could estimate its value simply by multiplying your estimate of earnings by the P-E Multiple

P-E is an indication of growth opportunities. The firm with more growth opportunities will have higher P-E ratio.

- But where do the P-E multiples come from?

- Both Cash Cow and Growth Prospects had expected earnings of \$5 in year 1

- But, because of their different investment opportunities, their prices were \$40 and \$57.14 respectively

- Thus, Cash Cow had a price-earnings multiple of 8, and Growth Prospects had a price-earnings multiple of 11.4

Price-Earnings ratio

- We said earlier that

$$P_0 = \frac{E_1}{r} + PVGO$$

- Which implies that

$$\frac{P_0}{E_1} = \frac{1}{r} \left(1 + \frac{PVGO}{E_1/r} \right)$$

P_0/E_1 grows as a function of $PVGO/(E_1/r)$. Basically proportional to the magnitude of $PVGO$.

- The ratio

$$\frac{PVGO}{E_1/r}$$

has a natural interpretation

- It is the ratio of a firm's present value of investment opportunities to the value of its assets in place

Will be higher if the firm has more growth opportunities. If $PVGO = 0$ the ratio is 0 (like Cash Cow). The higher $PVGO$ is the higher the P-E ratio is.

Price-Earnings ratio

Company	Share Price	Earnings Per Share	P-E Ratio
Microsoft	26.31	1.12	23.41
FedEx	79.91	4.72	16.93
GAP	18.52	1.29	14.38
Chevron	62.55	6.18	10.12
Ford	9.96	1.29	7.73

These are the same firms as the earlier slide.

Again we see that Ford has low investment opportunities and Microsoft has very high investment opportunities.

The high P-E ratio of Microsoft means it has a LOT of investment opportunity.

A new high tech company may be in a situation where it doesn't have much earnings but it is expected to grow tremendously. So the price of the stock will be very high (based on the growth expectations) but the earnings will be very low. So $\frac{\text{Price}}{\text{Earnings}}$ will be very high. Compared to a firm in steady-state with large earnings, the price is higher but not as much (such as Ford above at 7.73). We see in the above table that Ford has much lower investment opportunities than Microsoft.

The price reflects the growth of earnings, in dividends. High price means the earnings will grow.

Stock market reporting

52 WEEKS				YLD		VOL				NET
HI	LO	STOCKSYM	DIV	%	PE	100s	HI	LO	CLOSE	CHG
52.75	19.06	Gap Inc GPS	0.09	0.5	15	65172	20.50	19	19.25	-1.75

Gap has been as high as \$52.75 in the last year.

Gap pays a dividend of 9 cents/share
Given the current price, the dividend yield is 1/2 %

Gap has been as low as \$19.06 in the last year.

Given the current price, the PE ratio is 15 times earnings

Gap ended trading at \$19.25, down \$1.75 from yesterday's close

6,517,200 shares traded hands in the last day's trading

Practice questions

- 5.15
- 5.17
- 5.21
- 5.24
- 5.25