

CHAPTER FIVE

Accrual Accounting and Valuation: Pricing Book Values

Concept Questions

C5.1. True. A firm with positive expected residual earnings (produced by an ROCE above the cost of capital) must be valued at a premium.

C5.2. To trade at book value, we expect the ROCE to be equal to the cost of capital, 10%. (The current ROCE is not relevant here: P/B is based on expected future ROCE.)

C5.3. A P/B of 1.0 implies a future ROCE equal to the cost of capital. An ROCE of 52.2 % is high relative to the cost of capital, so the P/B implies the ROCE is unusually high and will drop in the future.

C5.4. No. If the firm is expected to earn an ROCE in excess of the required return, it should sell at a premium over book value. Given the forecast, the firm is a BUY if it trades below book value.

C5.5. False. If the firm maintains a low ROCE it will be valued at a discount on book value. But it can survive: it has a positive going-concern value.

C5.6. Firms create residual earnings through ROCE and growth in net assets. The ROCE for General Electric are level, but the book values are increasing.

C5.7. (a) Share issues produce more earnings because there are more assets earning in the business. And dividends reduce earnings.

(b) ROCE is a ratio and, as share issues (usually) affect the numerator and denominator of a ratio in different proportions, the ratio changes. But RE is not affected by share issues or dividends (in the case of a firm with no leverage).

C5.8. Yes. Value is generated by growing book values if the book rate of return is higher than the required return.

C5.9. If the analyst does not forecast all sources of earnings (that is, comprehensive earnings) then she will ignore some part of the payoff to shareholders, and will lose some value in her calculation of a value from the forecast.

Exercises

E5.1. A Residual Earnings Valuation

This question asks you to convert a pro forma to a valuation using residual earnings methods. First complete the pro forma by forecasting book values from earnings and dividends. Then calculate residual earnings from the completed pro forma and value the firm.

	<u>2004E</u>	<u>2005E</u>	<u>2006E</u>	<u>2007E</u>
<u>2008E</u>				
Earnings	388.0	570.0	599.0	629.0
660.4				
Dividends	115.0	160.0	349.0	367.0
385.4				
Book value	4,583.0	4,993.0	5,243.0	5,505.0
5,780.0				
ROCE	9.0%	12.4%	12.0%	12.0%
12.0%				
Residual earnings	-43.0	111.7	99.7	104.7
109.9				
Growth in RE			-10.7%	5.0%
5.0%				
Growth in Book value		8.9%	5.0%	5.0%
5.0%				
Discount factor	1.110	1.210	1.331	1.464
1.611				
PV of RE	-39.1	92.3	74.9	

- a. Forecasted book values, ROCE, and residual earnings are given in the completed pro forma above. Book value each year is the prior book value plus earnings and minus dividends for the year. So, for 2005 for example,

$$\text{Book value} = 4583 + 570 - 160 = 4,993.$$

The starting book value (in 2003) is 4,310. Residual earnings for each year is earnings charged with the required return in book value. So, for 2005,

$$\text{RE is } 570 - (0.10 \times 4,583) = 111.7.$$

- b. Forecasted growth rates in book value and residual earnings are given above.
- c. The growth rate in residual earnings is 5% after 2006. Assuming this growth rate will continue into the future, the valuation is a Case 3 valuation with the continuing value calculated at the end of 2006:

Book value, 2003	4,310.0
Total present value of RE to 2006 (from last line above)	128.1
Continuing value (CV), 2006: $\frac{104.7}{1.10 - 1.05} = 2094.0$	
Present value of CV: $2094/1.331$	<u>1,573.3</u>
Value of the equity, 2003	6,011.4
Per share value (on 1,380 million shares)	<u>4.36</u>

- d. The premium is $6,011.4 - 4,310 = 1,701.4$, or 1.23 on a per-share basis.
- The P/B ratio is $6,011.4/4,310 = 1.39$.

E5.2. Residual Earnings and Value

This problem applies the residual earnings model and its dividend discount equivalent.

Develop the pro forma as follows:

	<u>1999</u>	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>
Eps		3.90	3.70	3.31	3.59	3.90
Dps		1.00	1.00	1.00	1.00	1.00
Bps	22.00	24.90	27.60	29.91	32.50	35.40
(a) RE (0.12)		1.26	.71	0	0	0
Discount rate		1.12	1.2544			
PV		1.125	.57			
Total PV	<u>1.70</u>					

(b) Value 23.70

(c) As residual earnings are expected to be zero after 2004, the equity is expected to be worth its book value of \$35.40. That is no premium is expected at 2004.

An aside: The calculation can also be made by forecasting the cum-dividend book value in 2004 and reducing it by the value of dividends to be paid out (to get an ex-dividend price):

$$\text{Expected cum-dividend value in 2004 } (\bar{V}_T^E = \rho^T V_0^E) = 1.12^5 \times 23.70 = 41.77$$

Terminal value of the dividend payoff at 2000:

2000 div:	$1.00 \times 1.5735 = 1.57$	
2001 div:	$1.00 \times 1.4049 = 1.41$	
2002 div:	$1.00 \times 1.2544 = 1.25$	
2003 div:	$1.00 \times 1.12 = 1.12$	
2004 div:	1.00×1.00	<u>1.00</u>
		<u>6.35</u>

Expected ex-dividend value at 2004 35.42

(d) The expected premium at 2004 is zero because subsequent residual income is expected to be zero. Knowing this, you can calculate the expected price at 2004 as equal to the expected book value at that date: \$35.42. This is a much shorter calculation!

