

**Question 1**

Network Streaming Systems (NSS) Ltd is a video production company and currently rents the building in which its production equipment is located at an annual cost of £150,000, including all service charges.

The company is considering purchasing an alternative building in which to undertake its video business. These alternative premises are due to be demolished by the local council in 4 years' time to make way for a new road. It is known that the Council will purchase the building at that time at its book value of £100,000. Because of the instability caused by the Council's plans, NSS can purchase the building at a knock-down price of £250,000. Otherwise, since the building is located in a prime residential area, the land on which the building stands would be worth £1.8 million. Currently the building is in a state of disrepair, but a structural survey which has already been undertaken by NSS costing £3,000, recommends that the building must be upgraded at a cost of £50,000 before NSS moves in.

The annual heating and lighting expenses on the new building will be £40,000, but NSS will save the annual rents on its current premises. The removal costs of moving its equipment into the new building, and the cost of moving out again in four years' time will be £25,000 on each occasion.

NSS pays corporation tax on its profits at 30%, and the tax authorities allow NSS to offset its corporate tax liabilities by using straight line depreciation on its fixed assets. You may assume that NSS has sufficient taxable profits to take full advantage of any tax shields from purchasing the building. NSS applies an opportunity cost of capital of 10 per cent to all future cash flows. Assume all annual cashflows occur at the end of the year to which they relate.

- (a) Determine the free cash flow in each year from the investment in the new building, explaining your treatment of costs and depreciation allowances. **(10 marks)**
- (b) What is the project NPV? **(2 marks)**
- (c) NSS approaches you for advice on whether it should purchase the new building, and asks for your opinion on payback, IRR, and accounting rate of return as methods of investment appraisal. Advise NSS by comparing and contrasting the four alternative investment criteria. **(8 marks)**
- (d) Suppose that there is a small probability that the Council might change its decision to build a road, allowing the owner to sell the land for residential development. Outline how this would change your valuation of the project. **(5 marks)**



## Question 2

Tinpot Resources (TR), an all-equity firm, is considering purchasing the rights to operate an iron ore mine in the Pilbara region of Western Australia. Acquiring the rights will cost \$50,000 today (time 0) but will also oblige TR to pay substantial environmental rehabilitation costs of \$250,000 when the mine is shut down in 3 years' time. While in operation, the mine is expected to produce 20,000 tonnes of iron ore per year, with extraction costs running at \$93 per tonne.

3/10

Although TR knows it can sell iron ore in the market for \$100 per tonne year, it faces considerable uncertainty regarding the future iron ore price, which is equally likely to rise by 10% or fall by 15% in each of the subsequent two years.

There are no taxes or any other costs. Unless otherwise stated, assume any cash flows occur at the end of each year. Use a discount rate of 20% for all cash flows. Show your calculations.

- a) Draw a binomial tree depicting the possible market prices of iron ore during the mine's operating life. Remember, the price in year 1 is known with certainty. What is the expected market price of iron ore in years 2 and 3?

**(4 marks)**

- b) Calculate the NPV of the project. Should TR purchase the rights?

**(6 marks)**

- c) Explain why using the IRR rule is likely to result in an incorrect decision when evaluating this project (do not attempt to calculate the IRR). Be specific.

**(4 marks)**

Now assume that TR has the ability to temporarily halt extraction operations if iron ore prices move adversely. However, by doing so, it cannot avoid paying the environmental rehabilitation costs at the end of the mine's life.

- d) When will TR choose to exercise this option? Explain fully.

**(4 marks)**

- e) Determine the value of the abandonment option and comment on the source of the option value.

**(7 marks)**



#### Question 4

Consider an all-equity firm whose only asset is the option of investing in one of two mutually exclusive projects. Each project requires an investment today of £400 million. Next year, project A pays £520 million with probability 80% and £200 million with probability 20%. Next year, project B pays £600 million with probability 20% and £200 million with probability 80%. After these cash flows, the firm will be shut down. There are no taxes, depreciation, or any other benefits or costs.

To implement one of these projects, the firm must raise debt financing. Note that the managers of the firm act in the interest of the equityholders and that project choice occurs after debt financing is granted, so debtholders cannot control project choice after financing. However, debtholders can rationally anticipate the actions of managers.

When answering this question, state any additional assumptions you may need to make. Show your calculations.

For parts (a) and (b), assume all cash-flows are discounted at 0%.

(a) Compute the NPVs of the two projects. Which project is better? **(4 marks)**

(b) Show that the firm will be able to raise £400 million today via the issue of debt. Compute the terms of the debt (i.e. the face value) required by lenders. **(5 marks)**

For parts (c) and (d) assume, instead, that all cash flows are discounted at 12%.

(c) Recompute the NPVs of the two projects. Which project is better? **(4 marks)**

(d) Show that the firm will not be able to raise £400 million today via the issue of debt. Explain why this is so. Be precise: show your steps and explain your reasoning. **(7 marks)**

(e) Use your answers to parts (b) and (d) to comment briefly on the statement: "In times of financial stress, when lenders are impatient, if the discount rate is high, credit markets may fail. Some firms may be excluded from debt markets, i.e. there is no interest rate at which lenders are willing to lend to them." Speculate on which types of firms, based on this problem, are most likely to be rationed (i.e. excluded) from debt markets. **(5 marks)**

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### **Question 5**

Midlife Crisis Inc. (MCI) has two assets: £1,600 in cash and an investment project. The cash is invested in the risk-free asset which earns 5% per year. The project requires an investment of £800 today and generates an expected cash flow of £1,600 one year from now. This opportunity recurs perpetually each year. Thus, for example, one year from now MCI can again invest £800 and generate £1,600 one year subsequent to that investment. MCI has 800 shares outstanding. The market equity risk premium is 5% per year, and the investment project has a CAPM beta of 1. Assume a Modigliani and Miller world.

When answering this question, state any additional assumptions you may need to make. Show your calculations.

- (a) Should MCI invest in the project? Explain. **(5 marks)**
- (b) Suppose MCI's CFO decides to pursue the project. What is the value of MCI? **(5 marks)**
- (c) Suppose MCI's CFO decides to take the project and always pay out all free cash flow as a dividend. What is MCI's cum-dividend price expected to be one year from now? **(4 marks)**
- (d) MCI's investment banker suggests that MCI instead pays out the £1,600 in cash as a dividend today, reverting to the CFO's proposed dividend policy described in part (c) in one year. In order to continue to invest in the project, MCI must raise equity immediately after the dividend is paid to raise the cash needed for the project. How many shares must be issued to new shareholders? **(4 marks)**
- (e) Describe both the dollar amount and timing of the expected dividend stream to old shareholders under the investment banker's proposal. Has old shareholder wealth changed? **(3 marks)**
- (f) If MCI no longer operates in a Modigliani-Miller world, dividend policy may no longer be irrelevant. Carefully discuss the various ways MCI's dividend policy may affect their valuation. **(4 marks)**