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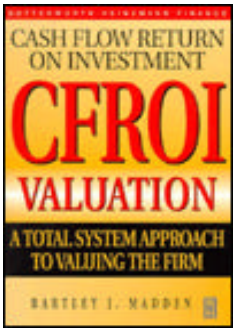
Investment Principles

Rev. September 29, 2003

## Absolute Valuation: Cash Flow Return on Investment (CFROI)

**Objective:** The objective of this assignment is to help reinforce the concept of Cash Flow Return on Investment (CFROI), which is an alternative value added technique to Economic Value Added (EVA). Proponents of CFROI include Holt Value Associates (now a part of Credit Suisse First Boston (CFSB)) and the Boston Consulting Group. More specifically, this exercise is designed to have you learn how to:

- Chart the Relative Wealth of our Firm
- Estimate the typical life of a project (project life) for our firm
- Convert historical cost to current values by calculating an inflation adjustment factor
- Derive Gross Cash Investment (as if the firm invested in all existing assets last year)
- Calculate Gross Cash Flows and Terminal Value of the Firm
- Calculate the CFROI given preceding inputs
- Calculate the Weighted Average Cost of Capital (WACC)
- Value the firm using assumptions about the life cycle of the firm and preceding inputs
- Partition the value of the firm into value from existing assets and future investments




Prior to doing this assignment, please read Madden, *CFROI Valuation: A Total System Approach to Valuing the Firm*. Be sure that you understand Chapter 3 and Chapter 7 thoroughly prior to undertaking this project. Also read the following articles:

The CFROI valuation model; Bartley J Madden; Journal of Investing, NY; Spring 1998; Vol. 7(1); pg. 31, 14 pgs

Analytical Tools: CSFB HOLT ValueSearch, Credit Suisse First Boston, May 29, 2002

Value Creators Report 2002: Succeed in Uncertain Times, Boston Consulting Group, 2002

These articles are located in the readings portion of my IP (Investment Principles) website (this is a password protected site): http://pages.stern.nyu.edu/~cliu/ip.html.

Since CFROI is a competing model to EVA, we will use the same firm that we used to do the EVA valuation, namely Lowe's. Following is the same information on Lowe's that was provided to you when you did the EVA case.

**Company:** Lowe's Companies, Inc. (Ticker: LOW, http://www.lowes.com) is the #2 US home improvement chain (after The Home Depot) with more than 850 superstores in about 45 states. The company's stores sell more than 40,000 products for home improvement and repair projects as well as appliances (for which the company has a market share of 14%) and consumer electronics. While Lowe's has previously concentrated on small and medium-sized markets, Lowe's is currently expanding in large metro areas, especially in the Northeast and Midwest. However, the company still plans on expanding its traditional customer base with approximately half of its new stores being smaller stores in rural markets. Lowe's is also focusing its attention on female customers, who, the company claims, call the shots on about 80% of home improvement decisions.


On September 23, 2003, Lowe's held their 2003 analyst and investors conference where Robert F. Hull, Jr., senior vice president and CFO, indicated that Lowe's fundamentals are strong and the company's future outlook remains bright. "We plan to add 140 and 150 new stores in fiscal 2004 and 2005, respectively, equating to approximately 13 to 15 percent square footage growth per year," said Hull. "This square footage growth should drive annual sales increases of approximately 17 percent for fiscal 2004 and 2005."

With fiscal year 2002 sales of $26.5 billion, Lowe's Companies, Inc. is a FORTUNE 100 company that serves approximately nine million customers a week at more than 900 home improvement stores in 45 states. In 2003, FORTUNE named Lowe's America's Most Admired Specialty Retailer. Based in Wilkesboro, N.C., the 57-year old company is the second-largest home improvement retailer in the world.

**Competitors**: Home Depot (HD), Menard (Private Company), and TruServ (Private-Cooperative)

**Assignment**: Download the spreadsheet labeled ip_cfroi_spr2004.xls from my website and do all your work on this spreadsheet. This is an *individual* assignment. Although you can discuss this case with your classmates, you are responsible for doing the case yourself. Students caught cheating will be given an F on this assignment. In doing this assignment, please use the assumptions given on the next page. The assignment/questions can be found after the assumptions. Please do NOT wait until the last minute to do this assignment. Start this assignment as soon as it is assigned. It should take you at least a couple of days. Good luck.

