CHAPTER 7

Stock Valuation

INSTRUCTOR'S RESOURCES

Overview

This chapter continues on the valuation process introduced in Chapter 6 for bonds. Models for valuing preferred and common stock are presented. For common stock, the zero growth, constant growth, and variable growth models are examined. The relationship between stock valuation and efficient markets is presented. The role of venture capitalists and investment bankers is also discussed. The free cash flow model is explained and compared with the dividend discount models. Other approaches to common stock valuation and their shortcomings are explained. The chapter ends with a discussion of the interrelationship between financial decisions, expected return, risk, and a firm's value.

PMF DISK

PMF Tutor: **Stock Valuation**

This module provides problems for the valuation of the constant growth and variable growth models for common stock valuation.

PMF Problem-Solver**: Stock Valuation**

This module's routines are Common Stock Valuation.

PMF Templates

Spreadsheet templates are provided for the following problem:

Problem	Topic
Problem 7-6	Common stock valuation–Zero growth

Study Guide

Suggested *Study Guide* examples for classroom presentation:

Example	Topic
1	Constant growth rate model
4	Mixed growth rates

ANSWERS TO REVIEW QUESTIONS

7-1 *Equity capital* is permanent capital representing ownership, while *debt capital* represents a loan that must be repaid at some future date. The holders of equity capital receive a claim on the income and assets of the firm that is secondary to the claims of the firm's creditors. Suppliers of debt must receive all interest owed prior to any distribution to equity holders, and in liquidation all unpaid debts must be satisfied prior to any distribution to the firm's owners. Equity capital is perpetual while debt has a specified maturity date. Both income from debt (interest) and income from equity (dividends) are taxed as ordinary income. To the corporation, debt interest is a tax deductible expense while dividends are not.

7-2 Common stockholders are the true owners of the firm, since they invest in the firm only upon the expectation of future returns. They are not guaranteed any return, but merely get what is left over after all the other claims have been satisfied. Since the common stockholders receive only what is left over after all other claims are satisfied, they are placed in a quite uncertain or risky position with respect to returns on invested capital. As a result of this risky position, they expect to be compensated in terms of both dividends and capital gains of sufficient quantity to justify the risk they take.

7-3 Rights offerings protect against *dilution of ownership* by allowing existing stockholders to purchase additional shares of any new stock issues. Without this protection current shareholders may have their voting power reduced. *Rights* are financial instruments issued to current stockholders that permit these stockholders to purchase additional shares at a price below the market price, in direct proportion to their number of owned shares.

7-4

- *Authorized shares* are stated in the company's corporate charter which specifies the maximum number of shares the firm can sell without receiving approval from the shareholders.

- When authorized shares are sold to the public and are in the hands of the public, they are called *outstanding shares*.

- When a firm purchases back its own shares from the public, they are classified as *treasury stock.* Treasury stock is not considered outstanding since it is not in the hands of the public.

- *Issued shares* are the shares of common stock that have been put into circulation. Issued shares include both outstanding shares and treasury stock.

7-5 Issuing stock outside of their home markets can benefit corporations by broadening the investor base and also allowing them to become better integrated into the local business scene. A local stock listing both increases local press coverage and serves as effective corporate advertising. Locally traded stock can also be used to make corporate acquisitions.

ADRs are claims issued by U.S. banks and represent ownership of shares of a foreign company's stock held on deposit by the U.S. bank in the foreign market. ADRs are issued in dollars by an American bank to U.S. investors and are subject to U.S. securities laws; yet still give investors the opportunity to internationally diversify their portfolios.

7-6 The claims of preferred stockholders are senior to those of the common stockholders with respect to the distribution of both earnings and assets.

7-7 *Cumulative preferred stock* gives the holder the right to receive any dividends in arrears prior to the payment of dividends to common stockholders.

The *call feature* in a preferred stock issue allows the issuer to retire outstanding preferred stock within a certain period of time at a prespecified price. This feature is not usually exercisable until a few years after issuance. The call normally takes place at a price above the initial issuance price and may decrease according to a predefined schedule. The call feature allows the issuer to escape the fixed payment commitment of the preferred stock which would remain on the books indefinitely. The call feature is also needed in order to force conversion of convertible preferred stock.

7-8 *Venture capitalists* are typically business entities that are organized for the purpose of investing in attractive growth companies. *Angel capitalists* are generally wealthy individuals that provide private financing to new businesses. Firms usually obtain angel financing first, then as their funding needs get too large for individual investors they seek funds from venture capitalists.

7-9 There are four bodies into which institutional venture capitalists are most commonly organized.

