

MIDTERM EXAM SOLUTIONS

Finance 70610 – Equity Valuation

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Fall Semester 2005 – Module 2

Monday, November 14, 2005

1. **Cost of Capital and Country Risk (22 points):**

You are valuing a Venezuelan mining firm and have converted all cash flows to \$U.S. You wish to estimate the cost of equity for the firm including a country risk component.

- a) (5 points) Analysts at your firm have provided you with the following historical data for the U.S. equity market during the period from 1928-2004. Based on this information, what market risk premium (excluding country risk) will you use in your cost of equity calculations? Briefly explain your reasoning.

Average Risk Premium	Arithmetic Average	Geometric Average
Relative to 30-day T-Bills	7.92%	6.02%
Relative to 10-year T-Bonds	6.53%	4.84%

The correct answer is 4.84%. We choose the 10-year T-Bond rather than the short-term Treasury to reflect that we are doing a long-term valuation problem. In this case, the short-term Treasury would include reinvestment risk. We choose the geometric average because it is a better predictor of future multi-period returns, as it accounts for compounding.

- b) (5 points) Yields on several U.S. and Venezuelan government-issued bonds are listed below. Based on this information, what risk-free rate will you use in your cost of equity calculations? Briefly explain your reasoning.

Government Bond	Yield
1-year U.S. Government T-Bill	4.1%
10-year U.S. Government T-Bond	4.4%
10-year U.S. Government Inflation-Indexed T-Bond	1.9%
10-year \$U.S.-denominated Venezuelan Gov't Bond	8.4%
10-year Bolivar-denominated Venezuelan Gov't Bond	14.7%

The correct answer is the 10-year U.S. Government T-Bond with a yield of 4.4%. We exclude the 1-year T-Bill because it is a short-term rate and includes reinvestment risk for long-horizon analysis. We exclude the inflation-indexed bond because it is a real rate and we are valuing nominal cash flows. We exclude the \$U.S.-denominated Venezuelan bond because it includes default risk (it is not risk-free). We exclude the Bolivar-denominated bond because it is not currency matched.

- c) (5 points) Long-term Bolivar-denominated bonds issued by the Venezuelan government are currently rated B+ by Standard and Poor's and have a default risk premium of 4.0%. In addition, you estimate the monthly standard deviation of the U.S. and Venezuelan equity markets are 4.5% and 10.0%, respectively. Based on this information, what country risk premium will you use in your cost of equity calculations? Briefly explain your reasoning.

There are two choices for calculating country risk based on the information provided. First, you could choose to use the default spread on the Bolivar-denominated bond, or 4.0%, as a measure of country risk. In this case, we are assuming that default risk in the bond market is a good proxy for country risk in the equity market.

The second choice is to use the U.S. market premium as a base and adjust it for the relative volatilities of the two equity markets. This would give a country risk premium of:

$$CountryRisk = 4.84\% \cdot \left(\frac{10.0\%}{4.5\%} - 1 \right) = 5.92\%$$

- d) (7 points) You estimate that the equity Beta of the firm is 1.3. Using this Beta and your answers to parts (a) through (c), estimate the cost of equity for this firm (including country risk). Explain any assumptions you make to obtain your answer.

After estimating country risk, we can estimate the cost of equity as follows:

$$K_e = R_f + \beta(E(R_m) - R_f) + \gamma(CountryRisk)$$

If we assume that all firms in the country have the same country risk, then $\gamma=1$, and the cost of equity equals:

$$K_e = R_f + \beta(E(R_m) - R_f) + \gamma(CountryRisk) = 4.4\% + 1.3(4.84\%) + 4.0\% = 14.692\%$$

or

$$K_e = R_f + \beta(E(R_m) - R_f) + \gamma(CountryRisk) = 4.4\% + 1.3(4.84\%) + 5.92\% = 16.612\%$$

If we assume that the sensitivity to country risk is equal to the sensitivity to equity market risk, then $\gamma=\beta=1.3$, and the cost of equity equals:

$$K_e = R_f + \beta((E(R_m) - R_f) + CountryRisk) = 4.4\% + 1.3(4.84\% + 4.0\%) = 15.892\%$$

or

$$K_e = R_f + \beta((E(R_m) - R_f) + CountryRisk) = 4.4\% + 1.3(4.84\% + 5.92\%) = 18.388\%$$

2. **Working Capital (6 points):**

Assets and Liabilities (in thousands) from Coca Cola's 2004 Balance Sheet are listed below. Use this information to calculate non-cash working capital for Coca Cola as of 12/31/2004.

