CHAPTER 14

EQUITY VALUATION MODELS

Problem 1

A. False. The dividend discount model can still be used to value the dividends that the company will pay after the high growth eases.

B. False. It depends upon the assumptions made about expected future growth and risk.

C. False. This will be true only if the stock market falls more than merited by changes in the fundamentals (such as growth and cash flows).

D. True. Portfolios of stocks that are undervalued using the dividend discount model seem to earn excess returns over long time periods.

E. True. The model is biased towards these stocks because of its emphasis on dividends.

Problem 2

A. Cost of Equity = 6.25% + 0.90 * 5.5% = 11.20%

Value Per Share = \$3.56 * 1.055/(.1120 - .055) = \$65.89

B. \$3.56 (1 + g)/(.1120 - g) = \$80

Solving for g,

g = (80 * .112 - 3.56)/(80 + 3.56) = 6.46%

Problem 3

A. Retention Ratio = 1 - Payout Ratio = 1 - 0.42/1.50 = 72%

Return on Capital

= (Net Income + Int Exp (1-t))/(BV of Debt + BV of Equity)

= (30 + 0.8 * (1 - 0.385))/(7.6 + 160) = 18.19%

Debt/Equity Ratio = 7.6/160 = .0475

Interest Rate on Debt = 0.8/7.6 = 10.53%

Expected Growth Rate

= 0.72 [.1819 + .0475 (.1819 - .1053 * (1 - 0.385))] = 13.5%

Alternatively, and much more simply,

Return on Equity = 30/160 = .1875

Expected Growth Rate = 0.72 * .1875 = 13.5%

B. Expected payout ratio after 1998:

= 1 - g/[ROC + D/E (ROC - i (1-t))]

= 1 - .06/(.125+.25(.125 - .07(1-.385))

= 0.5876

C. Beta in 1993 = 0.85
Unlevered Beta = 0.85/(1 + (1 - 0.385) * 0.05) = 0.8246
Beta After 1998 = 0.8246 * (1 + (1 - 0.385) * 0.25) = 0.95

D. Cost of Equity in 1999 = 7% + 0.95 * 5.5% = 12.23%
Expected Dividend in 1999
= (\$1.50 * 1.135^5 * 1.06) * 0.5876 = \$1.76
Expected Price at End of 1998 = \$1.76/(.1223 - .06) = \$28.25

E.

Year	*EPS*	*DPS*	
1994	\$1.70	\$0.48	
1995	\$1.93	\$0.54	
1996	\$2.19	\$0.61	
1997	\$2.49	\$0.70	
1998	\$2.83	\$0.79	\$28.25
Cost of Equity = 7% + 0.85 * 5.5% =			11.68%
PV of Dividends and Terminal Price (@ 11.68%) =			\$18.47

F. Total Value per Share = \$18.47
Value Per Share Using Gordon Growth Model
= \$1.50 * 1.06 * 0.5876/(.1223 - .06) = \$15.00
Value Per Share With No Growth = \$1.50 * 0.5876/.1223 = \$7.21
Value of Extraordinary Growth = \$18.47 - \$15.00 = \$3.47
Value of Stable Growth = \$15.00 - \$7.21 = \$7.79

Problem 4

A. Cost of Equity = 6.25% + 0.85 * 5.5% = 10.93%
Value of Stable Growth = \$0.48 * 1.07/(.1093 - .07) = \$13.07

B. Value of Extraordinary Growth
= \$0.48 * (6/2) * (.25 - .07)/(.1093 - .07) = \$6.60

C. The payout ratio is assumed to remain unchanged as the growth rate changes. The payout ratio in this case is assumed to remain at 60% (0.48/0.80).

Problem 5

A.

Period	*EPS*	*DPS*
1	$4.58	$0.79
2	$5.32	$0.92
3	$6.17	$1.07
4	$7.15	$1.21
5	$8.30	$1.43
6	$9.46	$2.35
7	$10.59	$3.56
8	$11.65	$4.94
9	$12.58	$6.44
10	$13.34	$8.00

B. Expected Price at End of 2003
= ($13.34 * 1.06 * 0.60)/(.1175 - .06) = $147.54
(Cost of Equity = 6.25% = 5.5% = 11.75%)

C.

