

Final Exam “Finance for Premasters”

Course: Finance for Premasters

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Students are expected to conduct themselves properly during examinations and to obey any instructions given to them by examiners and invigilators. Firm action will be taken in the event that academic fraud is discovered.

Instructions

- Answer all questions. Each question is worth 10 points, for a total of 50 points.
- On question 5, there are five sub-questions: choose four.
- Answer each question on a separate sheet, clearly marking each sheet with your name and ID number.
- The exam is closed book, no translation computers are allowed. You may use a Dutch/English dictionary.
- You are allowed to use a non-graphical calculator.
- You are allowed a handwritten cheat sheet which must not be larger than 1/4 of an A4 page.
- Explain your answers and show your calculations. Partial credit is given for incomplete answers. No credit is given for answers without explanation.

Question 1

Currently, there are three government bonds trading. All three are zero coupon bonds and have a face value of 1000, but they differ in maturity. Bond A matures in one year and trades for 917.43, bond B matures in two years and trades for 857.34, and bond C matures in three years and trades for 839.62.

- (a) Construct a yield curve showing the 1, 2, and 3-year interest rates.

$$r_1 = \frac{1000}{917.43} - 1 = 9\%, r_2 = \left(\frac{1000}{857.34}\right)^{\frac{1}{2}} - 1 = 8\%, r_3 = \left(\frac{1000}{839.62}\right)^{\frac{1}{3}} - 1 = 6\%$$

- (b) You are asked to value a newly issued government bond. This bond (bond D) is a three year coupon bond with a face value of 1000 and a coupon rate of 9%. What is the right price for bond D?

$$P = \frac{90}{1.09} + \frac{90}{1.08^2} + \frac{1090}{1.06^3} = 1074.91$$

- (c) Aegon issues a three-year zero-coupon bond with a face value of 1000. Aegon's bonds are considered risk free and this bond sells in an auction for 711.78. Estimate the yield and default premium of the Aegon bond.

Since the bonds are risk free, they must yield the same as the the three year government bond, which is 6%. The quoted yield is $\left(\frac{1000}{711.78}\right)^{\frac{1}{3}} = 12\%$. Therefore the default premium is 6%.

Question 2

Tilburg BV. is is a multinational provider of education services. Currently, Tilburg's equity beta is 2. Tilburg BV has traditionally maintained a 30% debt-to-value ratio. Tilburg researchers have developed a web-based student mind-control system, which the company is considering developing commercially as a separate division. Management views the risk of this investment as similar to that of another student mind-control company, Rotterdam NV, which has an equity beta of 2.5 and a fixed debt-to-value ratio of 80%.

Tilburg BV. estimates that the new division costs 78 million upfront, and will bring in 3.8 million of free cash flows next year, growing at 1.5% per year thereafter. Tilburg plans to finance the investment by issuing permanent debt.

The corporate tax rate is 40%, the risk free rate of return is 5% and the market risk premium is 8%. All firms can borrow at the risk free rate and they hold no cash. (That is, the debt cost of capital is 5% and you don't have to worry about net debt.)

(a) Calculate both Tilburg's and Rotterdam's equity cost of capital

Use the CAPM: $r_E^{Tilburg} = 5\% + 2 \times 8\% = 21\%$. The same calculation for Rotterdam BV gives $r_E^{Rot} = 25\%$

(b) Calculate Tilburg's and Rotterdams's pre-tax WACC (r_U).

$$r_U^{Til} = 0.7 \times 21\% + 0.3 \times 5\% = 16.2\%$$

$$r_U^{Rot} = 0.2 \times 25\% + 0.8 \times 5\% = 9\%$$

(c) Estimate the unlevered value of the new division (V_U).

$$V_U = \frac{3.8}{0.09 - 0.015} = 50.67 \text{ million } \text{€}. \text{ (Note: this is a growing perpetuity)}$$

(d) Calculate the APV (adjusted present value) of the new division? Is it a good investment? How would your answer change if there were no corporate taxes?