(e) The dividend discount formula can be applied because we now have a basis for calculating its terminal value. The terminal value is the expected terminal price, and this can be calculated at the end of 2001 because, at this point, expected price equals book value.

$$V_0^E = \sum_{t=1}^T \rho^{-t} \bar{d}_t + \overline{TV}_T / \rho^T$$

The TV_{2001} is given by the expected 2001 book value:

$$TV_{2002} = 27.60$$

So the calculation goes as follows:

	<u>1999</u>	<u>2000</u>	<u>2001</u>
<i>Dps</i>		<i>1.00</i>	<i>1.00</i>
PV		.89	.80
Total PV of divs.	1.69		
TV			27.60
PV of TV	<u>22.00</u>		
Value	<u>23.69</u>		

Note that, as price is expected to equal book value at the end of 2001, then we can also get the current value by taking the present value of the cum-dividend terminal book value:

As

$$V_{1999}^E = \text{Cum-dividend 2001 value} / 1.12^2$$

and as

$$\text{Cum-dividend 2001 value} = \text{cum-dividend 2001 book value}$$

then

$$V_{1999}^E = \text{cum-dividend 2001 book value} / 1.12^2$$

$$\text{Terminal value of 2000 and 2001 divs at end of 2001} = 2.12$$

$$\text{Expected 2001 book value} = \underline{27.60}$$

$$\text{Expected 2001 cum-dividend book value} = \underline{29.72}$$

$$PV = 29.72 / 1.12^2 = \underline{23.69}$$

E5.3. Residual Earnings Valuation and Return on Common Equity

- (a) Set the current year as Year 0.

$$\text{Earnings, Year 1} = 15.60 \times 0.15 = 2.34$$

$$\begin{aligned} \text{Residual earnings, Year 1} &= 2.34 - (0.10 \times 15.60) \\ &= 0.78 \end{aligned}$$

This RE is a perpetuity, so

$$\begin{aligned} V_0 &= B_0 + \frac{RE_0}{0.10} \\ &= 15.60 + \frac{0.78}{0.10} = 23.40 \end{aligned}$$

$$P/B = 23.40/15.60 = \underline{\underline{1.5}}$$

- (b) No effect: future payout does not affect current price (unless you have a tax story) and future dividends don't affect current book value.

P/B is still 1.5

E5.4. Using Accounting-Based Techniques to Measure Value Added for a Project

(a)

Time line:	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
Depreciation		30	30	30	30	30
Book value	150	120	90	60	30	0
Earnings (15%)		22.5	18	13.5	9	4.5
RE (0.12)		4.5	3.6	2.7	1.8	0.9
PV of RE		4.02	2.87	1.92	1.14	0.51
Total PV of RE		<u>10.47</u>				
Value of Project		<u>160.47</u>				

The investment added \$10.47 million over the cost.

(b)

Time line	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
Earnings		22.5	18.0	13.5	9.0	4.5
Depreciation		<u>30.0</u>	<u>30.0</u>	<u>30.0</u>	<u>30.0</u>	<u>30.0</u>
Cash from operations		52.5	48.0	43.5	39.0	34.5
PV of cash flow (1.12 ⁵)		46.88	38.27	30.96	24.79	19.58
Total PV of cash flow		160.47				
Cost		<u>150.00</u>				
NPV		<u>10.47</u>				

The NPV is the value added.

E5.5. Using Accounting-Based Techniques to Measure Value Added for a Going Concern

(a)								
Time line:	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
Investment	150	150	150	150	150	150	150	150
Depreciation ¹		30	60	90	120	150	150	150
Book value ²		270	360	420	450	450	450	450
Revenue		52.5	100.5	144.0	183.0	217.5	217.5	217.5
Depreciation		30.0	60.0	90.0	120.0	150.0	150.0	150.0
Earnings (15%)		22.5	40.5	54.0	63.0	67.5	67.5	67.5
RE (0.12)		4.5	8.1	10.8	12.6	13.5	13.5	13.5
PV of RE		4.0	6.5	7.7	8.0			
Total of PV of RE	26.2							
Continuing value ³						112.5		
PV of CV	71.5							
Value	<u>247.7</u>							
Lost	<u>150</u>							
Value added	<u>97.7</u>							

1. Depreciation is \$30 million per year for each project in place
2. Book value (t) = Book value (t-1) + Investment (t) – Depreciation (t)
3. $CV = \frac{13.5}{0.12} = 112.5$

The value of the firm is \$247.7 million. The continuing value is based on a forecast of residual earning of 13.5 in year 5 continuing perpetually with no growth. This is a Case 2 valuation.

- (b) The value added is \$97.7 million

(c) The value added is greater than 15% of the initial investment because there is growth in investment: value is driven by the rate of return of 15% (relative to a cost of capital of 12%) but also by growth.

E5.6. Residual Earnings Techniques: Bond Valuation

The bond has a face value of \$1,000. The required return is 8% p.a. but the coupon yields only 4%. To answer the question, ask how much discount off \$1,000 is required for a payoff of 4% rather than 8%. Clearly a payoff of 4% rather than 8% yields negative residual earnings.

$$\begin{aligned}
 \text{Discount} &= \frac{40 - (8\% \times 1000)}{1.08} + \frac{40 - (8\% \times 1000)}{1.1664} \\
 &+ \frac{40 - (8\% \times 1000)}{1.2597} + \frac{40 - (8\% \times 1000)}{1.3605} \\
 &+ \frac{40 - (8\% \times 1000)}{1.4693} \\
 &= 159.70
 \end{aligned}$$

So the bond should sell at \$1000 - 159.70 = \$840.30 (which is the same valuation as using a DCF technique).

E5.7. Analysts Forecasts and Valuation: Hewlett-Packard

(a)

Time line:	<u>1999A</u>	<u>2000E</u>	<u>2001E</u>	<u>2002E</u>	<u>2003E</u>	<u>2004E</u>	<u>2005E</u>
Eps	3.33	3.75	4.32	4.83	5.42	6.07	6.80
Dps ¹	0.64	0.71	0.82	0.92	1.03	1.15	1.29
BPS	19.36	22.40	25.90	29.81	34.20	39.12	44.63
RE (0.12)		1.43	1.63	1.72	1.84	1.97	2.11
Growth in RE			14.0%	5.5%	7.0%	7.0%	7.0%
PV of RE(1.12 ^b)		1.28	1.30	1.22			
Total PV of RE to 2002	3.80						
Continuing value ²				36.80			
PV of CV	<u>26.19</u>						
Value per share	<u><u>49.35</u></u>						

1. The dps forecast is based on maintaining the same pay out ratio as in 1999.

2. $CV = \frac{1.84}{1.12 - 1.07}$, where 7% is the long-term growth ratio in RE.

The valuation from the forecasts is less than the market price of \$83. The forecasts imply a SELL, not a BUY.

Note that one could also calculate the continuing value at the end of 2002, based on the 1.72 of RE in 2002 growing at 7%, and get the same answer.

(b) Suppose the market sets the \$83 price using analysts' forecasts for 2000 and 2001 plus a long-term growth rate forecast after 2001. The continuing value at 2001 will be

BPS, 1999
19.36
PV of RE to 2002: $(1.43 + 1.63)$
3.06
Continuing value (CV)
?
Value per share
83.00

The implied CV (?) is 60.58. The implied growth rate in the CV is that which solves the CV calculation:

$$60.58 = (1.63 \times g) / (1.12 - g)$$

Thus $g = 1.0905$ (an implied growth rate of 9.05%).