Assumptions to Use in Calculations:

| Item | Assumption |
|---|---|
| Forecasted CFROI | Use the number that you calculated in question 7 for the year 2003 (t+1). Use 6.3% for the forecasted CFROI in year 2042. This figure is based on mean reversion e.g., reversion to the average for all firms (refer to the article and book by Madden).<br><br>Assume that the CFROI will fade up or down for the period from year 2003 to year 2007. After this, the CFROI declines in a linear fashion to its long-term average.<br><br>For the period from 2004 to 2007, let CFROI = R and<br><br>$\underline{\text{if } R_{2003} > R_{2007} \text{ then}}$ $\quad\quad$ $\underline{\text{if } R_{2003} < R_{2007} \text{ then}}$<br>$R_{2004} = R_{2003} - (R_{2003}-R_{2007})/4$ $\quad\quad$ $R_{2004} = R_{2003} + (R_{2007}-R_{2003})/4$<br>…… $\quad\quad$ ……<br>$R_{2007} = R_{2006} - (R_{2003}-R_{2007})/4$ $\quad\quad$ $R_{2007} = R_{2006} + (R_{2007}-R_{2003})/4$<br><br>For the period from 2008 to 2042,<br><br>$CFROI_{2008} = CFROI_{2007} - (CFROI_{2007} - CFROI_{2042})/35$<br>$CFROI_{2009} = CFROI_{2008} - (CFROI_{2007} - CFROI_{2042})/35$<br>……<br>$CFROI_{2041} = CFROI_{2040} - (CFROI_{2007} - CFROI_{2042})/35$<br><br>After 2042, CFROI on new projects = WACC = 6.3%. |
| (Simple) Plowback Ratio | Plowback = (Net Income + Depreciation + Minority Interest - Dividends)/(Net Income + Depreciation + Minority Interest+ Interest Expense + Implied Interest on Op Leases). This ratio differs from the traditional plowback definition used in finance. |
| Inflation Rate | 1.339% |
| Percent Change in GDP Deflator | Assume that it's 1.339%. This is used in calculating the Gross Cash Flow (see question 6). |
| Tax Rate | Tax Rate = Provision for Income Taxes/Income Before Tax |
| Risk free Rate | Assume that the rate on a 10-year Treasury bond remains constant at its (year) 2002 level |
| Risk Premium | Assume that it is .055 or 5.5% |

**Assumptions to Use in Calculations**: (continued)

| Item | Assumption |
|---|---|
| Sustainable Growth Rate | Approximate Sustainable Growth Rate in 2003 (t+1)<br><br>= Simple Plowback Ratio * Current Year CFROI (2002)<br><br>Approximate Sustainable Growth Rate in 2007 (t+5)<br><br>= Simple Plowback Ratio * Expected CFROI on New Investments in 2007 (t+5)<br><br>For the period from 2004 to 2007,<br><br>if $G_{2003} > G_{2007}$ then<br>$G_{2004} = G_{2003} - (G_{2003}-G_{2007})/4$<br>……<br>$G_{2007} = G_{2006} - (G_{2003}-G_{2007})/4$<br><br>if $G_{2003} < G_{2007}$ then<br>$G_{2004} = G_{2003} + (G_{2005}-G_{2003})/4$<br>……<br>$G_{2007} = G_{2006} + (G_{2007}-G_{2003})/4$<br><br>For the period from 2008 to 2042,<br><br>$Growth_{2008} = Growth_{2007} - (Growth_{2007} - Growth_{2042})/35$<br>$Growth_{2009} = Growth_{2008} - (Growth_{2007} - Growth_{2042})/35$<br>……<br>$Growth_{2041} = Growth_{2040} - (Growth_{2007} - Growth_{2042})/35$<br><br>Sustainable Growth Rate in 2042 (t+40) = 2.5%<br><br>No growth occurs after 2042 since CFROI on new projects = WACC so there are no new investments. |
| Real Discount Rate (WACC) | Assume that the WACC that you calculated in question 6 remains constant from year 2003 up to and including year 2007 (t+1 until t+5). After this period, it decreases in a linear fashion to 6.3% (from article and book by Madden) in 2042 (t+40). It remains at 6.3% after year 2042.<br><br>$WACC_{2008} = WACC_{2007} - (WACC_{2007}-WACC_{2042})/35$<br><br>where $WACC_{2042} = 6.3\%$<br><br>Note that the CFROI methodology assumes that the CFROI on New Projects = WACC in 40 years. Hence, no new investments are made after this period because no incremental relative wealth is created since the return on new projects is equal to its borrowing cost. |