Assets:		Liabilities:	
Cash	6,707,000	Trade accounts payable	2,238,000
Marketable securities	61,000	Accrued expenses	2,045,000
Trade accounts receivable, net	2,171,000	Accrued income taxes	667,000
Inventories	1,420,000	Short-term loans & notes payable	4,531,000
Prepaid expenses & other assets	1,735,000	Current maturities of long-term debt	1,490,000
Total current assets	<u>12,094,000</u>	Total current liabilities	<u>10,971,000</u>
Investments in other firms and other assets	9,306,000	Total debt before current portion	2,647,000
Property, plant & equipment, net of depr	6,091,000	Less current portion	1,490,000
Trademarks & other intangible assets	3,836,000	Long-term debt	1,157,000
Total assets	<u>31,327,000</u>	Other liabilities	2,814,000
		Deferred income taxes	450,000
		Total liabilities	<u>15,392,000</u>

Non-cash current assets = $12094 - 6707 - 61 = 5,326$ million

Non-debt current liabilities = $10971 - 4531 - 1490 = 4,950$ million

Non-cash working capital = $5326 - 4950 = \$376$ million

3. **Levered Beta (10 points):**

One of the firms that you follow is a small biotech company that has announced plans to issue \$500 million in new debt with an after-tax cost of debt equal to 3%. Prior to the issue, the company has no debt, its equity has a market value of \$690 million, and its Beta is 1.4. In addition, the firm's marginal tax rate is 35%.

- a) (5 points) Calculate the levered (equity) Beta for this firm after the capital structure change (assuming the market value of equity does not change).

$$\beta_E = \left(1 + \frac{500}{690}(1 - .4)\right)1.4 = 2.059$$

- b) (5 points) Based on your answer to (a), calculate the weighted average cost of capital (WACC) for this firm after the capital structure change. Assume a market risk premium of 4.5% and a risk-free rate of 4%.

$$K_E = 4.0\% + 2.059(4.5\%) = 13.266\%$$

$$WACC = \left(\frac{690}{500 + 690}\right)13.266\% + \left(\frac{500}{500 + 690}\right)3.0\% = 8.952\%$$

4. **Present Value and Discounted Cash Flows (20 points):**

You are performing a valuation of a mid-cap technology firm. Free cash flows to the firm (FCFF) during the most recent year totaled \$213 million (this is the time 0 cash flow). You expect these cash flows to grow at an annual rate of 15% for the next five years as the firm gains market share. You then expect growth to stabilize at a long run rate of 5% (in perpetuity). The firm's weighted average cost of capital is 9% and its cost of equity is 13.5%.

- a) (14 points) What is the present value of the firm's future cash flows (FCFF)?

$$TerminalValue_5 = \frac{213(1.15)^5(1.05)}{.09 - .05} = \frac{449.84}{.04} = \$11,246.00mil$$

$$PV_{TV} = \frac{11246.00}{(1.09)^5} = \$7,309.13mil$$

$$CF_1 = 213(1.15) = 244.95$$

$$PV_{HighGrowth} = 244.95 \left(\frac{1 - \left(\frac{1.15}{1.09}\right)^5}{.09 - .15} \right) = \$1,254.32mil$$

$$PV_{Total} = 7309.13 + 1254.32 = \$8,563.45mil$$

- b) (6 points) In addition to the cash flows described above, the firm also has cash and marketable securities worth \$650 million and total debt of \$2,600 million. Based on this information and your answer to part (1), what is the value of the firm's equity? (Hint: you do not need to do another discounted cash flow analysis.)

$$Equity\ Value = \$8,563.45 + 650 - 2,600 = \$6,613.45\ million$$

5. **R&D Adjustments (22 points)**

You are valuing IBM and have decided to capitalize the firm's R&D expenses. The firm's R&D expenses for the past four years are listed below.