To find the APV, we have to subtract the present value of the tax shield. We assumed that company takes out 78 million € in permanent debt loan. Therefore the PV(tax shield) = $0.4 \times 78 = 31.2$. Therefore the APV is $50.67 + 31.2 = 81.87$. This is higher than the upfront cost of 78 million, therefore the project is a good investment.

If there were no corporate taxes, the value would only be 50.67 million, and should not be done. Thus the project is done only for its tax advantage.

Question 3

You are a manager at Perforated Fiber, which is considering expanding its operations in synthetic fiber manufacturing. The expansion project would require an up-front investment of \$7.5 million and produce extra sales for three years. Your boss has hired a consulting firm who provided the following estimates of the impact of the project on net income (all figures in thousands of \$):

(in thousands)	t=1	t=2	t=3
Sales	30,000	30,000	30,000
- COGS	18,000	18,000	18,000
Gross Profit	12,000	12,000	12,000
- Selling & Admin Exp.	2,000	2,000	2,000
- Depreciation	2,500	2,500	2,500
EBIT	7,500	7,500	7,500
- Income tax	2,625	2,625	2,625
Unlevered NI	4,875	4,875	4,875

Based on these numbers, the consultant recommended investing in this expansion “because it would bring in \$14.6 million in extra net income which is more than the cost of \$7.5 million.”

- (a) Explain in a few sentences what is wrong with the consultants report.

The consultant does not base his recommendation on the NPV, but on book profits. More specifically, he does not take into account that the cash for the project is needed now rather than a cost in the future (depreciation), that the project may change working capital requirements, and he ignores the time value of money.

- (b) Assuming that the project requires extra inventory of \$10 million (starting now, going back to zero in year 3), estimate the free cash flows of the project in years 1-3.

(in thousands)	t=0	t=1	t=2	t=3
Unlev.NI	0	4,875	4,875	4,875
-Cap.Exp.	-7,500	0	0	0
+Depreciation	0	2,500	2,500	2,500
- ΔNWC	-10,000	0	0	+10,000
FCF	-17,500	7,375	7,375	17,375

- (c) Assuming a cost of capital of 20%, should the project be done? Ignore tax shield effects.

Ignoring the tax shield effect, the Net Present Value is simply the sum of the discounted FCFs: $NPV = -17,500 + \frac{-7,375}{1.2} + \frac{7,375}{1.2^2} + \frac{17,375}{1.2^3} = 3,822$. Since the NPV is positive, the project should be done.

(d) How would your answer in (c) change if the firm could increase its debt capacity because of the project? Explain in words.

With an increased debt capacity, the company can take on more debt. This would increase the PV of the debt shield and therefore make the project even more attractive, at least potentially.

Question 4

The current price of *Good Luck* Corporation stock is \$30. In the next year, this stock price will either go up by 30% or go down by 10%. The stock pays no dividends. The one-year risk-free interest rate is 6% and will remain constant.

- (a) Using the Binomial Model, calculate the price of a one-year European call option on *Good Luck* stock with a strike price of \$25.

call = 6.41

- (b) Now, assume that the strike price of a one-year European call option on *Good Luck* stock is \$27. Calculate the risk neutral probabilities, then use them to price the option.

Risk neutral prob: 0.40. call = 4.53

- (c) Without redoing the calculation, how would your answer to (a) change if the stock price could go up by 60% and down by 20%?

Volatility is higher and the price of the call would increase

Question 5

Answer four of the following five questions:

- (a) Give five reasons most often cited for a takeover? Explain briefly.

see book

- (b) In the year 2000, short-term U.S. government bond rates were about 5.8% and the rate of inflation was about 3.4%. In 2003, interest rates were about 1% and inflation was about 1.9%. What was the real interest rate in 2000 and 2003?

2000: $r_r = \frac{r-i}{1+i} = 2.32\%$, 2003: $r_r = \frac{r-i}{1+i} = -0.88\%$

(c) How does the option to wait affect the capital budgeting decision? Explain in a few sentences

see book

(d) Why might firms prefer to fund investments using retained earnings or debt rather than issuing equity? Explain briefly.

“Pecking Order” theory

(e) Explain what the IRR rule of capital budgeting? How does it differ from the NPV rule and which rule is better? Explain.

see book