**Assumptions to Use in Calculations**: (continued)

| Item | Assumption |
|---|---|
| Amortization of Goodwill | Goodwill, if any, can no longer be amortized in accordance with SFAS 42. However, impairments to goodwill can be deducted. |
| Depreciation and Amortization | If depreciation and amortization is reported in the income statement then this figure otherwise use the depreciation and amortization that is reported in the Statement of Cash Flows. Note: If the depreciation = "NA" in the income statement, then the cost of goods sold includes depreciation and amortization. |
| Monetary Holding Gain (Loss) | If Net Monetary Holdings are negative, inflation results in a real gain because the firm settles net obligations with dollars of reduced purchasing power. Such gains should be added to Net Income to derive Current Dollar Gross Cash Flow |
| Pension Intangibles | Pension intangibles are zero for Lowe's. |
| Cash Flows on New Projects | This is calculated using the payment function in Excel e.g.,<br><br>Cash Flow = PMT(rate, nper, pv, fv, type)<br><br>For our firm, this translates into<br><br>Cash Flows for $Project_T$= PMT(Project $ROI_{T+1}$, Project Life, Expenditures for New Property and $Plant_{T+1}$, Investment Net Working $Capital_{T+1}$)<br><br>Where<br>Cash Flows for a Project are constant over its life<br>Project $ROI_{T+1}$ = CFROI on new investments in period T+1<br>Project Life = answer you got from question 1<br>Expenditures for $PP\&E_{T+1}$ = see below<br>Investment Net Working $Capital_{T+1}$ = see below<br><br>Note: Use your answer in worksheet "6. Gross Cash Flows" for $Project_{2002}$ cash flows. |

**Assumptions to Use in Calculations**: (continued)

| Item | Assumption |
|---|---|
| Project Life | Project life is derived using the worksheet labeled "3. Asset Life". The life of each project is identical. For example, if the first project has a life of 5 years, then the second project also has a life of 5 years.<br><br>$\text{Life of Project}_{2002} = \text{Life of Project}_{2003} = \ldots = \text{Life of Project}_{2042}$<br><br>To simplify our calculations, assume that capital spending each year is invested in only one "big" project even though it might be spent on several projects. In other words, all projects for a given year are assumed to have the same IRR and are added up to equal one big project. |
| Expenditures for New Property and Plant | Expenditures for new PP&E (known also as capital spending or capital expenditures) grow at the sustainable growth rate.<br><br>$\text{New PP\&E}_{T+1} = \text{PP\&E}_T*(1+ \text{Sustainable Growth Rate}_{T+1})$<br><br>So<br><br>$\text{New PP\&E}_{2003} = \text{PP\&E}_{2002}*(1+ \text{Sustainable Growth Rate}_{2003})$<br><br>Capital spending occurs each year until the year 2042. After 2042, there are no capital expenditures since the firm is assumed to wind-down (ROIC=WACC). |
| Depreciable Assets | In template "10. Valuation and Partitioning",<br><br>$\text{Depreciable Assets}_T$ = Expenditures for New Property and $\text{Plant}_T$ * (Ratio of Depreciable Assets/Gross Cash Investment).<br><br>This ratio is the result/answer from question 5. |
| Investment Net Working Capital (Non-depreciable Assets) | In template "10. Valuation and Partitioning",<br><br>$\text{Non-Depreciable Assets}_T$ = Expenditures for New Property and $\text{Plant}_T$ * (Ratio of Non-Depreciable Assets/Gross Cash Investment).<br><br>This ratio is the result/answer from question 5. Thus,<br><br>$\text{New PP\&E}_T = \text{Depreciable Assets}_T + \text{Non-Depreciable Assets}_T$ |