- *Small business investment companies (SBICs)* are corporations chartered by the federal government.
- *Financial VC funds* are subsidiaries of financial institutions, particularly banks.
- *Corporate VC funds* are firms, sometimes subsidiaries, established by non financial firms.
- *VC limited partnerships* are limited partnerships organized by professional VC firms, who serve as general partner.

Venture capitalist investments are made under a legal contract that clearly allocates responsibilities and ownership interest between existing owners and the VC fund or limited partnership. The specific financial terms will depend on factors such as: the business structure, stage of development, and outlook. Although each VC investment is unique, the transaction will be structured to provide the VC with a high rate of return that is consistent with the typically high risk of such transactions.

7-10 The general steps that a private firm must go through to public via an *initial public offering* are listed below.

- The firm must obtain the approval of its current shareholders.
- The company's auditors and lawyers must certify that all documents for the company are legitimate.
- The firm then finds an investment bank willing to underwrite the offering.
- A registration statement must then be filed with the Securities Exchange Commission.
- Once the registration statement is approved by the SEC the investment public can begin analyzing the company's prospects.

7-11 The *investment banker's* main activity is to underwrite the issue. In addition to underwriting the IB provides the issuer with advice about pricing and other important aspects of the issue.

The IB may organize an *underwriting syndicate* to help underwrite the issue and thus to share part of the risk. The IB and the syndicate will put together a *selling group* who share the responsibility of selling a portion of the issue.

7-12 The first item in a stock quotation is the year-to-date return. The next items are the highest and lowest price the stock traded for during the past 52 weeks, the company name, the company ticker symbol, the annualized dividend based on the last dividend paid, the dividend yield, the price/earnings ratio, the number of round lots traded for the trading day, the close (last) trade price for the day, and the change in the close price from the previous trading day.

The P/E ratio is calculated by dividing the closing market price by the firm's most recent annual earnings per share. The P/E is believed to reflect investor expectations concerning the firm's future prospects – higher P/E ratios reflect investor optimism and confidence; lower P/E ratios reflect investor pessimism and concern.

7-13 The *efficient market hypothesis* says that in an efficient market, investors would buy an asset if the expected return exceeds the current return, thereby increasing its price (market value) and decreasing the expected return, until expected and required returns are equal.

7-14 According to the efficient market hypothesis:

a. Securities prices are in equilibrium (fairly priced with expected returns equal to required returns);

b. Securities prices fully reflect all public information available and will react quickly to new information; and

c. Investors should therefore not waste time searching for mispriced (over- or undervalued) securities.

The efficient market hypothesis is generally accepted as being reasonable for securities traded on major exchanges; this is supported by research on the subject.

7-15 **a.** The *zero growth model* of common stock valuation assumes a constant, no growing dividend stream. The stock is valued as a perpetuity and discounted at a rate k_s:

$$P_0 = \frac{P_0}{k_s}$$

b. The *constant growth model* of common stock valuation, also called the Gordon model, assumes that dividends will grow at a constant rate, g. The stock is valued as the present value of the constantly growing cash flow stream:

$$P_0 = \frac{D_1}{k_s - g}$$

c. The *variable growth model* of common stock valuation assumes that dividends grow at a variable rate. The stock with a single shift in the growth rate is valued as the present value of the dividend stream during the initial growth phase plus the present value of the price of stock at the end of the initial growth phase:

$$P_0 = \sum_{t=1}^{N} \frac{D_0 \times (1+g_1)^t}{(1+k_s)^t} + \left(\frac{1}{(1+k_s)^N} \times \frac{D_{N+1}}{(k_s - g_2)} \right)$$

7-16 The *free cash flow valuation model* takes the present value of all future free cash flows. Since this present value represents the total value of the firm the value of debt and preferred stock must be subtracted to get the free cash flow available to stockholders. Dividing the resulting value by the number of shares outstanding arrives at the stock price.

The free cash flow model differs from the dividend valuation model in 2 main ways.

1. The total cash flows of the company are evaluated, not just dividends.

2. The firm's cost of capital is used as the discount rate, not the required return on stock.

7-17 **a.** *Book value* is the value of the stock in the event all assets are liquidated for their book value and the proceeds remaining after paying all liabilities are divided among the common stockholders.

b. *Liquidation value* is the actual amount each common stockholder would expect to receive if the firm's assets are sold, creditors and preferred stockholders are paid, and any remaining money is divided among the common stockholders.

c. *Price earnings multiples* are another way to estimate common stock value. The share value is estimated by multiplying expected earnings per share by the average price/earnings ratio for the industry.

