

Chapter 24

24-1

- a. Reinvestment Rate = $g/ROC = 5\%/10\% = 50\%$
 b. Firm Value = $100 (1.05)(1-.5)/(.10-.05) = \1050.00
 c. Value of Firm = $100/.10 = \$1,000.00$

24-2

- a. Reinvestment Rate = $5/15 = 33.3\%$
 b. Value of Firm = $100 (1.05)(1-.3333)/(.10-.05) = \$1,400.00$

24-3

- Expected Growth rate next year = Reinvestment rate * ROC = $0.5 * .01 = 5\%$
 Expected FCFF next year = $100 (1.05) (1-.5) = \$52.20$

24-4

- Net Income/(1-t) = EBT
 Earnings before interest and taxes = $50/.5 + 150 = \$250$; tax rate of 50%.
 Net Cap Ex = $200 - 100 = \$100.00$
 FCFF = $250 (1-.5) - 100 = \$25.00$
 Value of Firm = $25 (1.04)/(.11 - .04) = \371.43

24-5

- Unlevered beta of other networking software firms with cash = 1.20
 Unlevered beta corrected for cash = $1.20/(1-.10) = 1.33$
 Levered Beta for Netsoft's operating assets = $1.33 (1 + (1-.4) (15/85)) = 1.47$
 Cost of Equity for Netsoft = $6\% + 1.47 (5.5\%) = 14.09\%$
 Cost of Capital for Netsoft = $14.09\% (.85) + 10\% (1-.4) (.15) = 12.88\%$

- Value of Operating Assets = $200 * 1.04 / (.1288 - .04) = \$2,342.34$
 Value of Cash = $\$250.00$
 Value of Firm = $\$2,592.34$

24-6

- a. FCFF next year = $5 (1.20) - (4 - 2) (1.20) - (12 - 10) = \1.60

b.

Year	EBIT(1-t)	Cap Ex	Depreciation	WC	Chg in WC	FCFF	PV
1	\$ 6.00	\$ 4.80	\$ 2.40	\$ 12.00	\$ 2.00	\$ 1.60	\$ 1.43
2	\$ 7.20	\$ 5.76	\$ 2.88	\$ 14.40	\$ 2.40	\$ 1.92	\$ 1.53
3	\$ 8.64	\$ 6.91	\$ 3.46	\$ 17.28	\$ 2.88	\$ 2.30	\$ 1.64
4	\$ 10.37	\$ 8.29	\$ 4.15	\$ 20.74	\$ 3.46	\$ 2.76	\$ 1.76
5	\$ 12.44	\$ 9.95	\$ 4.98	\$ 24.88	\$ 4.15	\$ 3.32	\$ 1.88
6	\$ 13.06	\$ 6.53	\$ 5.23	\$ 26.13	\$ 1.24	\$ 10.51	

- c. Terminal value = $10.51 / (.10 - .05) = \$ 210.26$

d. Value of Operating Assets = PV of cash flows over next 5 years + PV of terminal value = $(1.43+1.53+1.64+1.76+1.88)+210.26/(1.12^5) = \127.55

24-7

a. Value of Equity = Value of operating assets + cash and non-operating assets - debt = $127.55 + 10 - 15 = \$122.55$

b. Value per share = $122.55/5 = \$ 24.51$

c. Value of common stock = Value of Equity - Value of options = $122.55 - 7 = \$115.55$
Value per share = $115.55/5 = \$23.11$

24-8

a. From the information given, we can work out the following information:

Gross Profit	2483.125
Depreciation	960
EBIT	1523.125
Interest	320
EBT	1203.125
Taxes	433.125
Net Income	770

Hence Free Cash Flow to the Firm = $EBIT(1-\text{tax rate}) + \text{Depreciation} - \text{Capital Expenditures} - \text{Change in Working Capital} = 1523.125(1-0.36) + 960 - 1200 = \734.8m.

b. Reinvestment rate = $(1200 - 960)/(1523.125(1-.36)) = 24.62\%$

Return on Capital = $1523.125(1-0.36)/(4000+5000) = 10.83\%$

Expected Growth Rate = $(.2462) (.1083) = 2.67\%$

The required rate of return on equity = $7\% + 1.05(5.5\%) = 12.775\%$; the cost of debt after-tax = $8\%(1-0.36) = 5.12$; the WACC = $(4/16)(5.12) + (12/16)(12.775) = 10.86\%$.

