Homework Solutions - Lecture 1

1. You are analyzing a company with the expected future cash flows shown below. Based on current market prices, the market value of the firm’s equity is $1,962.9. The outstanding debt has both a market and book value of $800. The firm's cost of equity \((k_e)\) is 11.0%, the firm’s past and future cost of debt is 10%, and the firm's tax rate is \(t=50\%\). Use this information to answer the questions below.

<table>
<thead>
<tr>
<th>Year</th>
<th>FCF to Firm</th>
<th>Int Exp ((1-t))</th>
<th>FCF to Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$140.0</td>
<td>$40</td>
<td>$100.0</td>
</tr>
<tr>
<td>2</td>
<td>$150.0</td>
<td>$40</td>
<td>$110.0</td>
</tr>
<tr>
<td>3</td>
<td>$161.0</td>
<td>$40</td>
<td>$121.0</td>
</tr>
<tr>
<td>4</td>
<td>$173.1</td>
<td>$40</td>
<td>$133.1</td>
</tr>
<tr>
<td>5</td>
<td>$186.4</td>
<td>$40</td>
<td>$146.4</td>
</tr>
<tr>
<td>Terminal Value</td>
<td>$3339.6</td>
<td>$2562.2</td>
<td></td>
</tr>
</tbody>
</table>

a. Calculate the value of the firm's equity by discounting the listed Free Cash Flows to Equity.

\[
PV_{\text{Equity}} = \frac{100}{1.11} + \frac{110}{1.11^2} + \frac{121}{1.11^3} + \frac{133.1}{1.11^4} + \frac{(146.4 + 2562.2)}{1.11^5} = $1962.9
\]

b. Calculate the value of the overall firm by discounting the listed Free Cash Flows to the Firm. Use your solution to calculate the value of the firm's equity.

\[
WACC = \left(\frac{1962.9}{2762.9}\right)10\% + \left(\frac{800}{2762.9}\right)10\%(1-.5) = 9.26\%
\]

\[
PV_{\text{Firm}} = \frac{140}{1.0926} + \frac{150}{1.0926^2} + \frac{161}{1.0926^3} + \frac{173.1}{1.0926^4} + \frac{(186.4 + 3339.6)}{1.0926^5} = $2762.9
\]

\[
PV_{\text{Equity}} = PV_{\text{Firm}} - MV \text{ of Debt} = 2762.9 - 800 = $1962.9
\]

c. In this example, the estimated value of equity was the same using the FCFE and FCFF models. In general, this will be the case only if:

i. The value of equity used to calculate the cost of capital is equal to the value obtained in the valuation.

ii. The interest expenses are equal to the pre-tax cost of debt multiplied by the market value of debt (i.e., debt is priced at face value).

iii. There are no extraordinary or nonoperating items that affect net income but not operating income (i.e., the only difference is interest expense).
2. I have attached Nike's financial statements from the most recent fiscal year ending May 31, 2012. The notes to the financial statements and full 10K are available on the class web site. Throughout the course, you will use this information to complete several assignments related to the valuation of Nike.

a. Using Nike's financial statements and any additional resources required, calculate the profitability ratios we discussed in class. Compare these ratios to those we calculated for Home Depot and note any important similarities and differences between the two firms.

Effective Tax Rate = \( \frac{760}{2983} \) = 25.5%

Gross Profit Margin = \( \frac{10471}{24128} \) = 43.40%

Aftertax Operating Profit Margin = \( \frac{(10471 - 7431)(1 - .255)}{24128} \) = \( \frac{2264.8}{24128} \) = 9.39%

Net Profit Margin = \( \frac{2223}{24128} \) = 9.21%

Return on Capital = \( \frac{(10471 - 7431)(1 - .255)}{(200 + 187 + 276) + 9843} \) = 21.56%

Return on Equity = \( \frac{2223}{9843} \) = 22.58%

EBIT = 10471 - 7431 = 3040. The debt used for the ROC calculation includes all short-term and long-term debt, including the current portion of long-term debt and notes payable. In addition, for the ROE and ROC where we compare an income statement number to a balance sheet number, I am using the beginning of period balance sheet value. It would also be acceptable to use the average of the beginning and ending period balance sheet values. Using average debt and equity values gives ROC=21.3% and ROE=22.0%.

