BEAM025

UNIVERSITY OF EXETER

BUSINESS SCHOOL

JUNE 2009

ADVANCED MANAGEMENT ACCOUNTING

Module Convenor: Brian Wright

Duration: TWO HOURS

Answer THREE Questions out of FOUR:
Question 1 **compulsory**. Choose **TWO** from Questions 2 – 4.

Question 1 is worth 30 marks. Each of questions 2-4 is worth 40 marks: total 110 marks for paper.

Standard approved calculators permitted.

This is a closed note examination.

<u>SECTION A</u>: THIS QUESTION IS COMPULSORY

Question 1:

It has been asserted that management accounting has evolved away from pure “number crunching” and a concern with the determination of costs. The management accountant is now seen by some as a collaborator in the strategic management process.

Discuss how the role of the management accountant has changed over time, and critically evaluate the above claim. You should illustrate your answer by reference to specific examples of management accounting “technology”.

(30 marks)

<u>SECTION B</u>: ANSWER <u>TWO</u> QUESTIONS FROM THIS SECTION.

Question 2:

A company is considering investing in three projects, labelled Project 1, Project 2 and Project 3. Annual net cashflows for each project, estimated reported *Year One* accounting profits, initial required investments and the lives of the projects, are as follows:

	Project 1	Project 2	Project 3
Annual net cashflows	£1m	£1.2m	£1.8m
Year One profits	£2m	£1.4m	£0.9m
Initial investment	£1m	£3m	£7m
Life of project	4 years	6 years	7 years

The discount rate for all of the company’s projects is d = 12%. The company has a total of £10m to invest in projects.

Assume that all of the projects, *apart from Project One*, are replicable (can be repeated), but that Project One is not replicable. Assume further that the company wishes to maximise the Net Present Value (NPV) of its invested projects, subject to the constraints. Fractional investments in projects are allowed.

Required:

(i) Formulate the above problem as a linear programming problem, leaving the discount rate d as a parameter.

(8 marks)

(ii) Assuming that the company's discount rate is 12%, solve the problem formulated in Part (i) using the matrix approach. Interpret the solution. HINT: start by inserting d = 12% into your objective function from Part (i) to get numerical values for the objective function coefficients.

(18 marks)

(iii) There is some uncertainty about the true value of the discount rate. By considering the reduced cost vector for the final solution in terms of a general discount rate d, determine whether your solution in part (ii) would change if the discount rate changed to 14%.

If you decide that the optimality of your solution changes, you ARE NOT required to determine the new solution.

HINT: You only need to show that ANY ONE of the new reduced costs indicates a sub-optimal solution.

(14 marks)

(Total 40 marks)

Question 3:

A portfolio manager is considering investing her wealth in the shares of two companies. The portfolio manager has calculated the expected returns and standard deviations of returns of the two shares, as follows:

	Expected Return	Standard Deviation of Return
Company One shares	8%	20%
Company Two shares	15%	45%

The returns of the two shares are *uncorrelated*.

The portfolio manager has £100,000 to invest. The risk-free rate is 4%, and the portfolio manager is able to lend or borrow at the risk-free rate. It has been determined that the standard deviation of returns of the portfolio should equal 35%. The portfolio manager wants to maximise expected return, subject to the standard deviation of returns being 35%.

Required:

(i) Formulate the above as a non-linear optimisation problem, using Lagrange multipliers. YOU ARE NOT REQUIRED TO SOLVE THE PROBLEM IN THIS PART, BUT YOU WILL BE ASKED TO SOLVE IT IN PART (ii).

(12 marks)

Turn over/…

(ii) By considering appropriate first partial derivatives of the Lagrangian function, solve the problem, to determine the optimal amount to invest in each company's shares. Calculate and interpret the Lagrange multipliers for the problem. Comment on your results.

HINT: There are two solutions to the problem, but only *one* of these gives a maximum.

(15 marks)

(iii) Determine the bordered Hessian matrix of the Lagrangian function for this problem, and explain how this would normally be used to determine whether a stationary point is a maximum, a minimum, or a saddle point.

(13 marks)

(Total 40 marks)

Question 4:

Compton Ltd is a company that operates in the solar energy industry. Compton may, each year, invest its capital in projects to generate a return. The variable K_t represents the total (historical) value of capital invested at time t, net of depreciation. Annual depreciation of capital stock occurs at a rate of δ per year, based on opening capital stock for the year.

The returns that Compton Ltd generates each year depend upon the level of capital at the start of that year, and are given by:

$$R_{t+1} = \frac{1}{2} e^{-\left(\frac{K_t}{100000} + t/6\right)}.$$

Compton's cost of capital is R_K. They intend to trade for 10 years. Compton can pay a dividend of D_t in year t (for each of years t = 1 to t = 10), from its generated returns and existing capital; any returns not paid out as dividends are re-invested as capital. After the end of Year 10, no further cashflows will be generated by continued trading, as the company will cease trading at this point.

Compton Ltd wish to determine their optimal dividend policy, i.e. the payout policy that will maximise the present value of total future dividend receipts over the ten years of their trading.

Compton start with capital of $K_0 = \underline{K}$ at time zero.

Required:

(i) Write down the objective function and the constraints for the above problem.

(8 marks)

(ii) Using your solution to Part (i), write down the Lagrangian function for this problem. Eliminate R_t from the Lagrangian by substitution of the expression given above.

(9 marks)

(iii) Using the Lagrangian function, determine the first-order conditions that must be satisfied by a solution to this problem.

YOU ARE NOT REQUIRED TO *SOLVE* THESE FIRST ORDER CONDITIONS

(15 marks)

(iv) From the first-order conditions determined in Part(iii), give an expression for the Lagrange multipliers associated with the capital accumulation constraints. Interpret these expressions in terms of the underlying problem.

(8 marks)

(Total 40 marks)

End of Paper