**Assumptions to Use in Calculations**: (continued)

| Item | Assumption |
|---|---|
| Recaptured Net Working Capital | Net Working Capital (aka Non-depreciable assets) is recaptured at the end of the useful project life. For example, suppose that each project has a life of 10 years. Then if the first project began in 2002, the non-depreciable assets associated with the first project, $Project_{2002}$, would be recaptured in 2012. The second project, $Project_{2003}$, started a year later in 2003, would have its non-depreciable assets recaptured e.g. sold in 2013. The useful life is your answer to question 3. |
| Minority Interest | Please be careful. There is a minority interest in the income statement ( a flow variable) and a minority interest in the balance sheet (a stock variable). The minority interest in the balance sheet is stated in terms of book value. To derive the minority interest in market value terms (balance sheet item), we use the price to book ratio (see the worksheet labeled "8. WACC"). Alternatively, we could have used the price to earnings ratio * minority interest income (in the income statement) to arrive at the market value for minority interest in the balance sheet. |

Hint: In setting up your spreadsheet(s), some cells require that you use IF statements such as =IF($B$6>$B$7,C20-($B$6-$B$7)/4,C20+($B$7-$B$6)/4) or nested IF statements such as in calculating the Recaptured Net Working Capital in the valuation worksheet

(IF(AverageScore>89,"A",IF(AverageScore>79,"B",IF(AverageScore>69,"C",IF(Average Score>59,"D","F"))))).

If you are not familiar with the IF command, click on Help in Excel and then select Contents and Index.

**Assignment**: Please complete all highlighted sections of each worksheet.

1. Using the "Returns (LOW HD)" worksheet,

   a. Calculate and graph the relative wealth index for Lowe's using a Column graph. In constructing your Column graph, show the values of your Data Labels. Next, add a trendline to this Column graph. To add a trendline, right click on mouse after positioning the cursor over a bar in the bar chart and click on the Trend/ Regression Type. Here we will use a polynomial regression.

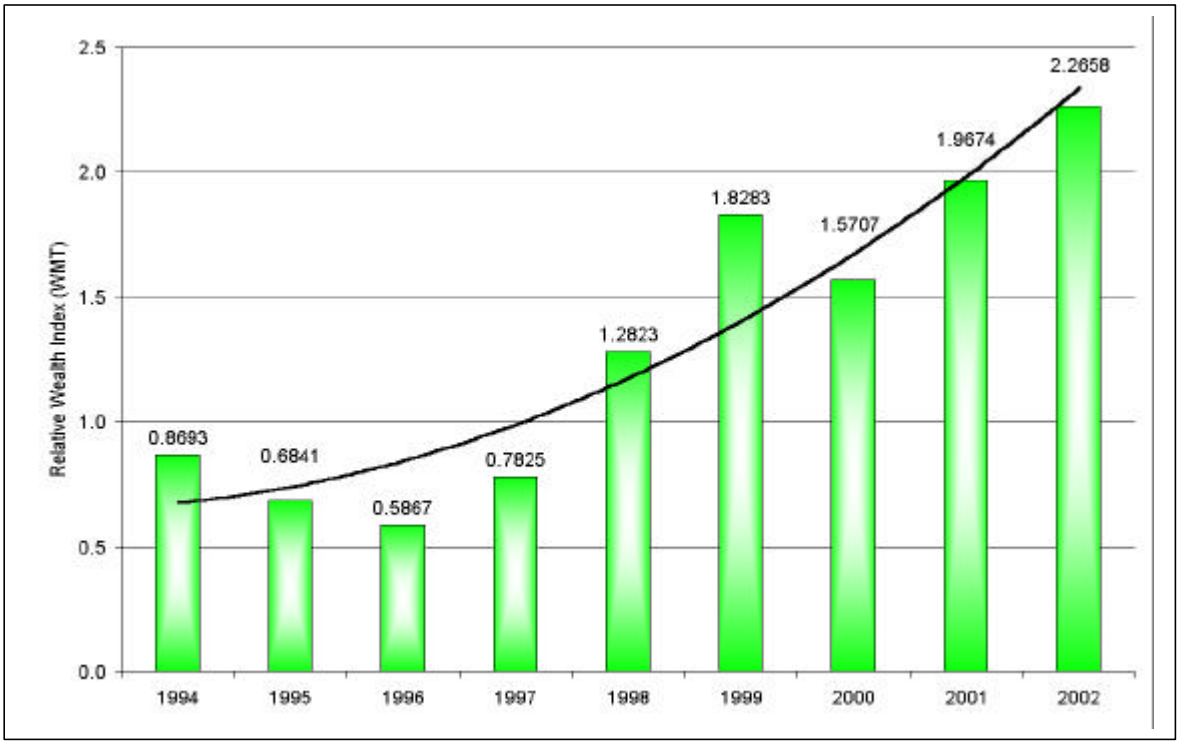
   b. Calculate and graph the relative wealth index for Home Depot. In constructing your Column graph, show the values of your Data Labels. Next, add a trendline to this Column graph. To add a trendline, right click on mouse after positioning the cursor over a bar in the bar chart and click on the Trend/ Regression Type. Here we will use a polynomial regression.

