

**Valuation: Final Exam**

Answer all questions and show necessary work. Please be brief. This is an open books, open notes exam.

1. Callaway Copper is a mature copper mining company. While the company is expected to be in stable growth, with revenues growing at 2.5% a year in perpetuity, its earnings are unstable and are a function of copper prices. The company has a book value of invested capital of \$1,200 million. The table below reports revenues and after-tax operating income over the last 5 years.

	Last year	2 years ago	3 years ago	4 years ago	5 years ago
Revenues	\$1,000	\$980	\$950	\$920	\$900
After-tax Operating Income	-\$120	\$325	\$330	-\$80	\$250

- a. Assume that the average after-tax operating margin over the last 5 years is a good estimate of the normalized margin and that operating margins will revert back immediately to normalized levels. The cost of capital for the firm is 7.5%. Based on these assumptions, estimate the value of the operating assets in the firm today. (3 points)

- b. Now assume that the company has a cash balance of \$150 million, debt outstanding of \$ 500 million and a 10% holding in another mining company. That holding has a book value of \$75 million and an estimated market value of \$290 million. Estimate the value of equity in the firm today. (1 point)
- c. Finally, assume that there is a 20% chance that the company will get nationalized in the near future and that if it is nationalized, you will receive the book value of the invested capital as your compensation. Estimate the value of equity per share today, given this danger. (2 points)

2. You are analyzing the apparel business and have separated the firms in the business broadly into brand name and generic companies. While you believe that both groups are in stable growth, growing 3% a year and have the same cost of capital and sales to invested capital ratio, the generic companies are trading at an EV/Sales ratio of 0.60 whereas the brand name companies are trading at an EV/Sales ratio of 1.40.
  - a. If the generic companies are fairly priced and expect to have an after-tax operating margin of 4% next year and have a sales to capital ratio of 3.0, estimate the cost of capital for these companies. (2 points)

- b. Now assume that brand name companies have the same cost of capital and sales to capital ratio as the generic companies and are also fairly priced. Estimate the after-tax operating margin for brand name companies. (2 points)

- c. Finally, assume that brand name companies are considering cutting prices by 10. If this will result in an operating margin of 8%, but increase sales by 15% (holding capital constant), what effect will this have on the EV/Sales ratio of brand name companies? (2 points)

3. Zuma Inc., a small US-based consumer product company, is looking at acquiring Alta Inc., a Brazilian consumer product company. The information on the two companies is provided below:

	Zuma	Alta
After-tax Operating Income next year	\$100.00	R\$ 50.00
Invested Capital	\$800.00	R\$ 250.00
Cost of equity	9%	16%
After-tax cost of debt	3%	6%
Debt ratio	40%	20%
Expected growth	2.5%	6%

Note that Alta's cost of equity, debt and expected growth rates are all specified in \$R terms. The current exchange rate is US\$ = 2 \$R.

- a. Estimate the value of the combined firm in US\$ right after the acquisition, assuming that there is no synergy. (3 points)

- b. Now assume that as a result of the acquisition, you expect the following changes in the combined company:
- The company will be able to cut costs and save \$10 million, while also shedding \$25 million in invested capital. The resulting return on capital can be maintained in perpetuity.
  - The company will continue to be in stable growth but the expected growth rate will be 3% in perpetuity.
  - The company's new cost of equity will be 9.5%, its after-tax cost of debt will be 3.5% and it will have a 40% debt ratio.

Estimate the value of synergy in this merger. (3 points)

4. Manza Inc. is a publicly traded company in three businesses. The details of the three businesses are provided below (in millions):

	Next year's EBIT (1-t)	Book equity	Book debt	Cost of capital	Growth rate (in perpetuity)
Steel	100	600	200	8%	2.50%
Chemicals	50	400	100	10%	2.00%
Real Estate	60	600	600	8%	3.00%

The company has no cash balance.