Both the book value and liquidation value approaches ignore the earning power of a firm's assets and lack a relationship to the firm's value in the marketplace. The price/earnings multiples approach is considered the best approach to valuation since it considers expected earnings. The P/E ratio also has the strongest theoretical roots. One divided by the P/E ratio can be viewed as the rate at which investors discount the firm's earnings. If the projected earnings per share is assumed to be earned indefinitely, the P/E multiple approach can be looked on as a method of finding the present value of a perpetuity of projected EPS at a rate equal to the P/E ratio.

7-18 A decision or action by the financial manager can have an effect on the risk and expected return of the stock, both of which are part of the stock valuation model.

7-19 CAPM: $k_s = R_F + [b_j \times (k_m - R_F)]$ and $b_j > 1.00$:

a. As beta (risk) increases, required return increases and stock price falls.

b. As the risk-free rate declines, the required return would also decline. Substituting k_s into the Gordon model $P_o = D_1 \div (k_s - g)$, as k_s declines, P_o increases.

c. As D_1 decreases, the P_o also decreases since the numerator in the dividend valuation models will decline.

d. As g increases, the P_o also increases. In the Gordon growth model the value of (k-g) in the denominator will become smaller resulting in a higher value.

SOLUTIONS TO PROBLEMS

7-1 LG 2: Authorized and Available Shares

a. Maximum shares available for sale

Authorized shares	2,000,000
Less: Shares outstanding	1,400,000
Available shares	600,000

b. $$\text{Total shares needed} = \frac{\$48{,}000{,}000}{\$60} = 800{,}000 \text{ shares}$$

The firm requires an additional 200,000 authorized shares to raise the necessary funds at $60 per share.

c. Aspin must amend its corporate charter to authorize the issuance of additional shares.

7-2 LG 2: Preferred Dividends

a. $8.80 per year or $2.20 per quarter

b. $2.20 For a no cumulative preferred only the latest dividend has to be paid before dividends can be paid on common stock.

c. $8.80 For cumulative preferred all dividends in arrears must be paid before dividends can be paid on common stock. In this case the board must pay the 3 dividends missed plus the current dividend.

7-3 Preferred Dividends

A	$15.00	2 quarters in arrears plus the latest quarter
B	$8.80	only the latest quarter
C	$11.00	only the latest quarter
D	$25.50	4 quarters in arrears plus the latest quarter
E	$8.10	only the latest quarter

7-4 LG 2: Convertible Preferred Stock

a. Conversion value = conversion ratio x stock price = 5 x $20 = $100

b. Based on comparison of the preferred stock price versus the conversion value the investor should convert. If converted, the investor has $100 of value versus only $96 if she keeps ownership of the preferred stock.

c. If the investor converts to common stock she will begin receiving $1.00 per share per year of dividends. Conversion will generate $5.00 per year of total dividends. If the investor keeps the preferred they will receive $10.00 per year of dividends. This additional $5.00 per year in dividends may cause the investor to keep the preferred until forced to convert through use of the call feature.

7-5 LG 2: Stock Quotation

a. Wednesday, December 13

b. $81.75

c. +3.2%

d. P/E ratio = 23

The P/E is calculated by dividing the closing market price by the firm's most recent annual earnings per share. The P/E is believed to reflect investor expectations concerning the firm's future prospects. Higher (lower) P/E ratios reflect investor optimism (pessimism) and confidence (concern).

e. $81.75

f. $1.32

g. Highest price = $84.13; Lowest price = $51.25

h. 12,432 round lots for total shares of 12,432 x 100 = 1,243,200 shares.

i. The price increased by $1.63. This increase tells us that the previous close was $80.12.

7-6 LG 4: Common Stock Valuation–Zero Growth: $P_o = D_1 \div k_s$

a. $P_o = \$2.40 \div .12$
$P_o = \$20$

b. $P_o = \$2.40 \div .20$
$P_o = \$12$

c. As perceived risk increases, the required rate of return also increases, causing the stock price to fall.

7-7 LG 4: Common Stock Valuation–Zero Growth

$$\text{Value of stock when purchased} = \frac{\$5.00}{.16} = \$31.25$$

$$\text{Value of stock when sold} = \frac{\$5.00}{.12} = \$41.67$$

Sally's capital gain is $10.42 ($41.67 - $31.25).

7-8 LG 4: Preferred Stock Valuation: $PS_o = D_p \div k_p$

a. $PS_0 = \$6.40 \div .093$
$PS_0 = \$68.82$

b. $PS_0 = \$6.40 \div .105$
$PS_0 = \$60.95$

The investor would lose $7.87 per share ($68.82 - $60.95) because, as the required rate of return on preferred stock issues increases above the 9.3% return she receives, the value of her stock declines.