(c) Difficulties:

1. Analysts did not give a forecast of dps (which affects forecasted eps and bps). We used a constant-payout forecast, but is this what analysts had in mind in forecasting the eps (that are displaced by dividends)?
2. We relied on analysts' long-run eps growth forecasts to calculate a value. These forecasts are suspect. Research shows they are not very accurate and are usually too optimistic.
3. We relied on analysts' forecasts to 2002 to get the implied long-run growth rate from the current market price. Are these good forecasts?

E5.8. Forecasting Target Prices Using Residual Earnings Techniques

For this question, recognize that a target (forecasted) value is calculated from forecasted book values and continuing values:

Target value = Book value + continuing value

- a. If residual earnings are forecasted to be zero (and thus the continuing value is zero), the forecasted value must equal the book value of \$6,120 million. (A

Case 1 valuation)

- b. In this case (Case 2), the continuing value (CV) is the RE for 2006 capitalized at 11%:

$$CV = \frac{25}{0.11} = 227.3$$

$$\text{Target value} = 6,120 + 227.3 = 6,347.3$$

- c. In this case (Case 3), the continuing value is the RE for 2006 capitalized at the growth rate of 3%:

$$CV = \frac{25}{1.11 - 1.03} = 312.5$$

$$\text{Target value} = 6,120 + 312.5 = 6,432.5.$$

E5.9. Residual Earnings Valuation and Accounting Methods

- a. Inventory in the balance sheet is carried at historical cost but is written down to market value if market value is less than cost. The carrying amount of inventory on the balance sheet becomes cost of good sold when the inventory is sold. So, a write-down of \$114 million in 2003 means cost of goods sold in 2004 will be \$114 million lower, and earnings will be \$114 million higher, that is, \$502 million. The book value at the end of 2003 is \$114 million lower, or \$4,196 million. So,

$$ROCE = 502/4,196 = 11.96$$

This is an increase over the 9% (388/4,310) before the impairment.

- b. Refer to the answer to Exercise 5.1. With earnings of \$502 million forecasted for 2004, residual earnings is now $502 - (0.10 \times 4,196) = \82.4 million. The present value of this RE is $\$82.4/1.10 = \74.9 million. As the present value of RE for 2004 prior to the impairment was $\$-39.1$ million, the change in the PV of RE in the valuation is \$114 million. As this is the change in the 2003 book, value the valuation remains unchanged.

The full pro forma under the changed accounting is below:

	<u>2004E</u>	<u>2005E</u>	<u>2006E</u>	<u>2007E</u>
<u>2008E</u>				
Earnings	502.0	570.0	599.0	629.0
660.4				
Dividends	115.0	160.0	349.0	367.0
385.4				
Book value	4,583.0	4,993.0	5,243.0	5,505.0
5,780.0				
ROCE	11.96%	12.4%	12.0%	12.0%
12.0%				
Residual earnings	82.4	111.7	99.7	104.7
109.9				
Growth in RE			-10.7%	5.0%
5.0%				
Growth in Book value		8.9%	5.0%	5.0%
5.0%				
Discount factor	1.110	1.210	1.331	1.464
1.611				
PV of RE	74.9	92.3	74.9	

Note that the pro forma is unchanged after 2004 as 2004 book values are the same as before.

The valuation now runs as follows:

Book value, 2003	4,196.0
Total present value of RE to 2006 (from last line above)	242.1
Continuing value (CV), 2006: $\frac{104.7}{1.10 - 1.05} = 2094$	
Present value of CV: $2094/1.331$	<u>1,573.3</u>

Value of the equity, 2003 6,011.4

Per share value (on 1,380 million shares) 4.36

This is the same valuation as before.

- c. The taxes will affect 2004 earnings and 2003 book values by the after-tax amount of the impairment:

After-tax effect on 2004 earnings = $\$114 \times (1 - 0.35) = \74.1

After-tax effect on book value in 2003 = $\$114 \times (1 - 0.35) = \74.1

Accordingly,

Earnings, 2004 = $388 + 74.1 = 462.1$

Book value at the end of 2003 = $4,310 - 74.1 = 4,235.9$

ROCE, 2004 = $462.1/4235.9 = 10.91\%$

As both 2004 earnings and 2003 book values are affected by the same amount, the value of the equity is unchanged (following the same calculation as in b).

E5.10. Comparison Valuations: Hewlett-Packard, Dell Computer, and Compaq Computer

(a) Hewlett Packard: Price = 95 $\frac{1}{8}$

First develop a residual earnings pro forma up to 1997. Analysts do not give dps forecasts, so they have to be estimated; use the dps forecasts in Table 5.3 to develop the pro forma.

	<u>1995A</u>	<u>1996E</u>	<u>1997E</u>
Eps	4.63	5.60	6.60
Dps	<u>0.70</u>	0.94	1.10
Bps	23.22	27.88	33.38
RE (.12)		2.81	3.25
Discount rate		1.120	1.254

To calculate the implied growth rate in residual earnings for years beyond 1997, calculate g in the following valuation:

$$95.125 = 23.22 + \frac{2.81}{1.120} + \frac{3.25}{1.254} + \frac{3.25xg / 1.12 - g}{1.254}$$

The \$3.25 is grown up at the rate g for one period, and the continuing value at the end of 1997 is specified with the implied growth rate.

The solution is $g = 1.078$ (a 7.8% growth rate).

Dell: Price = 36¾

The Pro forma (no dividends):

	<u>1995A</u>	<u>1996E</u>	<u>1997E</u>
Eps	2.67	3.20	4.15
Dps	<u>0.00</u>	0.00	0.00
Bps	10.35	13.55	17.70
RE (.12)		1.96	2.52
Discount rate		1.12	1.254

Formula for implied growth rate:

$$36.75 = 10.35 + \frac{1.96}{1.120} + \frac{2.52}{1.254} + \frac{2.52xg / 1.12 - g}{1.254}$$

The solution is $g = 1.029$ (a growth rate of 2.9%)

Compaq : Price = 47¾

	<u>1995A</u>	<u>1996E</u>	<u>1997E</u>
Eps	2.88	4.50	5.75
Dps	<u>0.00</u>	0.00	0.00
Bps	17.27	21.77	27.52

RE (.12)	2.43	3.14
Discount	1.12	1.25

For the implied growth rate:

$$47.375 = 17.27 + \frac{2.43}{1.120} + \frac{3.14}{1.254} + \frac{3.14xg}{1.12 - g} \times \frac{1}{1.254}$$

The solution is $g = 1.02$ (a growth rate of 2%).