Value of firm (assuming perpetual growth) = $734.8 (1.0267)/ (.1086-.0267) = \$ 9211$ million

c. Value of Equity = Value of Firm – Debt value = $\$9211 - \$3800 = \$ 6411$ million

Value of Equity per share = $\$ 6411 \text{ million} / 200 = \$ 32.06$

24-9

a., b. From the information given, we can compute the following:

	1993	1994	1995	1996	1997	1998	1999
Revenues	13500	14782.50	16186.84	17724.59	19408.42	21252.22	22102.31
EBITDA	1290	1412.55	1546.74	1693.68	1854.58	2030.77	2223.69
Interest	215	215.00	215.00	215.00	215.00	215.00	
Depreciation	400	438.00	479.61	525.17	575.06	629.70	689.52
Cap. Exp	450	492.75	539.56	590.82	646.95	708.41	689.52
Working Capital	945	1034.78	1133.08	1240.72	1358.59	1487.66	1547.16
FCFF		440.21	482.02	527.82	577.96	632.87	861.00
PV(FCFF)		402.50	440.74	482.61	528.46	578.66	

$$\text{FCFF} = (\text{EBITDA} - \text{Depreciation})(1-t) - (\text{Cap Ex} - \text{Depreciation}) - \text{Chg in WC}$$

The WACC in 1993 can be computed as 9.37%, using the cost of equity of 13.05% based on the current beta of 1.1.

Given the current beta and the current D/E ratio of 3200/3968, the unlevered beta = 0.74.

If we assume that the operations of the firm do not change until after 1988, we can infer that the WACC for the firm is constant until 1998. After 1998, the stock beta changes to $0.74(1+(1-0.4)0.5) = 0.964$ implying a cost of equity of 12.3% for 1999 and beyond.

This in turn can be used to compute a WACC of 8.4%.

We can discount the FCFF to the firm from 1994 to 1998 at the WACC of 9.37%, and thereafter at the rate of 8.4%. This yields a $\text{PV}(\text{FCFF upto 1998}) = 2432.98\text{m.}$, and a $\text{PV}(\text{FCFF after 1998}) = 13073.26\text{m.}$, or a firm value of 15,506.24m. The implied equity value, therefore, is $15,506.24 - 3200 = 12,306.24$, for a per-share price of \$198.49.

The shares are grossly underpriced.

24-10

a. The after tax cost of debt is $7.5(1-0.4) = 4.5\%$, while the cost of equity = $7 + 1.15(0.55) = 13.325\%$. Using a debt ratio of 20%, we find that the cost of capital for the health division = $(.2)(4.5) + (0.8)13.325 = 11.56\%$

b.

	1993	1994	1995	1996	1997	1998	1999
Revenues	5285	5787.08	6336.85	6938.85	7598.04	8319.85	8652.65
Depreciation	350	364.00	378.56	393.70	409.45	425.83	442.86
EBIT	560	593.60	629.22	666.97	706.99	749.41	779.38
Cap. Exp	420	436.80	454.27	472.44	491.34	510.99	531.43
FCFF		283.36	301.82	321.44	342.30	364.48	379.06
PV(FCFF)		254.00	270.54	288.13	306.83	326.71	

PV(FCFF until 1998) = 1446.22
PV(FCFF after 1998) = 2901.61938
Firm Value at the end of 1993 = 4347.84