- a. Estimate the value of the operating assets of the company assuming it stays with its existing business mix (and management). (3 points)

- b. Now assume that you have been brought in as a CEO and are thinking about restructuring the company. You believe that you can divest the real estate business for 75% of book value of invested capital and reinvest half the divestiture proceeds in the steel business and the other half in the chemical business. If you can maintain the current returns on capital in each of these businesses, estimate the new value for the business. (3 points)



5. A venture capitalist is interested in investing in a young, high growth start up. You have estimated the cash flows in your business as follows:

	1	2	3	4	5	Beyond
FCFF	-\$100.00	-\$50.00	\$50.00	\$75.00	\$100.00	Grows 3% forever
Cost of capital	15%	15%	15%	15%	15%	10%

The firm currently has no debt or cash.

- a. Assume that the VC will invest \$150 million in the firm (with the cash being held by it to meet future reinvestment needs), what percentage of the company should the VC get in return (given your intrinsic valuation)? (2 points)

- b. If you do invest, you will be given the option to either (1) invest an extra \$150 million at the end of year 4 and double your ownership stake in the firm or (2) sell your current stake back to the other owners and receive half of your initial investment back at the end of year 4. If the standard deviation in firm value of publicly traded firms in this business is 30% and the risk free rate is 3%, what is the value of the option(s)? (Show the inputs to the option pricing model and then value the option(s))

$d$	$N(d)$	$d$	$N(d)$	$d$	$N(d)$
-3.00	0.0013	-1.00	0.1587	1.05	0.8531
-2.95	0.0016	-0.95	0.1711	1.10	0.8643
-2.90	0.0019	-0.90	0.1841	1.15	0.8749
-2.85	0.0022	-0.85	0.1977	1.20	0.8849
-2.80	0.0026	-0.80	0.2119	1.25	0.8944
-2.75	0.0030	-0.75	0.2266	1.30	0.9032
-2.70	0.0035	-0.70	0.2420	1.35	0.9115
-2.65	0.0040	-0.65	0.2578	1.40	0.9192
-2.60	0.0047	-0.60	0.2743	1.45	0.9265
-2.55	0.0054	-0.55	0.2912	1.50	0.9332
-2.50	0.0062	-0.50	0.3085	1.55	0.9394
-2.45	0.0071	-0.45	0.3264	1.60	0.9452
-2.40	0.0082	-0.40	0.3446	1.65	0.9505
-2.35	0.0094	-0.35	0.3632	1.70	0.9554
-2.30	0.0107	-0.30	0.3821	1.75	0.9599
-2.25	0.0122	-0.25	0.4013	1.80	0.9641
-2.20	0.0139	-0.20	0.4207	1.85	0.9678
-2.15	0.0158	-0.15	0.4404	1.90	0.9713
-2.10	0.0179	-0.10	0.4602	1.95	0.9744
-2.05	0.0202	-0.05	0.4801	2.00	0.9772
-2.00	0.0228	0.00	0.5000	2.05	0.9798
-1.95	0.0256	0.05	0.5199	2.10	0.9821
-1.90	0.0287	0.10	0.5398	2.15	0.9842
-1.85	0.0322	0.15	0.5596	2.20	0.9861
-1.80	0.0359	0.20	0.5793	2.25	0.9878
-1.75	0.0401	0.25	0.5987	2.30	0.9893
-1.70	0.0446	0.30	0.6179	2.35	0.9906
-1.65	0.0495	0.35	0.6368	2.40	0.9918
-1.60	0.0548	0.40	0.6554	2.45	0.9929
-1.55	0.0606	0.45	0.6736	2.50	0.9938
-1.50	0.0668	0.50	0.6915	2.55	0.9946
-1.45	0.0735	0.55	0.7088	2.60	0.9953
-1.40	0.0808	0.60	0.7257	2.65	0.9960
-1.35	0.0885	0.65	0.7422	2.70	0.9965
-1.30	0.0968	0.70	0.7580	2.75	0.9970
-1.25	0.1056	0.75	0.7734	2.80	0.9974
-1.20	0.1151	0.80	0.7881	2.85	0.9978
-1.15	0.1251	0.85	0.8023	2.90	0.9981
-1.10	0.1357	0.90	0.8159	2.95	0.9984
-1.05	0.1469	0.95	0.8289	3.00	0.9987
-1.00	0.1587	1.00	0.8413		