(b) The forecasted P/E ratios imply forecasted prices in 1997 that can be calculated by multiplying forecasted 1997 earnings by the P/E ratio:

$$\text{Forecasted } P_{1997} = \text{Earnings}_{1997} \times (P/E)_{1997}$$

The 1995 prices implied by forecasted 1997 prices are the present value of cum-dividend 1997 prices:

$$P_{1995} = P_{1997}^C / 1.2544.$$

P^C indicates that the price is cum-dividend, that is, with the terminal value of any dividends paid in the payoff. Only HP has dividends. The value of the dividends at the end of 1997 is the 1997 dividend plus the 1996 dividend reinvested for one period at 12%: $1.10 + (0.94 \times 1.12) = 2.153$.

The following calculates the 1995 price implied by the forecast.

1995	1997		1997	1997
				Cum-div.
<u>Price</u>	<u>Eps</u>	<u>P/E</u>	<u>Price</u>	<u>Price</u>
HP	6.60	14.0	92.4	94.6
75.41				
Dell	4.15	12.0	49.8	49.8
39.70				
Compaq	5.75	8.4	48.3	48.3
38.50				

To ask whether the analyst's recommendations are consistent with the forecasts, compare the market price with the price implied by the forecast. Dell is the only firm where the current price from these calculations is consistent with the analyst's recommendation. For HP and Compaq there is an inconsistency between the forecast and the recommendation. He recommends BUY for Compaq, but the (intrinsic) price implied by his forecast is less than the market price. For HP, the price from the forecasts is considerably less than the market price, yet he advises a HOLD.

E5.11. Did You Pay Too Much for Book Value?

If you paid 220 at the beginning of 2001, you are expecting that the premium over book value that you paid (20) will be returned in (the present value of) subsequent residual earnings.

<u>Year</u>	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>
Book value	200	207	230	238
Dividends		15	0	15
Earnings		22	23	23
Residual earnings (RE)		2.0	2.3	0
PV of RE (at 1.10 ^t)		1.82	1.9	0
Total PV	3.72			
Premium you paid	<u>20.00</u>			
Ex post loss	<u><u>16.3</u></u>			

$$\text{Earnings} = B_t - B_{t-1} + d_t$$

(This is comprehensive income because it is calculated from the changes in the book value which includes the dirty surplus income that may not be reported in net income.)

The conclusion assumes RE beyond 2003 is also expected to be zero.

Another way of looking at it:

$$\begin{aligned} \text{Required 3-year stock return} &= 220 \times (1.10^3 - 1) \\ &= 72.82 \end{aligned}$$

If projected residual earnings are zero after 2003, price should equal the book value of 238 in 2003.

$$\begin{aligned} \text{Therefore actual return} &= P_T - P_0 + \text{terminal value of dividends} \\ &= 238 - 220 + (15 \times 1.10^2) + 15 \\ &= 51.15 \end{aligned}$$

$$\text{Actual} - \text{required return} = (21.67)$$

$$\text{PV at 2000} = 21.67 / (1.10)^3 = \underline{(16.28)}$$

(which is the ex post loss calculated above)

Note: you can also calculate the return as the cum-dividend earnings from 2001-2003 (71.15) plus the change in premium (0-20 = -20).

E5.12. Did You Pay Too Much for Book Value: Boeing, Lockheed, and

McDonnell-Douglas?

	1989	1990	1991	1992
1993				
<u>Boeing</u>				
Earnings, split-adj. ¹	6.35	9.02	10.26	3.65
8.24				
Dividends, split-adj. ¹	1.76	2.14	2.25	2.25
2.25				
BV	39.86	46.74	54.75	56.15
62.14				
Residual earnings (.12)	2.12	4.24	4.65	-2.92
1.50				
PV of RE	1.89	3.38	3.31	-1.86
.85				

Total PV of RE \equiv premium = 7.57

Unless you were buying startling higher profits beyond 1994 you overpaid at 60% (at a 25.36 per share premium).

Notes: 1. The split adjustments express amounts per share outstanding at the end of 1988.

Lockheed

Earnings	.03	5.30	4.86	-4.58
6.70				
Dividends	1.75	1.80	1.95	2.09
2.12				
BV	40.01	43.51	46.42	39.75
44.33				
Residual earnings	-4.98	0.50	-0.36	-10.16
1.93				
PV of RE	-4.45	0.40	-0.26	-6.46
1.10				
Total PV of RE \equiv premium =	(-9.67)			

Bad buy! Lockheed was purchased at book value (approximately), but delivered negative RE from 1989-92.

McDonnell Douglas

Earnings	5.72	7.99	11.03	-20.10
10.10				
Dividends	2.82	2.82	1.40	1.40
1.40				
BV	86.33	91.50	101.13	79.63
88.33				
Residual earnings	-4.29	-2.37	.05	-32.24
.54				
PV of RE	-3.83	-1.89	.04	-20.49
.31				

Total PV of RE = premium = (25.86)

Bad buy! MD was purchased at a discount of 11.18 but subsequent profitability justified a higher discount.

(Of course these conclusions might be changed based on performance subsequent to 1993.)

E5.13. Implied Growth in Residual Earnings: Coca-Cola Company

Market value at end of 1998 = \$66 ½ × 2.465 billion

= \$163.923 billion

Economic profit (residual earnings) for 1998 = 2.480 billion

The reverse engineering calculation of g is as follows:

$$\text{Value} = \text{Book value} + \frac{\text{Residual earnings} \times (1 + g)}{1.09 - g}$$

$$163.923 = 8.403 + \frac{2.480 \times g}{1.09 - g}$$

$$\therefore g = 1.0729 \text{ (or a growth rate of 7.29\%)}$$

E5.14. Residual Earnings Growth and Growth in Earnings: Hewlett-Packard

Company

This exercise demonstrates the relationships between changes in residual earnings and growth in earnings. It may be better appreciated after reading Chapter 6.