PV of Dividends - High Growth =	$3.67
PV of Dividends - Transition =	$9.10
PV of Terminal Price =	$44.59
Value Per Share =	$57.36

Problem 6

a. Dividends = $ 20 million

Value of equity = 20 (1.05)/(.12-.05) = $ 300 million

b. Average annual stock buyback = 180/4 = $ 45 million

Modified dividends = $ 65 million

Value of equity = 65 (1.05)/(.12-.05) = $ 975 million

Problem 7

A. True. Dividends are generally smoothed out. Free cash flows to equity reflect the variability of the underlying earnings as well as the variability in capital expenditures.

B. False. Firms can have negative free cash flows to equity. Dividends cannot be less than zero.

C. False. Firms with high capital expenditures, relative to depreciation, may have lower FCFE than net income.

D. False. The free cash flow to equity can be negative for companies, which either have negative net income and/or high capital expenditures, relative to depreciation. This implies that new stock has to be issued.

Problem 8

A. Value Per Share = \$1.70 * 1.07/(.1203 - .07) = \$36.20
(Cost of Equity = 6.25% + 1.05 * 5.50% = 12.03%)

B.

Current Earnings per share =			\$3.20
- (1 - Desired Debt Fraction)(Capital Spending - Depreciation) = 83.61%*			\$1.00
=\$0.84			
- (1 - Desired Debt Fraction) * Δ Working Capital	= 83.61% *	\$0.00 =	\$0.00
Free Cash Flow to Equity =			\$2.36

Cost of Equity = 6.25% + 1.05 * 5.5% = 12.03%

Value Per Share = \$2.36 * 1.07/(.1203 - .07) = \$50.20

This is based upon the assumption that the current ratio of capital expenditures to depreciation is maintained in perpetuity.

C. The FCFE is greater than the dividends paid. The higher value from the model reflects the additional value from the cash accumulated in the firm. The FCFE value is more likely to reflect the true value.

Problem 9

A.

Year	*EPS*	*Cap Exp*	*Depr*	*Δ WC*	*FCFE*	*Term Price*
1	\$2.71	\$2.60	\$1.30	\$0.05	\$1.64	
2	\$3.13	\$3.00	\$1.50	\$0.05	\$1.89	
3	\$3.62	\$3.47	\$1.73	\$0.05	\$2.19	

4	$4.18	$4.00	$2.00	$0.06	$2.54	
5	$4.83	$4.62	$2.31	$0.06	$2.93	$84.74
6	$5.12	$4.90	$4.90	$0.04	$5.08	

The net capital expenditures (Cap Ex - Depreciation) and working capital change is offset partially by debt (20%). The balance comes from equity. For instance, in year 1:
FCFE = $2.71 - ($2.60 - $1.30) * (1 - 0.20) - $0.05 * (1 - 0.20) = $1.64)
Cost of Equity = 6.5% + 1 * 5.5% = 12%
Terminal Value Per Share = $5.08/(.12 - .06) = $84.74
Present Value Per Share = $1.64/1.12 + 1.89/1.12^2 + 2.19/1.12^3 + 2.54/1.12^4 + (2.93 + 84.74)/1.12^5 = $55.89

B.

Year	*EPS*	*Cap Exp*	*Depr*	*Δ WC*	*FCFE*	*Term Price*
1	$2.71	$2.60	$1.30	$0.05	$1.64	
2	$3.13	$3.00	$1.50	$0.05	$1.89	
3	$3.62	$3.47	$1.73	$0.05	$2.19	
4	$4.18	$4.00	$2.00	$0.06	$2.54	
5	$4.83	$4.62	$2.31	$0.06	$2.93	$52.09
6	$5.12	$4.90	$2.45	$0.04	$3.13	

Terminal Value Per Share = $3.13/(.12 - .06) = $52.09
Present Value Per Share = $1.64/1.12 + 1.89/1.12^2 + 2.19/1.12^3 + 2.54/1.12^4 + (2.93+52.09)/1.12^5 = $37.36

C.

Year	*EPS*	*Cap Exp*	*Depr*	*Δ WC*	*FCFE*	*Term Price*
1	$2.71	$2.60	$1.30	$0.05	$1.43	
2	$3.13	$3.00	$1.50	$0.05	$1.66	
3	$3.62	$3.47	$1.73	$0.05	$1.92	
4	$4.18	$4.00	$2.00	$0.06	$2.23	
5	$4.83	$4.62	$2.31	$0.06	$2.58	$45.85
6	$5.12	$4.90	$2.45	$0.04	$2.75	

Terminal Value Per Share = $2.75/(.12 - .06) = $45.85
Present Value Per Share = $1.43/1.12 + 1.66/1.12^2 + 1.92/1.12^3 + 2.23/1.12^4 + (2.58 + 45.85)/1.12^5 = $32.87

The beta will probably be lower because of lower leverage.