   c. What does the relative wealth graph for Lowe's suggest with respect to the trend in Lowe's CFROI? Is Lowe's CFROI increasing or decreasing over time? Use Lexis-Nexis to help you explain this trend in relative wealth (CFROI). Also read Lowe's 10Ks and Annual Reports various years (1997,1996, 1995) especially the "Letter to Shareholders" section. You can access Lowe's (LOW) 10K report using the URL http://www.nyu.edu/library/bobst/vbl and click either on Thomson's Research or EdgarScan. How does the relative wealth graph for Lowe's compare to the relative wealth graph of Home Depot? Please discuss. In your discussion, please look at Home Depot's annual reports, especially the "Letter to Shareholders" section.

Example: Calculating the relative wealth index for Wal-Mart (WMT)

| DATE | WalMart | SP500 | DATE | 1+ r(WMT) | 1+ r(SP500) | Cum(1+r(WMT)) | Cum(1+r(SP500)) | Ratio Cum(1+r(WMT))/ Cum(1+r(SP500)) |
|---|---|---|---|---|---|---|---|---|
| 19940131 | 0.06 | 0.0325 | 19940131 | 1.06 | 1.0325 | 1 | 1 | 1.0000 |
| 19940228 | 0.07075 | -0.03005 | 19940228 | 1.07075 | 0.96995 | 1.134995 | 1.001473375 | 1.1333 |
| 19940331 | -0.08661 | -0.04575 | 19940331 | 0.91339 | 0.95425 | 1.036693083 | 0.955655968 | 1.0848 |
| 19940429 | -0.02415 | 0.01153 | 19940429 | 0.97585 | 1.01153 | 1.011656945 | 0.966674681 | 1.0465 |
| 19940531 | -0.06931 | 0.01242 | 19940531 | 0.93069 | 1.01242 | 0.941539002 | 0.978680781 | 0.9620 |
| 19940630 | 0.03372 | -0.02681 | 19940630 | 1.03372 | 0.97319 | 0.973287697 | 0.952442349 | 1.0219 |
| 19940729 | 0.03093 | 0.03147 | 19940729 | 1.03093 | 1.03147 | 1.003391486 | 0.98241571 | 1.0214 |
| 19940831 | -0.0133 | 0.03764 | 19940831 | 0.9867 | 1.03764 | 0.990046379 | 1.019393837 | 0.9712 |
| 19940930 | -0.05076 | -0.0269 | 19940930 | 0.94924 | 0.9731 | 0.939791625 | 0.991972143 | 0.9474 |
| 19941031 | 0.00535 | 0.02083 | 19941031 | 1.00535 | 1.02083 | 0.94481951 | 1.012634923 | 0.9330 |
| 19941130 | -0.00883 | -0.0395 | 19941130 | 0.99117 | 0.9605 | 0.936476754 | 0.972635843 | 0.9628 |
| 19941230 | -0.08602 | 0.0123 | 19941230 | 0.91398 | 1.0123 | 0.855921023 | 0.984599264 | 0.8693 |
| 19950131 | 0.07647 | 0.02428 | 19950131 | 1.07647 | 1.02428 | 0.921373304 | 1.008505334 | 0.9136 |
| 19950228 | 0.03825 | 0.03607 | 19950228 | 1.03825 | 1.03607 | 0.956615833 | 1.044882122 | 0.9155 |
| 19950331 | 0.08105 | 0.02733 | 19950331 | 1.08105 | 1.02733 | 1.034149546 | 1.07343875 | 0.9634 |
| 19950428 | -0.07317 | 0.02796 | 19950428 | 0.92683 | 1.02796 | 0.958480824 | 1.103452098 | 0.8686 |
| 19950531 | 0.04737 | 0.03631 | 19950531 | 1.04737 | 1.03631 | 1.003884061 | 1.143518443 | 0.8779 |
| 19950630 | 0.07739 | 0.02128 | 19950630 | 1.07739 | 1.02128 | 1.081574648 | 1.167852516 | 0.9261 |