Develop the pro forma with constant residual earnings after 2001 and add calculations of earnings growth, as follows:

	<u>1999</u>	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>
Eps		3.75	4.32	4.74	5.20	5.70
Dps	0.64	0.71	0.82	0.9	0.99	1.08
Bps	19.36	22.40	25.90	29.74	33.95	38.57
RE(0.12)		1.43	1.63	1.63	1.63	1.63
ROCE		19.4%	19.3%	18.3%	17.5%	16.8%
Cum-dividend eps		3.83	4.49	5.03	5.63	6.30
Growth in eps			15.2%	9.7%	9.7%	9.7%
Growth in cum-div. eps			17.2%	12.0%	12.0%	12.0%

- (a) The eps growth rate that implies a constant residual earnings is 9.7%.
- (b) Zero: a constant RE always means that there is no change in the premium.

The premium is the present value of expected residual earnings, so if residual earnings do not change, nor will the premium.

Some additional material that is relevant to Chapter 6:

You will notice that cum-dividend earnings are calculated in the pro forma. These cum-dividend eps forecasts are calculated by adding reinvested dividends to forecasted earnings. The amounts of earnings from reinvesting dividends at the cost of capital of 12% are in the following schedule:

Earnings from reinvested dividends

<u>Year</u>	<u>Dividend</u>	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>
1999	0.64	0.077	0.086	0.096	0.108	0.121
2000	0.71		0.085	0.095	0.107	0.120
2001	0.82			0.098	0.110	0.123
2002	0.90				0.108	0.121
2003	0.99					<u>0.119</u>
		<u>0.077</u>	<u>0.171</u>	<u>0.289</u>	<u>0.433</u>	<u>0.604</u>
Eps		<u>3.750</u>	<u>4.320</u>	<u>4.740</u>	<u>5.200</u>	<u>5.700</u>
Cum-dividend eps		<u>3.827</u>	<u>4.491</u>	<u>5.029</u>	<u>5.633</u>	<u>6.304</u>

The eps growth rate that implies a constant residual earnings is 9.7%. But this growth is affected by the amount of the payout. (Paying dividends reduces earnings growth.)

Growth in cum-dividend eps after 2001 is 12%. This is equal to the cost of capital, and illustrates a point: a constant RE always means that cum-dividend earnings grow at the cost of capital.

E5.15. Forecast Revision and Change in Value: Weyerhaeuser Company

	<u>1995A</u>	<u>1996E</u>	<u>1997E</u>	<u>1998E</u>	<u>1999E</u>	<u>2000E</u>
<u>March 31 forecast:</u>						
Eps	3.93	3.40	4.10	4.51	4.96	5.46
Dps	<u>1.50</u>	1.60	1.60	1.76	1.94	2.13
Bps	22.57	24.37	26.87	29.62	32.64	35.97
RE (.12)		.69	1.18	1.29	1.41	1.54
Discount factor		1.12	1.2544	1.4049	1.5735	1.7623
PV of RE		.62	.94	.92	.90	.87
Total PV	4.25					
*TV (g = 9%)						
55.95						
PV of TV	<u>31.75</u>					
Valuation	<u>58.57</u>					

*The terminal value is based on the 2000E RE of 1.54 growing at 9%: $\frac{1.54 \times 1.09}{.03}$

Revised forecast:

Eps	3.93	2.20	3.25
Dps	1.50	1.60	1.60
Bps	<u>22.57</u>	23.17	24.82
RE (.12)		(.51)	.47
Revision in RE		(1.20)	(.71)
PV of revision		(1.07)	(.57)
Total PV of revisions	<u>(1.64)</u>		

This implied revision in the value is based on forecast revisions for 1996 and 1997 only. To complete the valuation, we'd have to know what eps the analyst had in mind for years beyond 1997. Will eps grow at 10% from the revised 1997 forecast or will they be the same as in the first forecast? What is the payout the analyst expects beyond 1997? Will it be less because of lower forecasted earnings?

E5.16. Equivalent Valuation Methods

Scenario with no share issues or dividends:

Cum-dividend book value in Year 3 \$1,419

$$V_0^E = \frac{1,419}{1.331} = \$1,066 \text{ or } \$10.66 \text{ per share}$$

Scenario with share issue and dividend:

Future value in Year 3 of dividend	
In Year 2: \$25 + 1.10	27.4
Future value in Year 3 of cash surrendered	
in share issue: \$100 x (1.10) ²	(121.0)
Book value in Year 3 (ex-dividend)	<u>1,512.5</u>
Cum-dividend book value in Year 3	<u>\$1,419.0</u>

This cum-dividend book value is the same as that in the first scenario, so the valuations are the same. (Again, as in the text, the value is insensitive to share issues or dividends.)

E5.17. Impairment of Goodwill

(a) As the asset is at fair value (the acquisition price) on the balance sheet, it is expected to earn at the required return on book value: Residual earnings is projected to be zero. (Fair value in an acquisition always prices the acquisition to earn at the required rate of return.)

(b) The book value must be marked down to fair market value under FASB Statement No. 142. The book value at the end of 2002, before the write down, is $301 + 79 = 380$.

Forecasted earnings for 2003 on this book value (at the forecasted ROCE of 9%) is

$$380 \times 0.09 = 34.2$$

For a 10% required return, the book value that yields residual earnings in 2003 equal to zero $= 34.2 \times 10 = 342$:

$$RE_{2003} = 34.2 - (0.10 \times 342) = 0$$

A book value of 342 is thus “fair value.”

Accordingly, the amount of impairment $= 380 - 342 = 38$.

Minicases

M5.1. The Goldman Sachs IPO

This case introduces residual earnings valuation that evaluates price-to-book ratios, emphasizes the limitations of short-term forecasts, and compares pro forma valuation with multiple analysis.

A. The pro forma is simple:

	<u>1998A</u>	<u>1999E</u>	<u>2000E</u>
Eps		4.69	4.26
Dps		0.48	0.48
Bps	17.80	22.01	25.79
RE(0.10)		2.91	2.06
ROCE		26.3%	19.4%

With a forecast for a limited period, start with a Case 2 valuation. With this pro forma and a forecast that the 2000E residual earnings is a good estimate of residual earnings after 2000, the (Case 2) valuation of Goldman is:

$$V_{1998} = 17.80 + \frac{2.91}{1.10} + \left(\frac{2.06}{0.10} \right) / 1.10$$

$$= \$39.17$$

This value is considerably lower than the market price of \$70. But this valuation assumes no growth in residual earnings after 2000E. The analysts have not given enough information to complete this valuation. The market price of \$70 has an implied growth rate that can be tested:

$$70 = 17.80 + \frac{2.91}{1.10} + \left(\frac{2.06 \times g}{1.10 - g} \right) / 1.10$$

$$g = 1.06 \text{ (a 6.0\% growth rate)}$$

Can we come up with scenarios that justify a growth rate of 6.0% for Goldman?