7-9 LG 4: Common Stock Value–Constant Growth: $P_o = D_1 \div (k_s - g)$

Firm	$P_o = D_1 \div (k_s - g)$		Share Price
A	$P_o = \$1.20 \div (.13 - .08)$	=	$ 24.00
B	$P_o = \$4.00 \div (.15 - .05)$	=	$ 40.00
C	$P_o = \$ .65 \div (.14 - .10)$	=	$ 16.25
D	$P_o = \$6.00 \div (.09 - .08)$	=	$600.00
E	$P_o = \$2.25 \div (.20 - .08)$	=	$ 18.75

7-10 LG 4: Common Stock Value–Constant Growth

a.

$$k_s = \frac{D_1}{P_0} + g$$

$$k_s = \frac{\$1.20 \times (1.05)}{\$28} + .05$$

$$k_s = \frac{\$1.26}{\$28} + .05 = .045 + .05 = .095 = 9.5\%$$

b.

$$k_s = \frac{\$1.20 \times (1.10)}{\$28} + .10$$

$$k_s = \frac{\$1.32}{\$28} + .10 = .047 + .10 = .147 = 14.7\%$$

7-11 LG 4: Common Stock Value–Constant Growth: $P_o = D_1 \div (k_s - g)$

Computation of growth rate:

FV = PV x $(1 + k)^n$
\$2.87 = \$2.25 x $(1 + k)^5$
\$2.87 ÷ \$2.25 = $FVIF_{k\%,5}$
1.276 = $FVIF_{k\%,5}$
g = k at 5%

a. Value at 13% required rate of return:

$$P_0 = \frac{\$3.02}{.13 - .05} = \$37.75$$

b. Value at 10% required rate of return:

$$P_0 = \frac{\$3.02}{.10 - .05} = \$60.40$$

c. As risk increases, the required rate of return increases, causing the share price to fall.

7-12 LG 4: Common Stock Value - Variable Growth:

P_0 = Present value of dividends during initial growth period
+ present value of price of stock at end of growth period.

Steps 1 and 2: Value of cash dividends and present value of annual dividends

t	D_0	$FVIF_{25\%,t}$	D_t	$PVIF_{15\%,t}$	Present Value of Dividends
1	\$2.55	1.250	\$3.19	.870	\$2.78
2	2.55	1.562	3.98	.756	3.01

3	2.55	1.953	4.98	.658	3.28
					$9.07

Step 3: Present value of price of stock at end of initial growth period

D_{3+1} = \$4.98 x (1 + .10)
D_4 = \$5.48

P_3 = $[D_4 \div (k_s - g_2)]$
P_3 = \$5.48 ÷ (.15 -.10)
P_3 = \$109.60

PV of stock at end of year 3 = P_3 x ($PVIF_{15\%,3}$)
PV = \$109.60 x (.658)
PV = \$72.12

Step 4: Sum of present value of dividends during initial growth period and present value price of stock at end of growth period

P_0 = \$9.07 + \$72.12
P_0 = \$81.19

7-13 LG 4: Common Stock Value–Variable Growth

$$P_0 = \sum_{t=1}^{N} \frac{D_0 \times (1+g_1)^t}{(1+k_s)^t} + \frac{1}{(1+k_s)^N} \times \frac{D_{N+1}}{(k_s - g_2)}$$

P_0 = Present value of dividends during initial growth period + present value of price of stock at end of growth period.

Steps 1 and 2: Value of cash dividends and present value of annual dividends

D_1 = \$3.40 x (1.00) = \$3.40
D_2 = \$3.40 x (1.05) = \$3.57
D_3 = \$3.57 x (1.05) = \$3.75
D_4 = \$3.75 x (1.15) = \$4.31
D_5 = \$4.31 x (1.10) = \$4.74

t	D_t	$PVIF_{14\%,t}$	Present Value of Dividends
1	\$3.40	.877	\$2.98
2	3.57	.769	2.75
3	3.75	.675	2.53
4	4.31	.592	2.55
			\$10.81

Step 3: Present value of price of stock at end of initial growth period

P_4 = $[D_5 \div (k_s - g)]$

P_4 = \$4.74 ÷ (.14 -.10)
P_4 = \$118.50

PV of stock at end of year 4 = P_4 x ($PVIF_{14\%,4}$)
PV = \$118.50 x (.592)
PV = \$70.15

Step 4: Sum of present value of dividends during initial growth period and present value price of stock at end of growth period

