

On the Improper use of the Internal Rate of Return in Cost-Benefit Analysis

“The IRR should be avoided as the decision criterion.” (UK Green book; Item 6.9 on page 39)

While textbooks and manuals on Cost-Benefit Analysis (CBA) all agree that the only economically-relevant criterion for project selection is net present value (NPV), often other measures are proposed as summary indicators to rank projects—*e.g.*, the benefit-cost ratio, the overall rate of return, and the internal rate of return (IRR). Of these criteria, the IRR is the most popular because of its intuitive appeal, and it is often mistakenly cited as equivalent to proper CBA. The WB PAD template, Annex 9, on economic and financial analysis requires a “cost-benefit analysis (economic rate of return or net present value) for projects which are amenable to this type of analysis.”

The IRR is presented as a break-even discount rate—*i.e.*, it is defined as the discount rate that makes the NPV equal to zero. It is then argued that if the ‘appropriate’ discount rate falls below the IRR, the NPV must be positive—and the reverse must hold for discount rates above the IRR. However, IRR rankings have no relation with the relevant NPV rankings. Often the IRR can be very misleading, at best just somewhat misleading.¹ Moreover, the informational requirements for computing the proper NPV and the IRR are the same except for the discount rate—yet without thinking about the proper discount rate no proper CBA can be performed. There are no shortcuts.

The IRR contains no useful information about the economic value of a project. This can be illustrated by graphing the NPV as a function of the discount rate—consider Figure 1 that displays the NPV schedule for two alternative projects. Project A has a substantially higher NPV for any discount rate in the economically-relevant range (*i.e.*, for any r less than 30%), yet it crosses the x -axis to the left of project B, and consequently has a lower IRR—*i.e.*, the $IRR_A = 40\% < IRR_B = 70\%$.

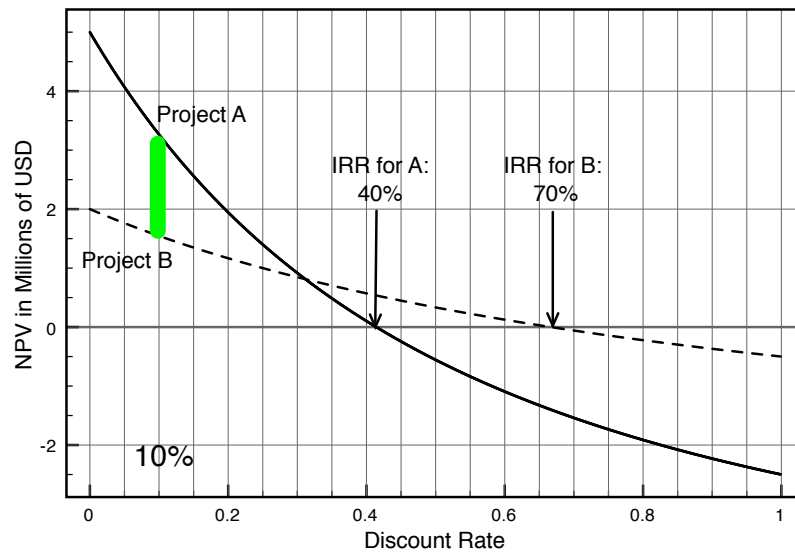


Fig. 1. Example: $NPV_A(r) > NPV_B(r)$ for $r < 30\%$, but $IRR_A < IRR_B$.

Since welfare depends on NPV, not IRR, it is apparent that project A dominates B. For instance $NPV_A(r)$ exceeds $NPV_B(r)$ by about \$1.6 million for a discount rate in a neighbourhood of 10%. The point where the graphs cross the x -axis in the figure (the IRR), is economically irrelevant and should not be used in economic discussions.

Prepared by PREM staff E. Ley, who thanks Jim Brumby, Frederico Gil Sander and Brian Pinto for comments.

¹ See the PRMED Knowledge Brief “CBA Evaluation Criteria.”