Remember growth in RE come from two factors:

- increase in ROCE
- increase in net assets earning at the ROCE

B. Corzine and Paulson saw growth coming from acquisitions. So a complete analysis would involve acquisition strategy. Who were potential acquirees? An insurance firm (as in the Citicorp Travelers merger)? A larger asset management business? Chase? The analysis would also involve costs of acquisitions. Were cheap acquisitions available? Were synergistic merges a possibility? Or would Goldman have to pay a fair price and earn a normal return (a zero RE) on the acquisition?

Do shares give a firm currency? No: using shares in an acquisition gives up the same value as the cash equivalent. Goldman might face borrowing constraints to raise the cash, however. And, if it found itself in a position of having its shares overvalued in the market, it might use the shares to buy another firm cheaply. Which brings us to the question 3.

C. If Merrill and Morgan Stanley were “appropriately priced” the use of multiples is a reasonable way of getting a valuation, with any adjustments for differences between the firms. But if the prices of comparison firms were too high—as some maintained—then the Goldman partners may indeed have been taking advantage of a mispricing. Remember the issue of Ponsi schemes in multiples (in Chapter 3)? There is further discussion on the Chapter 3 web page.

[Note: This case was written in October 1999. Goldman’s strategy might be more apparent when you read this case later, and its effects can be incorporated into this analysis.]

M5.2.Strategy and Valuation: Weyerhaeuser Company

This case can be combined with the Weyerhaeuser Minicase M2.3 in Chapter 2 to compare asset-based valuation with pro forma analysis.

The case introduces the analysis of strategies and highlights the problems one often has in translating statements about strategy into forecasts and a valuation. It also motivates students to dig for further information.

Some preliminary calculations

Bps, 1997 (on 199.486 million shares)	23.30
Bps, 1998 (on 199.009 million shares)	22.74

ROCE, 1998 $\left(\frac{1.48}{23.30} \right)$	6.4%
P/B ratio, 1998 (at price of \$55)	2.4
P/E ratio, 1998 (dividend-adjusted)	38.2

To answer the questions, develop a pro forma based on the plans and their forecasted outcomes:

Effect on 1999 eps:

Eps, 1998	\$1.48
Effect of increasing harvest	0.85
Effect of cost cutting	0.72
Effect of price increases	0.40
Effect of capacity utilization	<u>0.20</u>
Eps, 1999	<u>\$3.65</u>

A pro forma that forecasts 1999 residual earnings is as follows:

	<u>1997A</u>	<u>1998A</u>	<u>1999E</u>
Eps		1.48	3.65
Dps		1.60	1.60
Bps	23.30	22.74	24.79
RE (0.12)		(1.32)	0.92
ROCE		6.4%	16.1%

Answering the Questions

A. The plans and their forecasted affects yield an ROCE for 1999 of 16.1%, just short of the goal of 17%.

B. Valuing the firm from the forecast.

Suppose the forecasted residual earnings for 1999 are to continue indefinitely.

Then the value per share would be:

$$V_{1998} = 22.74 + \frac{0.92}{0.12}$$

$$= 30.41$$

This value is well below the market price of \$55. If the cost of capital were 8%, the value would be \$45.62 per share.

But this valuation is incomplete because there may be growth in RE (and there may be a decline, negative growth, in RE). What growth is the market forecasting at \$55?

$$55 = 22.74 + \frac{0.92}{1.12 - g}$$

$$\therefore g = 1.0915 \text{ (or a growth rate of 9.15\%)}$$

So, to pay \$55, we have to be able to forecast a growth of 9.15% in RE. This translates into a growth rate in eps of 9%-10% if the \$1.60 dps is maintained.

C. The question introduces operating leverage: with fixed cost more of each additional dollar of revenue goes to the bottom line.

D. There are a number of concerns:

(i) The forecasted ROCE for 1999 is high by historical standards and is for anticipated upswing in the cycle. Shouldn't the valuation be based on the average, long-term ROCE for the cycle?

(ii) The excess capacity gives us a red flag. Will some of this capacity have to be written off in a restructuring or more accelerated depreciation in the future? These actions will lower ROCE.

(iii) Will Weyerhaeuser resist the temptation to overinvest at the top of the next cycle?

(iv) The increased harvest is a concern. Is the firm planning to cut timber for short-term gain at the expense of the long-term? Is the anticipated cutting in excess of accretion through tree growth? Are the timberlands more valuable uncut?

E. There are two issues on which we want further information.

(i) Is the ROCE forecasted for 1999 sustainable? The issues raised in part (d) are relevant to this question.

(ii) Getting a handle on the long-term growth is clearly the key here. A forecast (or objective) for ROCE is not enough. Growth in investment (book value) must be considered.

The student does not have the tools to develop growth forecasts at this stage. These are at the heart of the analysis in Part Two of the book. A key element is the growth in revenues, for growth in revenues is the primary driver of growth in RE. Weyerhaeuser's revenues had been flat or declining, over the prior three years. Is this to change? The professor could explore the growth issue as an introduction to Part Two

Another question: Is Weyerhaeuser worth more than its going concern value? Look back at the asset-based valuation in case M3.4 in Chapter 3. Should timberlands not be cut because the return they produce from cutting is valued less than their value uncut?

The student might look at how Weyerhaeuser has performed since 1999. Was the \$55 price (that rose to \$70 by mid 1999) justified ex post?

M6.3 Chrysler Corporation: The Kerkorian Bid

The main purpose of this case is to help students understand what are the necessary ingredients for carrying out a valuation. Students discover this by finding out the information they need to solve the problem, but do not have. Students also discover the tools they lack. This sets them up for what follows in the rest of the book.

Background

At the time of the bid, Chrysler traded at $39\frac{3}{4}$ per share. Kerkorian's offer was \$55 per share. Other relevant data:

Shares outstanding (issued minus treasury stock):

December 31, 1994	\$355.1million
December 31, 1995	\$378.3million

Book value	<u>Total</u>	<u>Per Share</u>
December 31, 1994	\$10,692million	\$30.11
December 31, 1995	\$10,959million	\$28.97

Traded P/B ratio, April 1995	1.32
Kerkorian's bid/book ratio	
April 11, 1995	1.83
January, 1996	1.90
Chrysler's beta at the end of 1995 (from beta services)	
1.35	

Question A of the Case

Greenmail involves demanding to be bought out at a price above the fair price. But Kerkorian could have had a number of ideas that would lead to a better price for Chrysler on the market.