| 19950731 | -0.00467 | 0.03178 | 19950731 | 0.99533 | 1.03178 | 1.076523694 | 1.204966869 | 0.8934 |
| 19950831 | -0.07793 | -0.00032 | 19950831 | 0.92207 | 0.99968 | 0.992630203 | 1.204581279 | 0.8240 |
| 19950929 | 0.0102 | 0.0401 | 19950929 | 1.0102 | 1.0401 | 1.002755031 | 1.252884989 | 0.8004 |
| 19951031 | -0.12626 | -0.00498 | 19951031 | 0.87374 | 0.99502 | 0.876147181 | 1.246645521 | 0.7028 |
| 19951130 | 0.11214 | 0.04105 | 19951130 | 1.11214 | 1.04105 | 0.974398326 | 1.297820424 | 0.7508 |
| 19951229 | -0.07292 | 0.01744 | 19951229 | 0.92708 | 1.01744 | 0.9033452 | 1.320454412 | 0.6841 |

Illustration of Relative Wealth Graph for Wal-Mart:




2. Using the information on the operating lease for Lowe's, calculate the present value of the Operating Lease for the fiscal year 2002. Round the number of years remaining on the operating lease to the nearest number using the Excel function = Round ( ,0)

3. Using the financial statement, operating lease, and risk factors as well as bond yields provided, calculate the estimated life of the project using the template provided in the worksheet labeled "3. Asset Life". The area to be completed is highlighted in yellow. To make sure that you understand where Land, Buildings, Machinery and Equipment, Leasehold Improvements, and Property, Plant, and Equipment (Gross) come from that I have provided in the "Lowe's 10K" worksheet at the bottom of the spreadsheet, print out the appropriate page from Lowe's 10K for the year ended January 31, 2003 and highlight the relevant numbers in yellow.

4. Calculate the:

a. Real historical growth rate in operating assets using the worksheet labeled "4a. Real OpAsset HistGrowth" by filling out all the highlighted sections.

b. Inflation adjustment factor for LOW using the worksheet labeled "4b. Inflation Adj (Gross Plant)" by filling out all the highlighted sections.

5. Using the Inflation Adjustment Factor that you calculated in question 4b in conjunction with the Present Value of Operating Leases that you computed in question 2, derive the

- Depreciable Assets (stated in 2002 dollars) in dollars and percentage terms
- Non-depreciable Assets (stated in 2002 dollars) in dollars and percentage terms
- Gross Cash Investment in Year 2002 dollars (current dollars)

using the worksheet labeled "5. Gross Cash Investment". The gross cash investment can be thought of as the amount that the firm, in this case Lowe's, has invested in assets "as if" it just started the business from scratch in the Year 2002.

6. Calculate the gross cash flow using the template provided in the worksheet labeled "6. Gross Cash Flow". Note: The gross cash flow is NOT the same as the free cash flow to the firm (FCFF). However, the gross cash flow is one component of the adjusted FCFF, which Madden refers to as Net Cash Receipts (NCR).