P_o = \$10.81 + \$70.15
P_o = \$80.96

7-14 LG 4: Common Stock Value–Variable growth

a.

t	D_0	$FVIF_{8\%,t}$	D_t	$PVIF_{11\%,t}$	Present Value of Dividends
1	\$1.80	1.080	\$1.94	.901	\$ 1.75
2	1.80	1.166	2.10	.812	1.71
3	1.80	1.260	2.27	.731	1.66
					\$ 5.12

$D_4 = D_3(1.05)$ = \$2.27 x (1.05) = \$2.38

P_3 = [$D_4 \div (k_s - g)$]
P_3 = \$2.38 ÷ (.11 -.05)
P_3 = \$39.67

PV of stock at end of year 3 = P_3 x ($PVIF_{11\%,3}$)
PV = \$39.67 x (.731)
PV = \$29.00

P_0 = \$29.00 + \$5.12 = \$34.12

b. The present value of the first 3 year's dividends is the same as in part a.

$D_4 = D_3(1.0)$ = 2.27

P_3 = [$D_4 \div (k_s - g)$]
P_3 = \$2.27 ÷ .11
P_3 = \$20.64

PV of stock at end of year 3 = P_3 x ($PVIF_{11\%,3}$)
PV = \$20.64 x (.731)
PV = \$15.09

$P_0 = \$15.09 + \$5.12 = \$20.21$

c. The present value of the first 3 year's dividends is the same as in part a.

$D_4 = D_3(1.10) = 2.50$

$P_3 = [D_4 \div (k_s - g)]$
$P_3 = \$2.50 \div (.11 - .10)$
$P_3 = \$250.00$

PV of stock at end of year 3 = P_3 x ($PVIF_{11\%,3}$)
PV = \$250.00 x (.731)
PV = \$182.75

$P_0 = \$182.75 + \$5.12 = \$187.87$

7-15 LG 4: Common Stock Value–All Growth Models

a. $P_0 = (CF_0 \div k)$
$P_0 = \$42,500 \div .18$
$P_0 = \$236,111$

b. $P_0 = (CF_1 \div (k - g))$
$P_0 = (\$45,475^* \div (.18 - .07)$
$P_0 = \$413,409.10$

* $CF_1 = \$42,500(1.07) = \$45,475$

c. **Steps 1 and 2: Value of cash dividends and present value of annual dividends**

t	D_0	$FVIF_{12\%,t}$	D_t	$PVIF_{18\%,t}$	Present Value of Dividends
1	\$42,500	1.120	\$47,600	.847	\$40,317.20
2	\$42,500	1.254	53,295	.718	38,265.81
					\$78,583.01

Step 3: Present value of price of stock at end of initial growth period

$D_{2+1} = \$53,295 \text{ x } (1 + .07)$
$D_3 = \$57,025.65$

$P_2 = [D_3 \div (k_s - g)]$
$P_2 = \$57,025.65 \div (.18 - .07)$
$P_2 = \$518,415$

PV of stock at end of year 2 = P_2 x ($PVIF_{18\%,2}$)
PV = \$518,415 x (.718)
PV = \$372,222

Step 4: Sum of present value of dividends during initial growth period and present value price of stock at end of growth period

P_0 = \$78,583 + \$372,222
P_0 = \$450,805

7-16 LG 5: Free Cash Flow Valuation

a. The value of the total firm is accomplished in three steps.

(1) Calculate the present value of FCF from 2009 to infinity.

$$FCF = \frac{\$390,000(1.03)}{.11-.03} = \frac{\$401,700}{.08} = \$5,021,250$$

(2) Add the present value of the cash flow obtained in (1) to the cash flow for 2008.

FCF_{2008} = \$5,021,250 + 390,000 = \$5,411,250

(3) Find the present value of the cash flows for 2004 through 2008.

Year	FCF	$PVIF_{11\%,n}$	PV
2004	\$200,000	.901	\$180,200
2005	250,000	.812	203,000
2006	310,000	.731	226,610
2007	350,000	.659	230,650
2008	5,411,250	.593	3,208,871
	Value of entire company, V_c =		\$4,049,331

b. Calculate the value of the common stock.

$V_S = V_C - V_D - V_P$
V_S = \$4,049,331 - \$1,500,000 - \$400,000 = \$2,191,331

c.

$$\text{Value per share} = \frac{\$2,191,331}{200,000} = \$10.96$$

7-17 LG 5: Using the Free Cash Flow Valuation Model to Price an IPO

a. The value of the firm's common stock is accomplished in four steps.