Year	R&D Expense (\$ millions)
2001	5,290
2002	4,750
2003	5,077
2004	5,673

- a) (8 points) Calculate the unamortized value of IBM's R&D asset as of 12/31/2004 assuming a three-year life for R&D.

Year	R&D Expense (\$ million)	2004 Amortization	Unamortized Amount Remaining in 2004	
2001	5,290.0	1763.3	0%	0.0
2002	4,750.0	1583.3	33%	1583.3
2003	5,077.0	1692.3	67%	3384.7
2004	5,673.0	0.0	100%	5673.0
Total		5039.0		10641.0

The unamortized R&D on the balance sheet in 2004 equals \$10,641 million.

- b) (6 points) IBM had operating income (EBIT) in 2004 equal to \$10,975 million and a tax rate of 29.8%. Calculate adjusted after-tax operating income for IBM after accounting for the capitalization of R&D.

After-tax Adjusted Operating Income = $10975(1-.298) + 5673 - 5039 = \$8,338.45$ million

Note that the R&D terms are not multiplied by (1-T).

- c) (8 points) During 2004, IBM also reported capital expenditures of \$4,770 million, depreciation of \$3,959, and an increase in working capital of \$1,337 million. Estimate free cash flow to the firm (FCFF) for IBM in 2004.

Since the R&D adjustment does not affect FCFF, you can estimate FCFF either with or without the adjustment, as follows:

8338.45	$10975(1-.298)$
- (4770 + 5673)	- 4770
+ (3959 + 5039)	+ 3959
- 1337	- 1337
<u>= \$5556.45 million</u>	<u>= \$5556.45 million</u>

6. **Operating Lease Adjustments (20 points)**

Future operating lease commitments for Southwest Airlines are shown below. In 2004, the firm reported operating income of \$554 million, operating lease expenses of \$403 million, and total debt of \$1,846 million. The firm's cost of debt was 7% and its tax rate was 36%.

Year	Operating Lease Commitments (\$ millions)
2005	343
2006	279
2007	256
2008	226
2009	204
>2009	1,369

- a) (14 points) Calculate the present value of future operating lease commitments for Southwest Airlines. Based on this calculation, what is the adjusted book value of debt for the firm after accounting for operating lease commitments?

Average lease payment 2005-2009 = \$261.6

Lease pymts >2009 can be approximated as an annuity of \$261.6 million per year for 5 years, since $1369/261.6 = 5.23$ (you could also use 5.23 years).

$$PV = \frac{343}{(1.07)^1} + \frac{279}{(1.07)^2} + \frac{256}{(1.07)^3} + \frac{226}{(1.07)^4} + \frac{204}{(1.07)^5} + \frac{261.6 \left(\frac{1 - (1.07)^{-5}}{.07} \right)}{(1.07)^5} = \$1885.8mil$$

$$\text{Adjusted Debt} = 1846 + 1855.8 = \$3701.8mil$$

Note: Using 5.23 years gives operating lease debt of \$1885 million.

- b) (6 points) What is the adjusted after-tax operating income for Southwest Airlines in 2004 after accounting for operating lease commitments?

$$\text{Adjusted Operating Income} = 554 + 403 - \left(\frac{1855.8}{10} \right) = \$771.4$$

$$\text{After - tax} = 771.4(1 - .36) = \$493.7mil$$

or

$$\text{Adjusted Operating Income} = 554 + (1855.8)(.07) = \$683.89$$

$$\text{After - tax} = 683.89(1 - .36) = \$437.69mil$$