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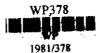
Working Paper

A NOTE ON NON NEUTRALITY OF CAPITAL
SUBSIDY UNDER IRR CRITERION

By

G. Srinivasan

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INDIAN INSTITUTE OF MANAGEMENT
AHMEDABAD-380015
INDIA

Most of the financial institutions in India use internal Rate of Return

R) as a criterion for project evaluation. However the financial institutions

not take into account the capital subsidies (like backward area capital

bsidy) in the computation of IRR.[1] This note establishes that if the cash

bsidies are to be included in the project evaluation then it will be non-

eutral under IRR criterion.

By non neutral we mean that if two projects had equal IRR without considering

the subsidy then the IRR incorporating subsidy may not be equal. It depends on the

pattern of inflows.

Let us demonstrate this with a simple example. Let I_A and I_B be investments

in projects A and B with a life of two years. A1, A2 and B1, B2 are the inflows

from the projects A and B at the end of time periods 1 and 2. Let the investment

and IRR without considering the subsidy of both the projects be equal.

$$I_A = \frac{A_1}{(1+r)} + \frac{A_2}{(1+r)^2}$$

$$I_B = \frac{B_1}{(1+r)} + \frac{B_2}{(1+r)^2}$$

$$I_A = I_B$$

$\therefore$

$$\frac{A_1}{(1+r)} + \frac{A_2}{(1+r)^2} = \frac{B_1}{(1+r)} + \frac{B_2}{(1+r)^2}$$

$$B_2 = (1+r)(A_1 - B_1) + A_2$$

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1. Industrial Development Bank of India, Industrial Development of Backward Regions Bombay. IDBI, 1974. pp 465.

e the investment is same the subsidy for both the projects are same and

al to S

t the IRᵣ of projects after incorporating the subsidy be r_a and r_b

r projects A and B

ion we have

$$I_A - S = \frac{A_1}{(1+r_a)} + \frac{A_2}{(1+r_a)^2}$$

$$I_B - S = \frac{B_1}{(1+r_b)} + \frac{B_2}{(1+r_b)^2}$$

Now to show that subsidy is non neutral one has to show that $r_a \neq rb$

The proof is by contradiction

If $r_a = r_b = r_o$

then $I_A - S = \frac{A_1}{(1+r_o)} + \frac{A_2}{(1+r_o)^2}$

$I_B - S = \frac{B_1}{(1+r_o)} + \frac{B_2}{(1+r_o)^2}$

$I_A - S = I_B - S$

$\therefore B_2 = (1+r_o)(A_1-B_1) + A_2$

But earlier we have seen that

$B_2 = (1+r)(A_1 - B_1) + A_2$

Since the subsidy S is positive, r_o is greater than r. And for $A_1 \neq B_1$ this

implies $B_2 = B_2 + \Delta$ Where Δ is non zero which is a contradiction.

Hence $r_a \neq r_b$

This implies that if the projects had differential inflows the incorporation

of the subsidy in the computation of IRR is non neutral. This emerges from the fact that an equal change in any periods' flow will not in general result in equal change in IRR across projects eventhough they had equal IRR before the change unless all the flows are identical.

It can also be shown that in general the incorporation of subsidy will be biased in favour of projects with larger cashflows in the earlier years. We can illustrate this point with the above example. Suppose after incorporation of the subsidy the returns of the projects are: r_a and r_b respectively. We have to show that If $A_1 > B_1$ then $r_a > r_b$

$$I_A - S = \frac{A_1}{(1+r_a)} \quad \frac{A_2}{(1+r_a)^2}$$

$$I_B - S = \frac{B_1}{(1+r_b)} + \frac{B_2}{(1+r_b)^2}$$

Since $I_A - S = I_B - S$ We have

$$B_2 = \frac{A_1(1+r_b)^2}{(1+r_a)} - \quad \frac{B_1(1+r_b) + A_2(1+r_b)^2}{(1+r_a)^2}$$

We have already shown $r_b > r$

If $r_b > r_a$ and $A_1 > B_1$ then

$$\frac{A_1(1+r_b)^2}{(1+r_a)} - B_1(1+r_b) > (A_1 - B_1)(1+r_b) > (A_1 - B_1)(1+r)$$

$$\frac{A_2(1+r_b)^2}{(1+r_a)} > A_2(1+r_b) > A_2(1+r)$$

$$\therefore B_2 > (A_1 - B_1)(1+r) + A_2$$

But we have seen $B_2 = (A_1 - B_1)(1+r)+A_2$

Hence $r_b \gtrless r_a$

On a multi period analysis one can conjecture that a project with larger initial flows will have a higher post subsidy return than a project whose flows are concentrated towards the end.