(1) Calculate the present value of FCF from 2008 to infinity.

$$FCF = \frac{\$1{,}100{,}000(1.02)}{.08 - .02} = \frac{\$1{,}122{,}000}{.06} = \$18{,}700{,}000$$

(2) Add the present value of the cash flow obtained in (1) to the cash flow for 2007.

$FCF_{2007} = \$18{,}700{,}000 + 1{,}100{,}000 = \$19{,}800{,}000$

(3) Find the present value of the cash flows for 2004 through 2007.

Year	FCF	$PVIF_{\%,n}$	PV
2004	\$700,000	.926	\$648,200
2005	800,000	.857	685,600
2006	950,000	.794	754,300
2007	19,800,000	.735	14,533,000
	Value of entire company, V_c =		\$16,621,100

(4) Calculate the value of the common stock using equation 7.8.

$V_S = V_C - V_D - V_P$
$V_S = \$16{,}621{,}100 - \$2{,}700{,}000 - \$1{,}000{,}000 = \$12{,}921{,}100$

$$\text{Value per share} = \frac{\$12{,}921{,}100}{1{,}100{,}000} = \$11.75$$

b. Based on this analysis the IPO price of the stock is over valued by \$0.75 (\$12.50 - \$11.75) and you should not buy the stock.

c. The value of the firm's common stock is accomplished in four steps.

(1) Calculate the present value of FCF from 2008 to infinity.

$$FCF = \frac{\$1{,}100{,}000(1.03)}{.08 - .03} = \frac{\$1{,}133{,}000}{.05} = \$22{,}660{,}000$$

(2) Add the present value of the cash flow obtained in (1) to the cash flow for 2007.

$FCF_{2007} = \$22{,}660{,}000 + 1{,}100{,}000 = \$23{,}760{,}000$

(3) Find the present value of the cash flows for 2004 through 2007.

Year	FCF	$PVIF_{\%,n}$	PV
2004	\$700,000	.926	\$648,200
2005	800,000	.857	685,600
2006	950,000	.794	754,300
2007	23,760,000	.735	17,463,000
	Value of entire company, V_c =		\$19,551,700

(4) Calculate the value of the common stock using equation 7.8.

$V_S = V_C - V_D - V_P$
$V_S = \$19{,}551{,}700 - \$2{,}700{,}000 - \$1{,}000{,}000 = \$15{,}851{,}700$

$$\text{Value per share} = \frac{\$15{,}851{,}700}{1{,}100{,}000} = \$14.41$$

If the growth rate is changed to 3% the IPO price of the stock is under valued by $1.91 ($14.41 - $12.50) and you should buy the stock.

7-18 LG 5: Book and Liquidation Value

a. Book value per share:

$$\frac{\text{Book value of assets - (liabilities + preferred stock at book value)}}{\text{Number of shares outstanding}}$$

$$\text{Book value per share} = \frac{\$780{,}000 - \$420{,}000}{10{,}000} = \$36 \text{ per share}$$

b. Liquidation value:

Cash	$ 40,000	Liquidation value of assets	722,000
Marketable Securities	60,000	Less: Current Liabilities	(160,000)
Accounts Rec.		Long-term debt	(180,000)
(.90 x $120,000)	108,000	Preferred Stock	(80,000)
Inventory		Available for CS	$ 302,000
(.90 x $160,000)	144,000		
Land and Buildings			
(1.30 x $150,000)	195,000		
Machinery & Equip.			
(.70 x $250,000)	175,000		
Liq. Value of Assets	$722,000		

$$\text{Liquidation value per share} = \frac{\text{Liquidation Value of Assets}}{\text{Number of Shares Outstanding}}$$

$$\text{Liquidation value per share} = \frac{\$302{,}000}{10{,}000} = \$30.20 \text{ per share}$$

c. Liquidation value is below book value per share and represents the minimum value for the firm. It is possible for liquidation value to be greater than book value if assets are undervalued. Generally, they are overvalued on a book value basis, as is the case here.

7-19 LG 5: Valuation with Price/Earnings Multiples

Firm	EPS x P/E	=	Stock Price
A	3.0 x (6.2)	=	$18.60
B	4.5 x (10.0)	=	$45.00
C	1.8 x (12.6)	=	$22.68
D	2.4 x (8.9)	=	$21.36
E	5.1 x (15.0)	=	$76.50

7-20 LG 6: Management Action and Stock Value: $P_o = D_1 \div (k_s - g)$

a. $P_o = \$3.15 \div (.15 - .05) = \$31.50$
b. $P_o = \$3.18 \div (.14 - .06) = \$39.75$
c. $P_o = \$3.21 \div (.17 - .07) = \$32.10$
d. $P_o = \$3.12 \div (.16 - .04) = \$26.00$
e. $P_o = \$3.24 \div (.17 - .08) = \$36.00$

The best alternative in terms of maximizing share price is b.

