



Exercise 1

$$a) (1) FLEV = \frac{NFC}{CSE} = \frac{(1320 - 1221)}{16649} = 0.0059 = \underline{0.59\%}$$

$$(2) \text{After-tax operating PM} = \frac{OI(\text{after tax})}{\text{sales}} = \frac{1549.3}{26776} = 0.0579 = \underline{5.79\%}$$

OI	2523
- income tax	(978)
+ tax on interest income*	4.3
OI (after tax)	<u>\$1549.3 million</u>

* Since the company has net financial income instead of net financial expense one have to add the tax component from this income instead of deducting it as it would have done with tax benefit on net debt.

$$b) (1) RNOA = PM \times ATO$$

$$9.3\% = 5.79\% \times ATO \rightarrow ATO = \frac{9.3\%}{5.79\%} \approx \underline{1.61}$$

$$(2) ReOI_{2011} = [RNOA - (p_F - 1)] \times NOA_{2010} = [0.093 - (1.04 - 1)] \times 16659.1$$

$$\approx \underline{\$882.9 \text{ million}}$$

$$NOA_{2010} = \frac{OI_{2011}}{RNOA} = \frac{1549.3}{9.3\%} \approx 16659.1$$

$$c) FCF_{2011} = OI_{2011} - \Delta NOA_{2011}$$

$$= 1549.3 - (16748 - 16659.1) = \underline{\$1460.4 \text{ million}}$$

$$* NOA_{2011} = 23457 - 6709 = 16748$$

d) $\$50 \times 2336 = 116\,800 = V_{2011}^E$ implied by the market

$$V_{2011}^E = CSE_{2011} + \frac{RO_{2011} \times g}{PF - g}$$

$$116\,800 = 16\,649 + \frac{882.9 \times g}{1.04 - g} \quad || \times 1.04 - g$$

$$121\,472 - 116\,800g = 17\,314.96 - 16\,649g + 882.9g$$

$$g = \frac{121\,472 - 17\,314.96}{116\,800 - 16\,649 + 882.9} = \underline{\underline{1.0309}}$$

The market forecast a growth rate of 3.09% for residual operating income, based on my calculations.

e) unlevered price-to-sales = $\frac{V_{2011}^E + NFO_{2011}}{\text{sales}_{2011}}$

$$= \frac{116\,800 + (1320 - 1221)}{26\,776} \approx \underline{\underline{4.366}}$$

f) Sales growth rate are determined by growth in PM, growth in asset turnover and growth in net assets. This is the same assumption for growth in residual operating income. Therefore must the sales growth rate implied in the price-to-sales ratio (hence, implied in the value of equity) be equal to the implied growth rate for residual operating income; 3.09%

Exercise 2

- a) Since this is an equity statement for a pure equity firm OI (after tax) will be equal to net income. We can derive this from sales and PM:

$$OI(\text{after tax}) = 912 \times 0.125 = \underline{\$114 \text{ million} = \text{net income}}$$

To get comprehensive income we have to include the dirty surplus items:

$$\text{comprehensive income} = 114 - 8 + 6 = \underline{\$112 \text{ million}}$$

- b) Since it is a pure equity firm FCF is equal to net dividends to shareholders (d). From the clean surplus relation we have:

$$d_{2015} = CSE_{2014} + \text{comp. income}_{2015} - CSE_{2015}$$

$$= 760 + 112 - 963 = \underline{\$(-91 \text{ million})}$$
, which is negative

free cash flow, meaning investments are higher than cash flow generated by operations.