Problem 10

A.

Year	*EPS*	*Cap Ex*	*Deprec*	*Δ WC*	*FCFE*	*Term. Price*
1	$2.30	$0.68	$0.33	$0.45	$1.57	
2	$2.63	$0.78	$0.37	$0.48	$1.82	
3	$2.99	$0.89	$0.42	$0.51	$2.11	
4	$3.41	$1.01	$0.48	$0.54	$2.45	
5	$3.89	$1.16	$0.55	$0.57	$2.83	$52.69
6	$4.16	$0.88	$0.59	$0.20	$3.71	

The net capital expenditures (Cap Ex - Depreciation) and working capital change is funded partially by debt (10%). The balance comes from equity. For instance, in year 1 - FCFE = $2.30 - ($0.68 - $0.33) * (1 - 0.10) - $0.45 * (1 - 0.10) = $1.57)

B. Terminal Price = $3.71/ (.1305 - .07) = $52.69

C. Present Value Per Share = $1.57/1.136 + 1.82/1.136^2 + 2.11/1.136^3 + 2.45/1.136^4 + (2.83 + 52.69)/1.136^5 = $35.05

Problem 11

A.

Year	*1*	*2*	*3*	*4*	*5*
Earnings	$0.66	$0.77	$0.90	$1.05	$1.23
(CapEx-Deprec'n) * (1-∂)	$0.05	$0.06	$0.07	$0.08	$0.10
Δ Working Capital * (1-∂)	$0.27	$0.31	$0.37	$0.43	$0.50
FCFE	$0.34	$0.39	$0.46	$0.54	$0.63
Present Value	$0.29	$0.30	$0.30	$0.31	$0.31

Transition Period (up to ten years)

Year	*6*	*7*	*8*	*9*	*10*
Growth Rate	14.60%	12.20%	9.80%	7.40%	5.00%
Cumulated Growth	14.60%	28.58%	41.18%	51.63%	59.21%
Earnings	$1.41	$1.58	$1.73	$1.86	$1.95
(CapEx-Deprec'n) * (1-	$0.11	$0.13	$0.14	$0.15	$0.16

∂)					
Δ Working Capital * (1-	$0.45	$0.39	$0.30	$0.22	$0.13
∂)					
FCFE	$0.84	$1.07	$1.29	$1.50	$1.67
Beta	1.38	1.31	1.24	1.17	1.10
Cost of Equity	14.59%	14.21%	13.82%	13.44%	13.05%
Present Value	$0.37	$0.41	$0.43	$0.44	$0.43
End-of-Life Index					1

Stable Growth Phase

Growth Rate: Stable Phase =	5.00%	
FCFE in Terminal Year =	$1.95 (1.05)	
Cost of Equity in Stable Phase =	13.05%	
Price at the End of Growth Phase =		$23.79
PV of FCFE in High Growth Phase =		$1.51
Present Value of FCFE in Transition Phase =		$2.08
Present Value of Terminal Price =		$6.20
Value of the Stock =		$9.79

B.

Year	*1*	*2*	*3*	*4*	*5*
Earnings	$0.66	$0.77	$0.90	$1.05	$1.23
(CapEx-Deprec'n)* (1-∂)	$0.05	$0.06	$0.07	$0.08	$0.10
Δ Working Capital * (1-	$0.27	$0.31	$0.37	$0.43	$0.50
∂)					
FCFE	$0.34	$0.39	$0.46	$0.54	$0.63
Present Value	$0.29	$0.30	$0.30	$0.31	$0.31

Transition Period (up to ten years)

Year	*6*	*7*	*8*	*9*	*10*
Growth Rate	14.60%	12.20%	9.80%	7.40%	5.00%
Cumulated Growth	14.60%	28.58%	41.18%	51.63%	59.21%
Earnings	$1.41	$1.58	$1.73	$1.86	$1.95
(CapEx-Deprec'n)*(1-∂)	$0.11	$0.13	$0.14	$0.15	$0.16
Δ Working Capital *(1-	$0.50	$0.48	$0.43	$0.36	$0.26
∂)					

FCFE	$0.79	$0.97	$1.16	$1.35	$1.54
Beta	1.38	1.31	1.24	1.17	1.10
Cost of Equity	14.59%	14.21%	13.82%	13.44%	13.05%
Present Value	$0.34	$0.37	$0.39	$0.40	$0.40
End-of-Life Index					1

Stable Growth Phase

Growth Rate in Stable Phase = 5.00%
FCFE in Terminal Year = $1.78
Cost of Equity in Stable Phase = 13.05%
Price at the End of Growth Phase = $22.09
PV of FCFE in High Growth Phase = $1.51
Present Value of FCFE in Transition Phase = $1.90
Present Value of Terminal Price = $5.76
Value of the Stock = $9.17

C.