7-21 LG 4, 6: Integrative–Valuation and CAPM Formulas

$P_0 = D_1 \div (k_s - g)$ $\qquad$ $ks = R_F + [b \times (k_m - R_F)]$
$\$50 = \$3.00 \div (k_s - .09)$ $\qquad$ $.15 = .07 + [b \times (.10 - .07)]$
$k_s = .15$ $\qquad$ $b = 2.67$

7-22 LG 4: 6: Integrative–Risk and Valuation

a. $k_s = R_F + [b \times (k_m - R_F)]$
$k_s = .10 + [1.20 \times (.14 - .10)]$
$k_s = .148$

b. g: $FV = PV \times (1 + k)^n$
$\$2.45 = \$1.73 \times (1 + k)^6$
$\frac{\$2.45}{\$1.73} = FVIF_{k\%,6}$
$1.416 = FVIF_{6\%,6}$
g = approximately 6%

$P_o = D_1 \div (k_s - g)$
$P_o = \$2.60 \div (.148 - .06)$
$P_o = \$29.55$

c. A decrease in beta would decrease the required rate of return, which in turn would increase the price of the stock.

7-23 LG 4, 6: Integrative–Valuation and CAPM

a. g: $FV = PV \times (1 + k)^n$
$\$3.44 = \$2.45 \times (1 + k)^5$
$\$3.44 = \$2.45 \times (1 + k)^5$
$\$3.44 \div \$2.45 = FVIF_{k\%,5}$
$1.404 = FVIF_{7\%,5}$
$k =$ approximately 7%

$k_s = .09 + [1.25 \times (.13 - .09)]$
$k_s = .14$

$D_1 = (\$3.44 \times 1.07) = \$3.68$

$P_0 = \$3.68 \div (.14 - .07)$
$P_0 = \$52.57$ per share

b. **(1)** $k_s = .09 + [1.25 \times (.13 - .09)]$

$D_1 = \$3.61$ ($\$3.44 \times 1.05$)

$P_0 = \$3.61 \div (.14 - .05)$
$P_0 = \$40.11$ per share

(2) $k_s = .09 + [1.00 \times (.13 - .09)]$
$k_s = .13$

$D_1 = \$3.68$

$P_0 = \$3.68 \div (.13 - .07)$
$P_0 = \$61.33$ per share

The CAPM supplies an estimate of the required rate of return for common stock. The resulting price per share is a result of the interaction of the risk free rate, the risk level of the security, and the required rate of return on the market. For Craft, the lowering of the dividend growth rate reduced future cash flows resulting in a reduction in share price. The decrease in the beta reflected a reduction in risk leading to an increase in share price.

CHAPTER 7 CASE
Assessing the Impact of Suarez Manufacturing's Proposed Risky Investment on Its Stock Values

This case demonstrates how a risky investment can affect a firm's value. First, students must calculate the current value of Suarez's stock, rework the calculations assuming that the firm makes the risky investment, and then draw some conclusions about the value of the firm in this situation. In addition to gaining experience in valuation of stock, students will see the relationship between risk and valuation.

a. Current per share value of common stock

Growth rate of dividends:

g can be solved for by using the geometric growth equation as shown below in (1) or by finding the PVIF for the growth as shown in (2).

(1)

$$g = \sqrt[4]{\frac{1.90}{1.30}} = (1.46154)^{1/4} - 1 = 1.0995 - 1 = .0995 = 10.0\%$$

(2)

$$g = \frac{1.30}{1.90} = .6842$$

PV factor for 4 years closest to .6842 is 10% (.683).

Use the constant growth rate model to calculate the value of the firm's common stock.

$$P_0 = \frac{D_1}{k_s - g} = \frac{\$1.90(1.10)}{.14 - .10} = \frac{\$2.09}{.04} = \$52.25$$

b. Value of common stock if risky investment is made:

$$P_0 = \frac{D_1}{k_s - g} = \frac{\$1.90(1.13)}{.16 - .13} = \frac{\$2.15}{.03} = \$71.67$$

The higher growth rate associated with undertaking the investment increases the market value of the stock.

c. The firm should undertake the proposed project. The price per share increases by $19.42 (from $52.25 to $71.67). Although risk increased and increased the required return, the higher dividend growth offsets this higher risk resulting in a net increase in value.