24-11

Unlevered Beta (using last 5 years) = $0.9 / (1 + (1 - .4)(.2)) = 0.80$
Unlevered Beta of Non-cash assets = $0.80 / (1 - .15) = 0.94$

Levered Beta for Non-cash assets = $0.94 (1 + 0.6(.5)) = 1.222$
Cost of Equity for Non-cash Assets = $6\% + 1.22(5.5\%) = 12.71\%$
Cost of Capital for Non-cash Assets = $12.71\%(.667) + .07*.6*(.333) = 9.88\%$

Estimated FCFF next year from non-cash assets = $(450 - 50)(1 - .4)(1.05) - 90 = 162$
Estimated Value of Non-cash Assets = $162 / (.0988 - .05) = \$ 3,320$
Cash Balance = \$500
Estimated Value of the Firm = \$ 3,820
Less Value of Debt Outstanding of \$800
= Value of Equity = \$3,020

24-12

First, solve for the cost of capital used by the analyst

$$750 = 30 / (r - g)$$

$$g = 5\%$$

$$r = 9\%$$

Cost of equity = 12%; Cost of debt = 6%

$$12\% (1 - X) + 6\% X = 9\%$$

X = 0.50 : So book value weight for debt was 50%

Correct weights should be 75% equity, 25% debt

$$\text{Cost of capital} = 12\%(.75) + 6\% (.25) = 0.105$$

$$\text{Correct firm value} = 30 / (.105 - .05) = \$545.45$$

24-13

Adjusted pre-tax operating income = \$ 10 million - \$ 1.5 million = \$8.50

Adjusted after-tax operating income = \$ 8.5 million (1 - .40) = \$5.10

$$\text{Firm Value} = 5.1(1.05) / (.09 - .05) = \$133.88$$

Illiquidity Discount = $.30 - .04 (\ln(100)) = 11.58\%$

$$\text{Firm Value after Illiquidity Discount} = 133.88 (1 - .1158) = \$118.37$$

24-14

a. Payout ratio = $(1.06 / 2.40) = 44.17\%$

$$g = 6\%$$

$$r = 7\% + 1.05 (5.5\%) = 12.775\%$$

$$PE = (.4417) (1.06) / (.12775 - .06) = 6.91$$

b. The actual P/E ratio is 10.

$$PE = (.4417) (1 + g) / (.12775 - g)$$

Solving for g ,
 Implied Growth Rate = 8%

24-15

- a. The average P/E ratio = 13.2, while the median P/E ratio = 12.25, which is the average of the 7th ranking and 8th ranking firm's P/E ratios. The fact that the mean and the median are relatively close to each other means that there is no appreciable skewness: there are no great extreme values. We can, therefore, interpret either number as a means of the market's valuation of earnings
- b. This would be true if Thiokol's riskiness were equal or less than that of the industry, on average. Another reason for Thiokol to have a lower P/E ratio even with no underpricing is if it were a low growth stock, say, because of a high payout ratio.
- c. Using the estimated PEG ratio, it would seem that Thiokol is overvalued, since the average PEG ratio works out to 1.53, while Thiokol's PEG ratio is 2.08. Using the PEG ratio however assumes that value is proportional to growth.
- d. These kinds of differences can be controlled for using the regression approach. Using this approach, the second to last column gives us the estimated P/E ratios based on the payout ratio, risk and growth. The last column, which represents the difference between the actual P/E ratio and the estimated P/E ratio gives us an estimate of relative under- or over-valuation. Positive values imply overvaluation, while negative values imply undervaluation:

Company	Actual P/E	Expected Growth	Beta	Payout	Estimated P/E ratio	Difference	Estimated PEG ratio
Thiokol	8.7	5.5	0.95	15	11.44	-2.74	2.08
Northrop	9.5	9	1.05	47	14.82	-5.32	1.64667
Lockheed Corp.	10.2	9.5	0.85	37	12.31	-2.11	1.29579
United Industrial	10.4	4.5	0.7	50	9.11	1.29	2.02444
Martin Marietta	11	8	0.85	22	11.34	-0.34	1.4175
Grumman	11.4	10.5	0.8	37	12.07	-0.67	1.14952
Raytheon	12.1	9.5	0.75	28	10.85	1.25	1.14211
Logicon	12.4	14	0.85	11	13.17	-0.77	0.94071
Loral Corporation	13.3	16.5	0.75	23	13.21	0.09	0.80061
Rockwell	13.9	11.5	1	38	14.85	-0.95	1.2913
General Dynamics	15.5	11.5	1.25	40	17.90	-2.40	1.55652
GM- Hughes	16.5	13	0.85	41	13.68	2.82	1.05231
Boeing	17.3	3.5	1.1	28	12.90	4.40	3.68571
McDonnell Doug.	22.6	13	1.15	37	17.15	5.45	1.31923

24-16

- a. The current payout ratio = $2/4 = 0.5$. Assume that this ratio will be kept constant. The return on equity = $4/40 = 10\%$. If we use the Gordon growth model, the price is

estimated at $2(1.06)/(.11675-.06) = \$37.36$. The price/book value ratio = $37.36/40 = 0.934$.

b. The actual share price is \$60. We can use this to solve for the value of g in the equation $60 = 2(1+g)/(.11675-g)$. Solving, we find $g = 8\%$. If $g = 8\%$, then we need a Return on Equity, such that $.08 = .5(\text{Return on Equity})$; i.e. the required Return on Equity = 16%. This approach focuses on the price element in the price/book value ratio, since book value is an accounting quantity and is not necessarily directly related to market pricing.

24-17

a. The average Price/Book Value ratio = 1.66. I wouldn't necessarily use this ratio to price the new issue because of the heterogeneity amongst these firms. In particular, even though most of the firms have zero payout ratios like our firm, nevertheless, some of them have high payout ratios, such as Browning Ferris and Safety-Kleen. Growth rates also vary quite a bit. These factors affect the Market Value to Book Value ratio.

b. I would try to control for differences in growth and risk. I would expect the IPO to trade at a higher price to book ratio because of its higher growth rate. I would also examine the ROE; a higher return on equity should translate into a higher price to book ratio.

24-18

a. The price can be estimated as $1.12(1.06)/(.07+.9(.055)-.06) = \19.95 . Hence the price/sales multiple = $19.95/122 = 0.1635$.

b. If the stock is trading at \$34, then the price-sales multiple is $34/122 = 0.2787$. If this price is correct, then the earnings per share would have to increase (assuming that the payout ratio remains constant). We would need to have dividends this year of $D(1.06)/(.07+.9(.055)-.06) = \34 , or $D = 1.90$. Hence, we would need earnings of $(2.45/1.12)1.90 = \$4.17$ per share. With sales of \$122, this implies a profit margin of $4.17/122 = 3.42\%$

24-19

Yes. There are several reasons why Walgreen might have a high Price to Sales ratio and still be fairly priced; however, they don't seem to apply here. One reason might be that the firm expects higher sales in the future. However, Walgreen's expected growth rate of 13.5% is less than the average of the firms, which is 14.5. Furthermore, the payout ratio is higher than the average for the sample (22.3). On the other hand, the firm's beta is higher than the average for the sample (0.9) and so is the firm's profit margin of 2.7 relative to 1.9. However, on balance, the firm does seem to be overpriced, at least compared with firms such as Arbor Drugs, which has a higher profit margin, a lower payout ratio *and* a higher expected growth rate.

24-20

EBITDA	\$ 550
Depreciation	\$ 150
EBIT	\$ 400
EBIT (1-t)	\$ 240
	Next Year
EBITDA	\$ 578
EBIT	\$ 420
EBIT (1-t)	\$ 252
- Reinvestment	\$ 84
FCFF	\$ 168
Firm Value	\$ 4,200
Value/FCFF	25.00
Value/EBIT	10.00
Value/EBITDA	7.27