- (i) He may just have thought that the stock was undervalued at \$39¾: the market did not recognize Chrysler's earning potential. He may also have thought that his offer would "signal" his belief to the market and increase the price. Indeed Chrysler's stock price increased about 25% when his offer was announced. Apparently other investors saw his \$55 price as persuasive. Icahn, however, doubted Kerkorian's valuation and took short positions. The price chart indicates that, in the long run the Kerkorian position was the profitable one.
- (ii) Kerkorian may have had ideas to add value by better management. He saw Chrysler lacking good ideas or missing out on investment opportunities. He was very critical of the management at the time and may have thought that he could run an automobile firm better. He saw the build up of cash as evidence that management did not have investment ideas. He of course had little experience with the industry, but Iacocca's partnership would provide this. It was Iacocca who was

credited with bringing Chrysler back from the brink after a US government bailout in the 1980s.

- (iii) Kerkorian may have seen some “synergy” with his existing operations in marketing, production, technology or research and development. This is doubtful; Kerkorian was in gambling, resorts and entertainment.
- (iv) Kerkorian may have seen Chrysler as a bridge to other opportunities. With Chrysler he might have strategies to launch takeovers of other firms. [He’d want to keep the \$7.5 billion of cash inside the firm in this case.]
- (v) He thinks paying out dividends will drive up the price because shareholders value firms with higher dividends. This runs into the dividend irrelevance notion. But see the discussion on paying out the \$7.5 billion cash later.
- (vi) He may have seen that the break-up value of the firm was greater than its going concern value. This is the asset stripper at work.
- (vii) He may be an empire builder who is willing to pay a lot to build his empire.
- (viii) He may have seen Chrysler as a takeover target for someone else (like Daimler Benz) who would be willing to pay more than \$55 per share.

Question B of the Case

Knowing a firm’s strategy - or strategic alternatives - is a prerequisite for valuing a firm. With the information that we have here, we will not be able to do a thorough valuation. We would need to know the industry quite well and know what strategic options are open to Chrysler. Further, given

that we want to value Chrysler in Kerkorian's hands, we'd also like to have an idea of his plans for the firm.

If we indeed could lay out the strategy options we would need a good deal more information than that given with case to analyze the value in the strategies. So working this case is going to produce some frustrations. But the purpose is to get you working on a valuation problem with limited information - which often is what you have. You will also discover what further information you need to do a thorough job. You might also be surprised how far you can get with simple, approximate valuations.

The claim that Kerkorian was attempting to greenmail the management presumes that \$55 is too high a price. To get a feel for the appropriate price (and P/B ratio), focus on the residual income model:

$$V_0^E = B_0 + \frac{RE_1}{\rho} + \frac{RE_2}{\rho_E^2} + \frac{RE_3}{\rho_E^3} + \dots$$

Carry out the valuation at December 31, 1995. Kerkorian would be expected to be buying 1995 book value by the time matters were resolved. A rough valuation that relies only on the information at hand runs as follows.

A Rough Valuation

1. Rough Forecasting

Apply information in the equity research report to develop rough pro forma income statements:

	<u>1995A</u>	<u>1996E</u>	<u>1997E</u>	<u>1998E</u>	<u>1999E</u>	<u>2000E</u>
Revenue	53,195	55,323	56,982	56,982	58,122	59,285
Cost of Sales	<u>41,304</u>	<u>42,875</u>	<u>44,161</u>	<u>45,016</u>	<u>45,335</u>	<u>46,242</u>
Gross Margin	11,891	12,448	12,821	11,966	12,787	13,043
Other Expenses	<u>9,887</u>	<u>10,290</u>	<u>10,599</u>	<u>10,599</u>	<u>10,810</u>	<u>11,027</u>
Net Income	<u>2,004</u>	<u>2,158</u>	<u>2,222</u>	<u>1,367</u>	<u>1,977</u>	<u>2,016</u>
Notes:						

- (1) The 1995 gross margin percentage appears to be based on “costs, other than items below” in income statement.
- (2) Other expenses are a percentage of revenue, as incurred in 1995 (18.6%).

Is this pro forma satisfactory?

- a. Net income may not be comprehensive. Chrysler did not publish a statement of shareholders' equity, but the reconciliation of beginning and ending shareholders' equity in footnotes indicates adjustments in pension liabilities and translation adjustments that are part of comprehensive income. These are small and may not be predictable in the future, however.
- b. Are revenue estimates reasonable? This is a strategy and market research issue.
- c. Gross margin should be calculated on sales revenue, not total revenue.
- d. Are gross margin estimates reasonable? This is an issue of technology, production, labor rates, material costs, product mix, etc.
- e. Is the other expense percentage correct? Need further detail:
 - distinguish types of revenue
 - distinguish fixed and variable expenses
 - distinguish interest income and expense from operating items
 - distinguish unusual expenses in 1995 that are not likely to be repeated

More financial analysis is needed. Part Two of the book will supply this.

2. **Rough Valuation (cost of capital 12%)**

Suppose that forecasted 1996 RE will continue in subsequent years at the same level.

$$\begin{aligned}\overline{RE}_{1996} &= 2,158 - (0.12 \times 10,959) \\ &= 843\end{aligned}$$

$$\begin{aligned}V_{1995}^E &= B_{1995} + \frac{\overline{RE}_{1996}}{0.12} \\ &= 10,959 + \frac{843}{0.12}\end{aligned}$$

= \$17.984 billion or \$47.54 per share. Kerkorian's offer was \$55

per share. If Chrysler can maintain 1996 profitability, it looks like the stock is undervalued at 39%.

There are clearly problems here (besides questioning the pro forma):

a. Cost of capital

Test sensitivity: 10%?

$$V_{1995}^E = 10,959 + \frac{843}{0.10}$$

= \$19.389 billion or \$51.25 per share

Use CAPM? Chrysler's beta was about 1.35 at the time.

What cost of capital (and risk) does Kerkorian see?

b. Constant residual earnings prediction

What growth rate in RE would justify a price of \$55 per share?

