R.E. Marks

MID-TERM EXAM

AGSM 5302
30 May 2002

Do ONE question from Section *A*, and ONE question from Section *B*. The exam is open-book. *The exam is 80 minutes long; the first 10 minutes is time for reading, but you may also write during this time.*

PLEASE RETURN THE QUESTION SHEET AT THE END OF THE EXAM

Section A Attempt ONE of Questions 1 and 2.

1. In any kind of document advocating a project it seems mandatory to boast about the number of jobs created. Thus, the Concept Report on the VFT Speedrail Project claims that the direct and indirect creation of jobs was 9,000.

    a. Should a project be favoured because of job creation? What would the approach based on shadow pricing of labour say about the social benefits of job creation?

    b. In doing a cost−benefit analysis of the Speedrail Project, would you want to assess the shadow price of labour below the market price? If so, why?

    c. In general, do you think that having large quantities of inputs—that is, many jobs created for persons or machines—is necessarily desirable? Explain.

    d. In shadow pricing the cost of capital, the shadow price is generally between the pre-tax and post-tax cost of capital. Why might this be? Does this mean that both public- and private-sector firms should be subsidised to undertake investments?

OR

2. Attempt all parts.

    a. (Paretian) cost−benefit analysts use the Potential Pareto Improvement Criterion (PPIC) to decide whether to undertake a project. Explain what the PPIC is and how it might be used.

    b. Explain why, when using the PPIC, it is not necessary that those who stand to gain must compensate those who stand to lose in order for the project to be desirable. Could such compensation nevertheless be desirable? Explain.

    c. When there is capital rationing, Internal Rate of Return is the appropriate investment criterion to use to choose which (non-exclusive) projects to undertake. Discuss this statement.

    d. A higher highway toll results in increased demand in the secondary market for rail travel. Assume that the supply schedule for rail travel

is horizontal (constant marginal costs), and that no externalities result from the reduced use of the highway and the increased use of the railway. Are there additional costs or benefits as a result of the increased demand for rail travel that should be accounted for in a CBA? Why or why not?

Section B Attempt ONE of Questions 3 and 4.

3. Answer both parts of this question.

i. Consider a project that costs $200,000 in year 0 and yields an annual return of $60,000 for five years (in years 1, 2, 3, 4, and 5). At the end of the fifth year, there is a cost of $40,000 to dispose of the waste from the project. Should the project be undertaken if the discount rate is: (a) 0% p.a.? (b) 10% p.a.? (c) 15% p.a.? Why?

Assume that the government has a choice now between undertaking the smaller project described above and undertaking a larger project. If it spends an additional $200,000, returns will be increased by $50,000 per year and disposal costs at the end of the fifth year will increase by $40,000. Which project (the smaller or the larger) should be undertaken if the discount rate is (d) 0% p.a.? (e) 10% p.a.? (f) 15% p.a.? Why?

ii. Discuss how and why, under ***any three*** of the following circumstances, a social cost−benefit analysis might differ from a private financial analysis of a project which uses as inputs: labour, clothing, petrol, or insurance.

a. the unemployment rate is 7%

b. the government has imposed a tariff on the importation of clothing and footware

c. the government has imposed price controls on petroleum products

d. the government has regulated insurance companies, so that premiums are less than competitive levels

OR

4. Suppose that gold can be sold at the world market price of $200 per fine oz. At this price, mines in Australia produce at the rate of 2,000 oz. per week. The price then rises to $250 per oz. and Australian production increases to 2,500 oz. per week. Suppose that the increase of in the price of gold has induced an increase in the price of one particular input, skilled goldsmiths. (The prices of all other inputs have remained constant.) Before the price of gold increased, 4000 person hours of goldsmith labour were employed per week by Australian gold mines. The wage rate was $22.50 per person hour. The increase in the price of labour led to an increase in the demand for goldsmiths by Australian mines. As a result, the wage rate increased to $27.50 per person hour and the total quantity of labour employed as goldsmiths in Australia increased to 5000 person hours per week.

a. Draw the two supply curves and the effective (observed) supply curve in the Australian market for gold. Draw the supply curve and the two demand curves in the Australian market for goldsmiths. (Straight lines are OK.)

b. How much is gained by (I) the mine owners and (II) the goldsmiths as a result of the changes in the price of gold and in the wage rate? (III) What is the net gain to the mine owners and the goldsmiths? (IV) By how much does Australia gain from the world gold price increase? Why? (Make whatever further assumptions you believe necessary.) Explain your answers.

Equations

Net Present Value

$$NPV = \sum_{t=0}^{T} \frac{b(t) - c(t)}{(1+r)^t} - K,$$

where NPV = net present value from project
$b(t)$ = benefits ($) received from project in year t
$c(t)$ = costs ($) of project in year t
$\frac{1}{1+r}$ = discount factor at interest rate r p.a.
T = lifetime of project
K = initial (capital) outlay at $t = 0$

Internal Rate of Return

$$NPV = \sum_{t} \frac{x_t}{(1+i^*)^t} = 0 \rightarrow i^* = \text{IRR}.$$

$$\text{IRR} = r^* : \sum_{t=0}^{T} \frac{b_t}{(1+r^*)^t} = \sum_{t=0}^{T} \frac{c_t}{(1+r^*)^t} + K$$

Perpetuity

Where FV is the *future value* of an amount F_0 and r is the discount rate over n periods; where F is an *annuity* of over t periods. When n is infinite, we have a *perpetuity*. In present value terms:

$$PV = \frac{F_n}{(1+r)^n}$$

$$PV = F\,\frac{1-(1+r)^{-t}}{r} \quad \text{annuity}$$

$$PV = \frac{F}{r} \quad \text{perpetuity}$$

Value on Completion

If a project involves cash investment outlays $-x_t$ without receipts over the first T years of the project, followed by net operating revenues y_t over the operating life of the project represented by L, then the Value On Completion (VOC):

$$VOC_T = x_0(1+r)^T + x_1(1+r)^{T-1} + \cdots + x_T$$

Benefit/Cost Ratio

$$\text{The ratio of } \frac{\text{p. v. of benefits}}{\text{p. v. of costs}} = \frac{B}{C} \text{ or } \quad \frac{\sum_{t=0}^{T} \frac{b_t}{(1+r_m)^t}}{\sum_{t=0}^{T} \frac{c_t}{(1+r_m)^t} + K} = \frac{B}{C}$$

Harberger Equation

$$\text{Social cost (1) + (2)} = P_s \bullet \Delta G$$

$$= \Delta P \ (\eta \bar{Q}_D + \kappa \bar{Q}_s)$$

$$\therefore \ P_s = \frac{\Delta P \ (\eta \bar{Q}_D + \kappa \bar{Q}_S)}{\Delta G} \text{ shadow price}$$

$$= \frac{\Delta P \left(\eta(\frac{Q_1 + Q_D}{2}) + \kappa(\frac{Q_1 + Q_S}{2}) \right)}{\Delta G}$$

(if $\eta = \kappa$)

$$= \frac{\Delta P \eta \left(Q_1 + \frac{Q_D}{2} + \frac{Q_S}{2} \right)}{\Delta G}$$

Payback Period $= \frac{K}{b_t}$

Net Benefit Investment Ratio, NBIR

$$NBIR = \frac{\sum_{t=0}^{T} \frac{B_t - OC_t}{(1+i)^t}}{\sum_{t=0}^{T} \frac{IC_t}{(1+i)^t}}$$

where OC_t are the project's operating costs in period t,
IC_t are the project's investment costs in period t,
B_t are the benefits in period t,
i is the appropriate discount rate.