Teaching MIRR to Improve Comprehension of Investment Performance Evaluation Techniques: A Comment

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ABSTRACT

Balyeat, *et. al.* (2013, this journal) suggest that IRR does not have a clear economic interpretation and that MIRR highlights the reinvestment assumptions of NPV and IRR thus increasing its value as a teaching tool. This comment addresses misconceptions found in the work of Balyeat, *et. al.* In particular, it reiterates the economic interpretation of IRR and reexamines the alleged reinvestment rate assumptions.

Introduction

Balyeat, *et. al.* (2013) in "Teaching MIRR to Improve Comprehension of Investment Performance Evaluation Techniques" examine the use of MIRR as a substitute for IRR in the evaluation of capital budgeting projects and investment performance. We believe their article further confuses the issues rather than improving the overall comprehension of the subject.

The purpose of this comment is to address two erroneous propositions in Balyeat, *et. al*. First: we address the fallacy of implicit reinvestment rate assumptions related to IRR (subsequently YTM) and NPV. Since the primary rationale for their paper is the teaching of MIRR, which by definition looks at the reinvestment of interperiod cash flows, a direct comparison with IRR and NPV, becomes invalid. Secondly: we reference previous work which provides an "economic interpretation" for IRR and highlights the relationship between IRR and MIRR in the context of a "realized rate of return".

Reinvestment Assumption

Beginning with their abstract, "The reinvestment assumptions of NPV and IRR are implicit and hidden from students…" and ending with their section entitled "The Reinvestment Rate Assumption", the authors are following a long line of erroneous research that posits that a reinvestment rate assumption is endogenous to the IRR and NPV techniques.

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In a previous note found in this journal, Johnston, Forbes, and Hatem (2002) lament the continued erroneous statements found in textbooks stating that NPV and IRR require a reinvestment rate assumption. Today, a decade later and over forty years from the original publication of Carlton L. Dudley's note in the *Journal of Finance* (1972), the error remains. [4]

As noted by Johnston, et. al. (2002):

> "Students should be told that conflicts between NPV and IRR signals may arise when considering mutually exclusive investments, and that the source of these conflicts is agreed to be the scale and/or timing of cash flows. That, when searching for a way to decide between conflicting NPV and IRR signals in these circumstances, **explicit** assumptions about reinvestment of cash flows to some future horizon might be used to resolve the conflict, but these are ad hoc in nature." p. 29

Hence, the introduction of a reinvestment rate assumption is an attempt to resolve the conflicts that exist between NPV and IRR, not a requirement of the actual methods.

Balyeat, *et. al.* (2013) note the reference by some detractors that MIRR, stands for "meaningless internal rate of return", on page 9. They cite the textbook by Ross, Westerfield, and Jordan but fail to understand the significance of Ross, *et. al.'s* (2014) comment on page 258, "The value of a project does not depend on what the firm does with the cash flows generated by that project… How the cash flows are spent in the future does not affect their value today."

Economic Interpretation of IRR

As to the authors' following reference, "Brealy and Myers (2000, p. 108) point out that IRR is a derived figure without any simple economic interpretation and that it cannot be described as anything more than a discount rate that when applied to all cash flows make NPV equal to zero." (Balyeat, *et. al.*, 2013, p. 39). This statement, however, is only a (repeatedly cited) assertion and even a myth. The truth is that IRR does have a clear economic interpretation. Unfortunately, it has not been well noted by financial economic academicians. Hence, it is worth reciting here.

From a perspective of bonds theory, Cebula, *et. al.* (2012) show vigorously that the YTM (Yield to maturity) of coupon bonds does have a very clear and simple economic explanation. It is the *ex ante* (or theoretic) *total rate of return* from holding a bond until maturity. As IRR is defined in the same way as YTM, IRR also measures the expected total rate of return from the project to be invested. The linkage between YTM and total rate of return is formally derived and proven in Cebula, *et al.* (2012). We offer the following quote from Ivo Welch, which is also relevant to the authors' puzzlement over why IRR is still widely used by businesses:

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[4] Dudley points out that this problem was first discussed in 1956 by Solomon, who was indirectly referenced by the authors. Had they found Dudley's note they would have discovered the confusion originated with subsequent authors misquoting Renshaw (1957). See Dudley (1972), pp. 907-908.

> "Why use the IRR instead of the NPV investment criterion? The answer is that the former is often quite intuitive and convenient, provided that the project's cash flow stream implies one unique IRR. In this case, IRR is convenient because you can compute it without having looked at financial markets, interest rates, or costs of capital. This is IRR's most important advantage over NPV: *It can be calculated even before you know the appropriate interest rate (cost of capital).*" (Welch, 2011, p. 70).

The Relation Between IRR and MIRR

Balyeat, *et. al.*(2013) promote the MIRR decision rule because they believe that "MIRR is a superior measure of rate of return in some cases (e.g., when project cash flows change sign more than once) compared to IRR." Before comparing the two measures, however, we must know what each of them actually addresses. They both measure the rate of return, but <u>not from the same investment.</u> From a bonds-theory perspective, Cebula and Yang (2008, JEFE) discussed the link between YTM (yield to maturity) and RCY (realized compounding yield) or realized rate of return, showing vigorously that RCY is in fact the YTM of two investments: holding a bond until maturity, and (re)investing the coupon payments periodically in something like a discount bond when they are received. Hence, RCY is a (weighted) average of the (initial) YTM and the rates of reinvestment, whereas the YTM is the rate of return from holding the bond *per se*. By definition, YTM has nothing to do with whether and how coupon payments are reinvested when they are received. And RCY relies on both cash flows from holding the bond and the rates of reinvestment.

In a capital budgeting content, IRR is analytically defined in the same way as YTM and MIRR is equivalent to RCY. Hence, IRR actually measures the rate of return from the business investment project on one hand, and MIRR measures the weighted average of rates of return from the project and the reinvestment, if applicable. Technically, the rate of reinvestment is assumed at the time of decision making, which may or may not be related to the investment project under the consideration. When making a decision on a business project, the decision should be made in terms of the estimated information from the project *per se*, not from the reinvested cash flows. In other words, there is no reinvestment rate assumption in IRR or NPV.

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