With 378.3 million shares outstanding at the end of 1995, the total value of the equity was \$20,800 million.

$$20,800 = 10,959 + \frac{843}{0.12 - \text{growth rate}}$$

growth rate = 3.5%

Is this reasonable? Again, one needs more information to decide.

The rough pro forma indicates earnings below 1996 earnings until at least 2001. And those earnings need more investment to maintain them.

On the other hand a market price of $39\frac{3}{4}$ per share in April, 1995 (or, with 378.3 million shares outstanding, \$15,037 million total value) forecasts a perpetual RE as follows

$$15,037 = 10,959 + \frac{\overline{RE}_{1996}}{0.12}$$

$$\overline{RE}_{1996} = 489$$

This implies a forecast of net income for 1996 of \$1,804 million. Too low?

A more thorough valuation would apply the residual earnings model with explicit forecasts of RE for 1997, 1998, and so on. This requires a forecast of book values for subsequent years, and so requires forecasts of dividends and net share issues. In turn this will require a forecast of cash needed which depends on cash to be generated from operations and from borrowing.

This could get complicated. We will simplify the process immensely. And we will develop the financial analysis that will give as much better pro formas than the rough one here.

Valuation using analysts' forecasts

In April 1995, analysts were forecasting eps for 1996 in a range of \$4.15 to \$6.23, with an average of \$5.10. Their forecasts for 1997 ranged from \$3.21 to \$5.55, with an average of \$4.38. The typical growth rate in eps forecasted for the three years after 1997 was 9%.

Using these forecasts, predict future residual earnings:

	<u>1995A</u>	<u>1996E</u>	<u>1997E</u>	<u>1998E</u>	<u>1999E</u>	<u>2000E</u>
Eps		5.10	4.38	4.77	5.20	5.67
Dps		2.50	2.80	2.90	3.00	3.20
Bps	28.97	31.57	33.15	35.02	37.22	39.69
ROCE		17.6%	13.9%	14.4%	14.8%	15.2%
RE(.12)		1.62	.59	.79	1.00	1.20
PV of RE		1.45	.47	.56	.66	.68

[The dps forecast is typically not given by analysts: one has to conjecture what they had in mind in making the eps forecasts, as future eps will depend on prior payout.]

You'll notice the pro forma is on a per-share basis, so one does not have to be concerned with possible share issues or repurchases.

Value the equity as follows:

Book value, 1995	\$28.97
Present value of RE to 2000	3.82
Present value of continuing value	<u>5.67</u>
Value, 1995	<u>\$38.46</u>

$$[\text{Continuing value (no growth)} = \frac{1.20}{0.12} = 10.00]$$

This valuation is sensitive to the continuing value calculation. What did analysts have in mind after the year 2000?

Given analysts' forecasts, the perpetual RE growth rate (after 2000) that yields the bid price of \$55 is 8.7%:

Book value, 1995	\$28.97
Present value of RE to 2000	3.82
Present value of continuing value	<u>22.21</u>
Value, 1995	<u>\$55.00</u>

$$[\text{Continuing value } (g = 1.087) = \frac{1.20 \times 1.087}{1.12 - 1.087} = 39.52]$$

Can we justify a perpetual growth rate of 8.7% in residual earnings?

A lesson to be learnt here: using analysts forecasts can be difficult because they usually do not give (very) long-term growth rates and they do not give dividend forecasts.

By now you are probably frustrated by the lack of information to solve the problem. You also realize you don't have all the tools. Indeed the purpose of this case is to spur you on to the succeeding chapters of the book which give you the apparatus to deal with the problem.

You found that you lacked the following:

- a) A strategy analysis
- b) More information on how strategy will generate sales
- c) More information on the expected profit margins and expense ratios of the business
- d) The tools to determine not just the future ROCE but also the growth in book value which determine future residual earnings. What investments will be necessary? How much additional equity will have to be raised?
- e) The long-term growth rate is clearly crucial.

Question C of the Case

Kerkorian might advance the following arguments for paying out the \$7.5 billion in cash:

- a) If management can't find good investments for the cash, give it to the shareholders who might.
- b) Without a cash buffer to protect themselves during bad times, management may work harder to generate more profits for shareholders and to protect shareholders against bad times in other ways. And management who have excess cash are tempted to invest it unwisely. Corporate Jets? This is the so-called "free cash flow hypothesis:" too much cash gives poor incentives to management. Are management just protecting themselves - their jobs and their incomes - against a rainy day rather than protecting shareholders?
- c) The rainy day argument has a fallacy. If a rainy day brings trouble, but it's temporary trouble, the firm can (if it indeed needs cash) borrow or issue new stock against the value expected to be generated in a recovery. A problem might be communicating to banks or the capital market that the trouble was temporary. Chrysler had had an experience in the late 1970s and early 1980s when it required US government guarantees on debt raised to get it through its troubles.

If a rainy day were permanent (operations permanently unprofitable) then the shareholders would not wish management to have the cash to lose in "chasing after the bad".

- d) The “cash” is in the form of liquid financial assets. Holding financial assets within corporations is not in shareholders’ interest. The interest income is taxed within the corporation and then again to the shareholders through taxes on dividends on capital gains for the income. This double taxation is avoided by payout. If investors want to invest in financial assets (which take no special skills), they should do it on personal account, not through a corporation. Holding financial assets in a corporation is justified only as a way of temporarily storing cash until it is needed in operations. This need is what’s at issue.
- e) If, as management insists, the financial assets are being held to use in operations, they are at risk in operations. Accordingly they should be required to earn at rate reflecting that risk. They are currently earning at the rate for less risky debt investments. Thus, as assets employed in operations, they are generating negative residual earnings and losing value. Suppose the financial assets (T-bills, say) were earning 3.5% after tax. Then, with approximately \$8.0 billion of the assets, the annual income would be \$280 million in income. As a holding of T-bills, they would earn zero residual income:

$$\text{Residual income} = 280 - (0.035 \times 8.0 \text{ billion}) = 0$$

Here the required return is just the required return on T-bills. But, if the assets were being put at risk in the operations (for a rainy day), the required rate is the rate for the risk in the operations. If this is 12%, then

$$\text{Residual income} = 287 - (0.12 \times 8.0 \text{ billion}) = - \$673 \text{ million (negative!)}$$

So the annual cost for carrying these assets as insurance against a rainy day is \$673 million. Is this expensive insurance? Can the shareholders better employ the \$8.0 billion elsewhere?

- f) If Chrysler's shares were undervalued, the cash could be used to buy back the stock and so create value for shareholders.