Properties of the Financial Break-Even Point in a Simple Investment Project as a Function of the Discount Rate

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Abstract

We consider a simple investment project with the following parameters: I>0: Initial outlay which is amortizable in n years; n: Number of years of the duration of the investment project which makes the same activities per year with only one product; A>0: Annual amortization (A=I/n); Q>0: Quantity of products sold per year; Cv>0: Variable cost per unit; p>0: Price per unit with p>Cv; Cf>0: Annual fixed costs; te: Tax of earnings; r: Annual discount rate. We also assume that the annual inflation is depreciable. We obtain the explicit expression of the net present value (NPV) of the investment project as a function of the independent variable Q and we get the explicit expression of the financial break-even point Qf (i.e. the investment project has a NPV of zero) as a function of the parameters I, n, Cv, Cf, te, r, p. We study the behavior of Qf with respect of the discount rate r and we prove that: (i) When r is depreciable Qf goes to the accounting break-even point Qc (i.e. the investment project has the earnings before taxes (EBT) of zero); (ii) When r is large the graph of the function Qf=Qf(r) has an asymptotic straight line with positive slope. Moreover, Qf(r) is an strictly increasing and convex function of the variable r; (iii) By a sensibility analysis we obtain that p and Cv have an appreciable influence on Qf, and Cf has a depreciable influence on Qf; (iv) Moreover, if we assume that the investment project is also growing at the rate g per year then we obtain the same results as before but the graph of the function Qf=Qf(r,g) vs r has, for all g>0, the same asymptotic straight line when r goes to infinity as the particular case with g=0.