d. D_{2004} = 2.15 (stated in case)
D_{2005} = 2.15 (1 + .13) = 2.43
D_{2006} = 2.43 (1 + .13) = 2.75
D_{2007} = 2.75 (1 + .10) = 3.11

$$P_{2006} = \frac{D_{2007}}{k_s - g} = \frac{\$3.11}{.16 - .10} = \frac{\$3.11}{.06} = \$51.83$$

Year	Cash Flow	$PVIF_{16\%,n}$		PV
2004	2.15	.862		$ 1.85
2005	2.43	.743		1.81
2006	2.75 + 51.83	.641		34.99
			P_0 =	$38.65

Now the firm should not undertake the proposed project. The price per share decreases by $13.60 (from $52.25 to $38.65). Now the increase in risk and increased the required return is not offset by the increase in cash flows. The longer term of the growth is an important factor in this decision.

INTEGRATIVE CASE 2
ENCORE INTERNATIONAL

This case focuses on the valuation of a firm. The student explores various methods of valuation, including the price/earnings multiple, book value, no growth, constant growth, and variable growth models. Risk and return are integrated into the case with the addition of the security market line and the capital asset pricing model. The student is asked to compare stock values generated by various models, discuss the differences, and select the one which best represents the true value of the firm.

a. $$\text{Book value per share} = \frac{\$60{,}000{,}000}{2{,}500{,}000} = \$24$$

b. $$\text{P / E ratio} = \frac{\$40}{\$6.25} = 6.4$$

c. **(1)** $k_s = R_F + [b_j \times (k_m - R_F)]$
$k_s = 6\% + [1.10 \times (14\% - 6\%)]$
$k_s = 6\% + 8.8\%$
$k_s = 14.8\%$

Required return = 14.8%
Risk premium = 8.8%

(2) $k_s = 6\% + [1.25 \times (14\% - 6\%)]$
$k_s = 6\% + 10\%$
$k_s = 16\%$

Required return = 16%
Risk premium = 10%

(3) As beta rises, the risk premium and required return also rise.

d. **Zero growth:** $$P_0 = \frac{D_1}{k_s}$$

$$P_0 = \frac{\$4.00}{.16} = \$25$$

e. **(1)** **Constant growth:** $$P_0 = \frac{D_1}{(k_s - g)}$$

$$P_0 = \frac{(\$4.00 \times 1.06)}{(.16 - .06)} = \frac{\$4.24}{.10} = \$42.40$$

(2) Variable Growth Model: Present Value of Dividends

$$P_0 = \sum_{t=1}^{n} \left(\frac{D_0 \times (1+g_1)t}{(1+k_s)t} \right) + \left[\frac{1}{(1+k_s)^N} \times \frac{D_{N+1}}{(k_s - g_2)} \right]$$

P_o = Present value of dividends during initial growth period + present value of price of stock at end of growth period.

Steps 1 and 2: Value of cash dividends and present value of annual dividends

Year	t	D_0	$FVIF_{8\%,t}$	D_t	$PVIF_{16\%,t}$	Present Value of Dividends
2004	1	\$4.00	1.080	\$4.32	.862	\$3.72
2005	2	\$4.00	1.166	4.66	.743	3.46
						\$7.18

Step 3: Present value of price of stock at end of initial growth period

D_{2003} = \$4.66 x (1 +.06) = \$4.94

P_{2005} = $[D_{2006} \div (k_s - g_2)]$
P_{2005} = \$4.94 ÷ (.16 - .06)
P_{2005} = \$49.40

PV of stock at end of year 2 (2005)
PV = P_2 x ($PVIF_{16\%,2yrs.}$)
PV = \$49.40 x (.743)
PV = \$36.70

Step 4: Sum of present value of dividends during initial growth period and present value price of stock at end of growth period

P_{2003} = \$7.18 + \$36.70
P_{2003} = \$43.88

f.

Valuation Method	Per Share
Market value	\$40.00
Book value	24.00
Zero growth	25.00
Constant growth	42.40
Variable growth	43.88

The book value has no relevance to the true value of the firm. Of the remaining methods, the most conservative estimate of value is given by the zero growth model. Wary analysts may advise paying no more

than $25 per share, yet this is hardly more than book value. The most optimistic prediction, the variable growth model, results in a value of $43.88, which is not far from the market value. The market is obviously not as cautious about Encore International's future as the analysts.

Note also the P/E and required return confirm one another. The inverse of the P/E is 1 ÷ 6.4, or .156. This is also a measure of required return to the investor. Therefore, the inverse of the P/E (15.6%) and 16% for the CAPM required return are quite close. The question may be asked of the students, "Is the market predicting the beta to rise from 1.10 to 1.25 as reflected in the P/E and the CAPM required return comparison?"