The comparable values for Home Depot are 36.0%, 34.5%, 6.1%, 5.5%, 14.9%, and 20.6%, respectively. All of Nike's margins are significantly higher than those for Home Depot and the firm's effective tax rate is lower. In addition, both the ROC and ROE are higher for Nike than for Home Depot. By these measures, Nike is more profitable and has lower costs than Home Depot.
b. As shown in part (a), the ROC for Nike is 21.6%, which is significantly higher than what we calculated for Home Depot (14.9%). Nike's ROC can be decomposed into an after-tax operating margin and capital turnover ratio as follows:

\[
\text{Return on Capital (ROC)} = \frac{(10471 - 7431)(1 - .255)}{(200 + 187 + 276) + 9843} = \left(\frac{2264.8}{24128}\right) \times \left(\frac{24128}{10506}\right)
\]

\[= 21.6\% = 9.39\% \times 2.30\]

Nike's capital turnover (2.30) is slightly lower than Home Depot's (2.46). Thus, Nike's higher ROC appears to be driven by Nike's higher operating margins (lower costs), rather than by Nike's ability to generate sales (capital turnover).

As shown in part (a), the ROE for Nike is 22.6%, which is again higher than what we calculated for Home Depot (20.6%). Nike's ROE can be decomposed into net profit margin, capital turnover ratio, and financial leverage, as follows:

\[
\text{Return on Equity (ROE)} = \frac{2223}{9843} = \left(\frac{2223}{24128}\right) \times \left(\frac{24128}{10506}\right) \times \left(\frac{10506}{9843}\right)
\]

\[= 22.6\% = 9.21\% \times 2.30 \times 1.067\]

As with the ROC, the higher ROE for Nike appears to be driven by higher margins. Again, Nike's capital turnover ratio (2.30) is slightly lower than that of Home Depot (2.46). In addition, Home Depot's ROE is driven up by its use of leverage, which is much higher than that of Nike. Without this leverage, Home Depot's ROE would look even worse relative to that of Nike. We can also decompose ROE as a function of ROC, as follows:

\[
\text{Return on Equity (ROE)} = \frac{ROC - D}{E} \left(ROC - i(1 - T)\right)
\]

\[= .2156 + \frac{663}{9843}(.2156 - .086(1 - .255))
\]

\[= .2156 + (.0674)(.2156 - .064) = .2156 + .0102 = 22.6\%
\]

where \(i = \frac{(3 + 54)}{663} = 8.6\%\)

This breakdown illustrates the large leverage effects in the ROE for Home Depot in comparison to Nike.
Additional Comments on the Effects of Investment Income and Expenses:

In the analysis above, all calculations are based on the Net Income as listed on the income statement. One issue that we have ignored in these calculations is the effect of investment income and expenses. To perform the valuation carefully, we should remove the effects of investment and other income/expenses from Net Income.

The income statement lists “interest expense, net” of $3 million and “other expense” of $54 million. Both expenses are subtracted before arriving at the Net Income number of $2,983 million. A careful reading of notes 6 and 16 provides more detail regarding these numbers. In particular, the “interest expense, net” value includes interest expense of $33 million and investment income of $30 million. The “other expense” value of $54 million is related to a change in the value of the firm’s derivatives positions.

To perform a careful analysis of net income and free cash flow to equity, we would eliminate the effects of the investment income and expenses. We can then value the firm’s investments and derivatives positions separately and adjust the firm valuation to account for these investments. To be more specific we should add back to Net Income the after-tax value of the derivative expense and subtract from Net Income the after-tax value of the investment income. This would leave only $33 million in interest expenses on the income statement. Note that adjustments to income should be made based on the marginal tax rate. As we will discuss in the lecture 3 homework, the marginal tax rate for Nike is 24.8%.

The adjusted values of Net Income and ROE would then be calculated as follows:

(Adjusted) Net Income = 2223 + (54 – 30)(1 – .248) = 2223 + 18.05 = 2241.05

(Adjusted) Return on Equity = \( \frac{2241.05}{9843} \) = 22.8%

The two decompositions of ROE could then be performed as follows:

Return on Equity (ROE) = \( \frac{2241.05}{9843} \) = \( \left( \frac{2241.05}{24128} \right) \times \left( \frac{24128}{10506} \right) \times \left( \frac{10506}{9843} \right) \)

= 22.8% = 9.29% × 2.30 × 1.067

Return on Equity (ROE) = \( ROC - \frac{D}{E} (ROC - i(1 - T)) \)

= .2156 + \( \frac{663}{9843} \)(.2156 – .0498(1 – .248))

= .2156 + (.0674)(.2156 - .0374) = .2156 + .012 = 22.8%

where \( i = \frac{33}{663} = 4.98\% \)