- c) $d = \text{common dividends} + \text{repurchases} \div \text{share issues}$

$$(-91) = \text{common dividends} + 0 \div 102$$

$$\rightarrow \text{common dividends paid to shareholders} = 102 - 91 = \underline{\$11 \text{ million}}$$

- d) $\text{coreRNOA} = \frac{OI_{2015}}{NOA_{2014}}$ in this case (pure equity firm) $NOA_{2014} = CSE_{2014}$.

$$\text{coreRNOA} = \frac{114}{760} = 0.15 = \underline{15\%}$$

- e) $\text{coreRNOA} = PM \times ATO$

$$15\% = 12.5\% \times ATO$$

$$\rightarrow ATO = \frac{15\%}{12.5\%} = \underline{1.2}$$

Exercise 3

- a) WRONG. Accountants can manipulate earnings (by different accounting methods) for the firm to seem more or less profitable on an annual basis. Free cash flows, on the other hand, cannot be manipulated by accounting hence the firm will have more control and they are usually more stable. The firm can invest more or less each year (can make huge differences), but for a firm to want to invest the investment has to create cash flows into the firm as well (cash flow from operations) so the differences in investments will be evened out. However, if firms invest differently each year in investments that does not provide inflow of cash FCF might be unstable, but I see no reason for why firms want to use cash on such investments.
- b) RIGHT. Liberal accounting put higher values of assets on the balance sheet, hence lower return on common equity (ROCE) and return on net operating assets (RNOA) which is measures for lower profitability.
- c) DEPENDS. If the risk-free interest rate increases the discount rate for operations (r_F) will also increase. However, the ~~discount~~ effect on the discount rate for equity^(r_E) is also determined by financial leverage and cost of debt. But, if financial leverage and cost of debt remains the same after the increase in risk-free rate it will increase the discount rate for equity as well.
- d) WRONG. Dirty surplus items should be put in the income statement instead of having it in the equity statement. Dirty surplus are added to net income to get comprehensive income, which is the earnings an investor base his/hers valuation on.

Exercise 4	2015	2016	2017	2018	2019	2020
a) Book value	315 000	255 750	196 539	137 364	78 234	0
OI		4 200	46 200	50 610	55 241	60 103
ReOI*		6 594	17 453.7	28 519	39 801.3	51 309.5

$$* = OI_t - (p_F - 1)B_{t-1}$$

b) First, use discounted cash flow model:

$$V_{2015}^P = \frac{101\,250}{1.1124} + \frac{105\,413}{1.1124^2} + \frac{109\,783}{1.1124^3} + \frac{114\,872}{1.1124^4} + \frac{138\,335}{1.1124^5} \approx \underline{\underline{411\,866}}$$

Now, use residual operating income model:

$$V_{2015}^P = 315\,000 + \frac{6\,594}{1.1124} + \frac{17\,453.7}{1.1124^2} + \frac{28\,519}{1.1124^3} + \frac{39\,801.3}{1.1124^4} + \frac{51\,309.5}{1.1124^5} \approx \underline{\underline{411\,866}}$$

As we can see the values calculated by the two valuation models are equal, which indicate this is the correct valuation based on the forecasts as the discounted cash flow model and residual operating income model should give identical values.

Exercise 5 Proof that the abnormal ^{earnings} growth model (AEGM) can be derived from the residual earnings model (REM):

Start with the REM: $V_0^E = B_0 + \sum_{t=1}^{\infty} \frac{RE_t}{p_E^t}$

where $RE_t = Eam_t - (p_E - 1)B_{t-1}$

we can define $(p_E - 1)B_{t-1}$ as required earning (REQE), hence

$$RE_t = Eam_t - REQE_t$$

First we assume that residual earning is constant for all future periods ($RE_1 = RE_2 = RE_3 = \dots = RE_{\infty}$). Then we can use the perpetuity model for valuation:

$$V_0^E = B_0 + \frac{RE_1}{p_E - 1}, \text{ put in what we defined in the beginning}$$

$$V_0^E = B_0 + \frac{Eam_1}{p_E - 1} + \frac{REQE_1}{p_E - 1}$$

To get the same denominator B_0 can be reformulated as $\frac{B_0(p_E - 1)}{p_E - 1}$, which can be written as $\frac{REQE_1}{p_E - 1}$ (see definition above). We are then left with:

$$V_0^E = \frac{Eam_1}{p_E - 1}, \text{ which is the AEGM if residual earnings are constant and therefore abnormal earnings growth are zero}$$

However, constant residual earnings might not be a realistic assumption. Instead we assume residual earnings will grow from $t=1$ to $t=2$, and that this is an one-time event ($RE_1 < RE_2 = RE_3 = RE_{\infty}$)

The change from RE_1 to RE_2 can be written as $\Delta RE_2 (= RE_2 - RE_1)$.