7. Complete the highlighted sections of the worksheet labeled "7. CFROI" using your answers to the preceding questions as the necessary inputs. To calculate the CFROI, use the IRR () function in Excel. Be sure to enter the Gross Cash Investment as a negative number. Do NOT fill in the area shaded in Gray. In addition to calculating the CFROI, calculate the Cash Value Added = CFROI * Gross Cash Investment.

8. Compute the before-tax weighted average cost of capital (WACC) using the worksheet labeled "8. WACC". Please note that the procedure that we use to calculate beta is NOT used in the CFROI methodology. The argument that Madden makes for not employing the CAPM in calculating the cost of equity is that for firms in financial distress, the historical beta for the firm is lower than for a healthy firm (which is counter-intuitive). Recall that the higher the risk, the higher the required return should be. Consequently, Madden argues that the cost of equity should start with a market return + differential adjustment for a company based on size and leverage. To address his concern, we use a built-up beta using one comparable, Home Depot[1]. Observe that the CFROI methodology treats "Other Long Term Liabilities" and "Preferred Stock" as debt.

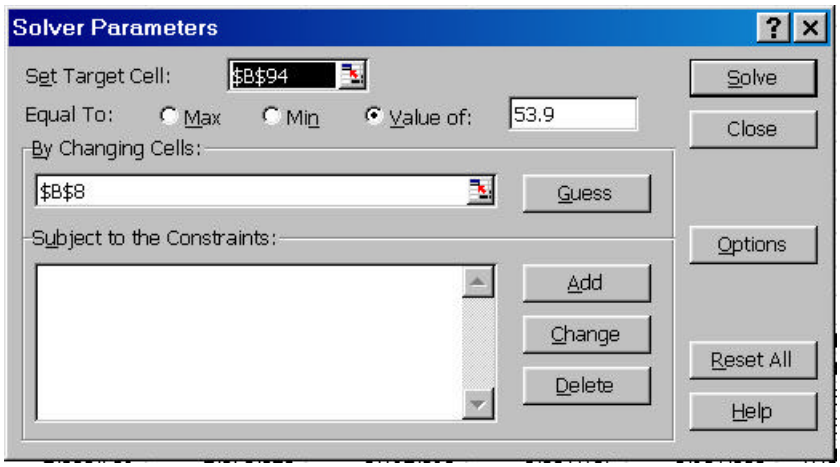
9. Calculate the simple plowback ratio for Lowe's using the worksheet labeled "9. Forecast Life Cycle". The simple plowback ratio is used to calculate the sustainable growth rate (see the Assumptions page in this handout).

10. Find the Expected CFROI on New Investments in 2007 (t+5) using the worksheet labeled "10. Valuation and Partitioning". Besides this, determine what percent of the total value of the firm (Lowe's) is due to expected future investments. To obtain the future CFROI implied by the current price for a share of stock (the market price of

[1]Note: We could have done the built-up beta by using Superstores in general such as Best Buy, Circuit City, Wal-Mart, etc. However, most Wall Street analysts usually compare Home Depot with Lowe's and exclude all other superstores.

Lowe's as of September 19, 2003 was $53.90), put in an arbitrary value for Expected CFROI on New Investments in 2007 (t+5). Recall that the Approximate Sustainable Growth Rate in 2007 (t+5) = simple plowback ratio * Expected CFROI on New Investments in 2007. Calculate the total value of the firm, the value of the firm due to existing assets, and the value of the firm arising from expected future investments. Next, use the Solver command in Excel (Tools → Solver) to set your calculated price equal to the current market price ($53.90) by changing the cell that your Expected CFROI on New Investments in 2007 is in.

Following is an example of this process.




where cell B8 contains the arbitrary number for Expected CFROI on New Investments in 2007 and cell B94 contains the justified equity per share.

Intuition for working backwards: Sometimes you want to test the assumptions that are imbedded in the stock price. For example, sometimes what management expects and the market expects (as implied by its stock price) differ.

Please turn in a **hard copy** of the spreadsheet together with your disk containing the spreadsheet with all the appropriate calculations.