

Internal rate of return: A **cautionary** tale

Tempted by a project with a high internal rate of return? Better check those interim cash flows again.

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The McKinsey Quarterly, Web exclusive, August 2004

Maybe finance managers just enjoy living on the edge. What else would explain their weakness for using the internal rate of return (IRR) to assess capital projects? For decades, finance textbooks and academics have warned that typical IRR calculations build in reinvestment assumptions that make bad projects look better and good ones look great. Yet as recently as 1999, academic research found that three-quarters of CFOs always or almost always use IRR when evaluating capital projects.¹

Our own research underlined this proclivity to risky behavior. In an informal survey of 30 executives at corporations, hedge funds, and venture capital firms, we found only 6 who were fully aware of IRR's most critical deficiencies. Our next surprise came when we reanalyzed some two dozen actual investments that one company made on the basis of attractive internal rates of return. If the IRR calculated to justify these investment decisions had been corrected for the measure's natural flaws, management's prioritization of its projects, as well as its view of their overall attractiveness, would have changed considerably.

So why do finance pros continue to do what they know they shouldn't? IRR does have its allure, offering what seems to be a straightforward comparison of, say, the 30 percent annual return of a specific project with the 8 or 18 percent rate that most people pay on their car loans or credit cards. That ease of comparison seems to outweigh what most managers view as largely technical deficiencies that create immaterial distortions in relatively isolated circumstances.

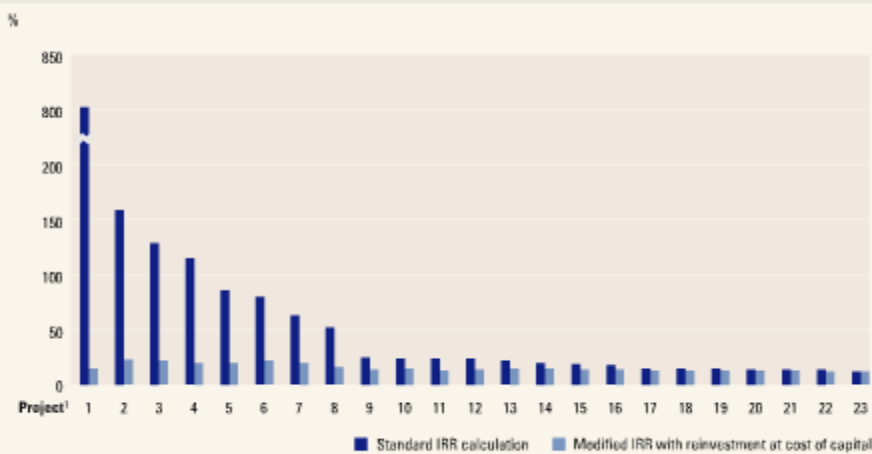
Admittedly, some of the measure's deficiencies are technical, even arcane,² but the most dangerous problems with IRR are neither isolated nor immaterial, and they can have serious implications for capital budget managers. When managers decide to finance only the projects with the highest IRRs, they may be looking at the most distorted calculations—and thereby destroying shareholder value by selecting the wrong projects altogether. Companies also risk creating unrealistic expectations for themselves and for shareholders, potentially confusing investor communications and inflating managerial rewards.

We believe that managers must either avoid using IRR entirely or at least make adjustments for the measure's most dangerous assumption: that interim cash flows will be reinvested at the same high rates of return.

The trouble with IRR

Practitioners often interpret internal rate of return as the annual equivalent return on a given investment; this easy analogy is the source of its intuitive appeal. But in fact, IRR is a true indication of a project's annual return on investment only when the project generates no interim cash flows—or when those interim cash flows really can be invested at the actual IRR.

When the calculated IRR is higher than the true reinvestment rate for interim cash flows, the measure will overestimate—sometimes very significantly—the annual equivalent return from the project. The formula assumes that the company has additional projects, with equally attractive prospects, in which to invest the interim cash flows. In this case, the calculation implicitly takes credit for these additional projects. Calculations of net present value (NPV), by contrast, generally assume only that a company can earn its cost of capital on interim cash flows, leaving any future incremental project value with those future projects.

A rude surprise

¹ Disagional example of large industrial company.

[enlarge exhibit](#)

What to do?

The most straightforward way to avoid problems with IRR is to avoid it altogether. Yet given its widespread use, it is unlikely to be replaced easily. Executives should at the very least use a modified internal rate of return. While not perfect, MIRR at least allows users to set more realistic interim reinvestment rates and therefore to calculate a true annual equivalent yield. Even then, we recommend that all executives who review projects claiming an attractive IRR should ask the following two questions.

1. What are the assumed interim-reinvestment rates? In the vast majority of cases, an assumption that interim flows can be reinvested at high rates is at best overoptimistic and at worst flat wrong. Particularly when sponsors sell their projects as "unique" or "the opportunity of a lifetime," another opportunity of similar attractiveness probably does not exist; thus interim flows won't be reinvested at sufficiently high rates. For this reason, the best assumption—and one used by a proper discounted cash-flow analysis—is that interim flows can be reinvested at the company's cost of capital.

2. Are interim cash flows biased toward the start or the end of the project? Unless the interim reinvestment rate is correct (in other words, a true reinvestment rate rather than the calculated IRR), the IRR distortion will be greater when interim cash flows occur sooner. This concept may seem counterintuitive, since typically we would prefer to have cash sooner rather than later. The simple reason for the problem is that the gap between the actual reinvestment rate and the assumed IRR exists for a longer period of time, so the impact of the distortion accumulates.⁴

Despite flaws that can lead to poor investment decisions, IRR will likely continue to be used widely during capital-budgeting discussions because of its strong intuitive appeal. Executives should at least cast a skeptical eye at IRR measures before making investment decisions.

About the Authors

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The authors wish to thank Rob McNish for his assistance in developing this article. This article was first published in the Summer 2004 issue of *McKinsey on Finance*.

Notes

¹ John Robert Graham and Campbell R. Harvey, "The theory and practice of corporate finance: Evidence from the field," Duke University working paper presented at the 2001 annual meeting of the American Finance Association, New Orleans.

2 As a result of an arcane mathematical problem, IRR can generate two very different values for the same project when future cash flows switch from negative to positive (or positive to negative). Also, since IRR is expressed as a percentage, it can make small projects appear more attractive than large ones, even though large projects with lower IRRs can be more attractive on an NPV basis than smaller projects with higher IRRs.

3 The amplification effect grows as a project's fundamental health improves, as measured by NPV, and it varies depending on the unique timing of a project's cash flows.

4 Interestingly, given two projects with identical IRRs, a project with a single "bullet" cash flow at the end of the investment period would be preferable to a project with interim cash flows. The reason: a lack of interim cash flows completely immunizes a project from the reinvestment-rate risk.