Since residual earnings are constant after this change we just need to add this one-time event to the valuation model we used before, but first we can rearrange that model to:

$$V_0^E = \frac{REQE_1}{p_E - 1} + \frac{RE_1}{p_E - 1}$$



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 Kandidatnr. : 4106
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Now we can add the value of ΔRE_2 . Since it is constant after $t=2$ it is a perpetuity: $\frac{\Delta RE_2}{p_E - 1}$, but this gives us the value in $t=1$ and we want to discount it an additional year to get the value at time 0. Hence: $\frac{\Delta RE_2}{(p_E - 1) \cdot p_E}$.

Now we can put that expression into the rearranged valuation model:

$$V_0^E = \frac{REQE_1}{p_E - 1} + \frac{RE_1}{p_E - 1} + \frac{\Delta RE_2}{(p_E - 1) \cdot p_E}$$

$$= \frac{1}{p_E - 1} \left(REQE_1 + RE_1 + \frac{\Delta RE_2}{p_E} \right)$$

Remember $RE_t = Eam_t - REQE_t \rightarrow Eam_1 = REQE_1 + RE_1$, hence

$$V_0^E = \frac{1}{p_E - 1} \left(Eam_1 + \frac{\Delta RE_2}{p_E} \right)$$

If residual earnings change every year/time/period the model can just add the change as it did with ΔRE_2 and the model can be written as:

$$V_0^E = \frac{1}{p_E - 1} \left(Eam_1 + \frac{\Delta RE_2}{p_E} + \frac{\Delta RE_3}{p_E^2} + \dots + \frac{\Delta RE_\infty}{p_E^{\infty-1}} \right)$$

It can be proven that $\Delta RE_t = AEG_t$, hence the model can be reformulated (see proof of $AEG_t = \Delta RE_t$ on next page)

$$V_0^E = \frac{1}{p_E - 1} \left(Eam_1 + \frac{AEG_2}{p_E} + \frac{AEG_3}{p_E^2} + \dots + \frac{AEG_\infty}{p_E^{\infty-1}} \right), \text{ which is the abnormal earnings growth model. } \Delta QED$$

To prove that $AEG_t = \Delta RE_t$ we start with defining AEG_t :

$$\begin{aligned}
 AEG_t &= Eam_t + (p_E - 1)d_{t-1} - p_E Eam_{t-1} \\
 &= Eam_t + \underbrace{Eam_{t-1} - Eam_{t-1}}_{=0} + (p_E - 1)d_{t-1} - p_E Eam_{t-1} \\
 &= Eam_t - Eam_{t-1} + (p_E - 1)(d_{t-1} - Eam_{t-1}) \\
 &= Eam_t - Eam_{t-1} - (p_E - 1)(Eam_{t-1} - d_{t-1})
 \end{aligned}$$

~~These~~ If the clean surplus relation holds: $Eam_{t-1} - d_{t-1} = B_{t-1} - B_{t-2}$
 Thus,

$$\begin{aligned}
 AEG_t &= Eam_t - Eam_{t-1} - (p_E - 1)(B_{t-1} - B_{t-2}) \\
 &= [Eam_t - (p_E - 1)B_{t-1}] - [Eam_{t-1} - (p_E - 1)B_{t-2}] \\
 &= RE_t - RE_{t-1} \\
 &= \Delta RE_t \qquad \qquad \qquad \Delta QED
 \end{aligned}$$