

**Midterm Solution**

<b>Performance Measures</b>	
Market value added (\$ millions)	market value of equity – book value of equity
Market-to-book ratio	market value of equity ÷ book value of equity
<b>Profitability Measures</b>	
Return on assets (ROA)	after-tax operating income/total assets
Return on capital (ROC)	after-tax operating income/(long-term debt + equity)
Return on equity (ROE)	net income/equity
EVA* (\$ millions)	after-tax operating income – cost of capital × capital
Operating profit margin	after-tax operating income/sales
<b>Efficiency Measures</b>	
Asset turnover	sales/total assets at start of year
Receivables turnover	sales/receivables at start of year
Average collection period (days)	receivables at start of year/daily sales
Inventory turnover	cost of goods sold/inventory at start of year
Days in inventory	inventories at start of year/daily cost of goods sold
<b>Leverage Measures</b>	
Long-term debt ratio	long-term debt/(long-term debt + equity)
Long-term debt-equity ratio	long-term debt/equity
Total debt ratio	total liabilities/total assets
Times interest earned	EBIT/interest payments
Cash coverage ratio	(EBIT + depreciation)/interest payments
<b>Liquidity Measures</b>	
Net working capital to assets	net working capital/total assets
Current ratio	current assets/current liabilities
Quick ratio	(cash + marketable securities + receivables)/current liabilities
Cash ratio	(cash + marketable securities)/current liabilities
<b>Growth Measure</b>	
Payout ratio	dividends/earnings

3 factor DuPont decomposition:

$$ROE = \frac{\text{Net income} + \text{after tax interest}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Assets}} \times \frac{\text{Assets}}{\text{Equity}}$$

ROE= Operating profit margin x Asset turnover x measure of leverage

- Present value of a cashflow:  $\sum_{t=1}^n \frac{C_t}{(1+r)^t}$
- Present value of a perpetuity:  $\frac{C}{r}$
- Present value of a perpetuity starting t years in the future:  $\frac{C}{r(1+r)^t}$
- Present value of an annuity received for t years:  $\frac{C}{r} - \frac{C}{r(1+r)^t}$
- Present value of an annuity received for t years, starting z years in the future:

$$\left[ \frac{C}{r} - \frac{C}{r(1+r)^t} \right] * \left[ \frac{1}{(1+r)^z} \right]$$

### Part 1 - Short questions (10 points each)

1. What is the role of the financial manager?

Management of uses (capital budgeting, investment) and sources (financing) of funds (money), with the goal of maximizing company value.

2. (5 pts each item)

a. Calculate the discount factor equivalent to a discount rate of 4% for one year.

0.96 See Excel

b. Calculate the discount factor equivalent to a discount rate of 4% for two years.

0.92 See Excel

3. Suppose you work in the investment area of a large pharmaceutical company. You are assisting the investment manager in selecting new investment projects. Project A has an IRR of 30% while Project B has an IRR of 15%. Both projects have the same NPV. The investment manager chose project B. Please provide and explain 2 reasons why that could have been a GOOD decision.

Many alternatives. Investment cost of project A greater than available capital, Project A has negative cash-flows in the future that are not reflected in IRR, etc.

### Part 2 – Quantitative questions (20 points each numeral)

4. An analyst looks at the following common size summary of financial statement and says. “Both firms seem equally profitable, they have the same Net Income + ATI / Sales ratio, so they must be equally effective at using their assets and leverage”. Is this argument true? Hint: Use a 3 factor DuPont decomposition to find additional insights regarding the source of profitability of each company. Comment your findings on each ratio.

(all figures expressed as % of sales)

	Block	Chain
Sales	100	100
Net income + after tax interest	20	20
Assets	50	25
Debt	25	0
Equity	25	25

See Excel for calculation. Should note: Return on equity is equal for both. Chain has greater asset turn-over but lower leverage.

5. A top university advertises its elite undergraduate program. “Our graduates earn on average an after tax annual salary of \$100,000”. However, such elite education comes with a cost. Tuition + expenses are \$100,000 a year, for 4 years. Assume the average student studies 4 years and then works for 40 years. Use a 15% discount rate.

a. In this context, is investing in education a positive NPV project?

Hint: calculate the present value of profits from education (a 40 year annuity, that starts 4 years from now), minus the present value of the cost of education (a 4 year annuity).

See Excel

b. Assume that if a person doesn't invest in education (at the cost and profit described above), s/he could work for 44 years starting today, receiving an after tax annual salary of \$35,000.- In this context, is it more profitable to get university education or to start working at 18 with a much lower wage?

Hint: Calculate the present value of the profits without education (a 44 year annuity that starts today) and compare it with the previous result.

See Excel

**Part 3 – Long quantitative question (30 points)**

6. Using the following information and a discount rate of 10%, determine for each project:

Project Bit				
Year	0	1	2	3
After tax income		30	40	80
Depreciation		10	10	10
Capex	-100			0
Changes in NWC		0	0	0
FCF	-100	40	50	90

Project Coin				
Year	0	1	2	3
After tax income		70	20	10
Depreciation		10	10	10
Capex	-70			0
Changes in NWC		0	0	0
FCF	-70	80	30	20

See Excel

a. If you can only invest \$100, which project would you invest on? Why? (10 pts)

Project Bit, because it has a greater NPV