Year	1	2	3	4	5
Earnings	$0.66	$0.77	$0.90	$1.05	$1.23
(CapEx-Deprec'n) * (1-∂)	$0.05	$0.06	$0.07	$0.08	$0.10
Δ Working Capital * (1-∂)	$0.27	$0.31	$0.37	$0.43	$0.50
FCFE	$0.34	$0.39	$0.46	$0.54	$0.63
Present Value	$0.29	$0.30	$0.30	$0.31	$0.31

Transition Period (up to ten years)

Year	6	7	8	9	10
Growth Rate	14.60%	12.20%	9.80%	7.40%	5.00%
Cumulated Growth	14.60%	28.58%	41.18%	51.63%	59.21%
Earnings	$1.41	$1.58	$1.73	$1.86	$1.95
(CapEx-Deprec'n) * (1-∂)	$0.11	$0.13	$0.14	$0.15	$0.16
Δ Working Capital * (1-∂)	$0.45	$0.39	$0.30	$0.22	$0.13
FCFE	$0.84	$1.07	$1.29	$1.50	$1.67

Beta	1.45	1.45	1.45	1.45	1.45
Cost of Equity	14.98%	14.98%	14.98%	14.98%	14.98%
Present Value	$0.36	$0.40	$0.42	$0.43	$0.41

Stable Growth Phase

Growth Rate in Stable Phase = 5.00%
FCFE in Terminal Year = $1.92
Cost Of Equity in Stable Phase = 14.98%
Price at End of Growth Phase = $19.19

PV of FCFE In High Growth Phase = $1.51
Present Value of FCFE in Transition Phase = $2.03
Present Value of Terminal Price = $4.75
Value of the Stock = $8.29

Problem 12

A. Both models should have the same value, as long as a higher growth rate in earnings is used in the dividend discount model to reflect the growth created by the interest earned, and a lower beta to reflect the reduction in risk. The reality, however, is that most analysts will not make this adjustment, and the dividend discount model value will be lower than the FCFE model value.

B. The dividend discount model will overstate the true value per share, because it will not reflect the dilution that is inherent in the issue of new stock.

C. Both models should provide the same value.

D. Since acquisition, with the intent of diversifying, implies that the firm is paying too much (i.e., negative net present value), the dividend discount model will provide a lower value than the FCFE model.

E. If the firm is over-levered to begin with, and borrows more money, there will be a loss of value from the over-leverage. The FCFE model will reflect this lost value, and will thus provide a lower estimate of value than the dividend discount model.

Problem 13

a. Equity Reinvestment rate
   = (Cap Ex – Deprec'n + Chg in WC- Net Debt Issued)/ Net Income

   = (50 –20 + 20 - 10)/ 80 = 50%

Return on Equity = Net Income/ Book value of equity = 80/ 400 = 20%

Expected growth rate = ROE * Equity Reinv. Rate = 20% * .5 = 10%

b.

Equity reinvestment rate after year 5 = g/ ROE = 4/12 = 33.33%

Year	Net Income	Equity Reinvestment	FCFE	Terminal value	PV
1	$88.00	$44.00	$44.00		$40.00
2	$96.80	$48.40	$48.40		$40.00
3	$106.48	$53.24	$53.24		$40.00
4	$117.13	$58.56	$58.56		$40.00
5	$128.84	$64.42	$64.42	$1,488.83	$964.44
6	$133.99	$44.66	$89.33		
					$1,124.44

Value of Equity today = $1,124.44 million

Problem 14

a. Non-cash return on equity

= (Net Income – Interest income from cash (1-t))/ (BV of equity – Cash)

= (100 – 10)/ (1000 – 200) = 90 / 800 = 11.25%

b. Equity reinvestment rate = g / ROE = 3% / 11.25% = 26.67%

Value of non-cash equity = 90 (1.03) (1- .2667)/ (.09 - .03) = $ 1,133 million

Value of equity = $1,133 million + $ 200 million = $1,333 million

(I valued cash separately and added it to the value of the non-cash equity.