

A refinement to the Sharpe ratio and information ratio

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Craig L. Israelsen

is an Associate Professor in the Home and Family Living Department at Brigham Young University (Provo, UT), where he teaches Family Finance. He holds a PhD in Family Resource Management from Brigham Young University. He received a BS in Agribusiness and an MS in Agricultural Economics from Utah State University. He writes monthly for *Financial Planning Magazine* (New York).

Department of Home and Family Living, 2055 JFSB, Brigham Young University, Provo, UT 84602, USA
Tel: +01 801 4224 537; e-mail: craig_israelsen@byu.edu

Abstract By modifying the denominator, both the Sharpe ratio and information ratio provide correct rankings during periods of negative excess returns.

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The reward-to-variability ratio (more commonly known as the Sharpe ratio (SR)) was introduced by William Sharpe in 1966 (Sharpe, 1966). The information ratio (IR) (originally referred to as the 'appraisal ratio') was introduced by Jack Treynor and Fischer Black in 1973 (Treynor and Black, 1973).

Both are measures of volatility-adjusted performance. The key difference between the two is the definition of 'excess return'. The SR defines excess return as the return above the risk free rate. The IR defines excess return as the return in excess of a relevant benchmark index. The denominator of the IR is often referred to as a measure of 'tracking error'. Thus, the IR is often described as (a) residual return divided by residual risk or (b) alpha divided by residual risk. Whatever the definition, the higher the IR (and SR) quotient the better.

The SR is demonstrated in Equation (1) and the IR in Equation (2).

$$\text{Sharp ratio} = \frac{\text{excess return}}{\text{standard deviation of excess return}} \quad (1)$$

where excess return is the asset return minus the risk-free return.

$$\text{Information ratio} = \frac{\text{excess return}}{\text{standard deviation of excess return}} \quad (2)$$

where excess return is the asset return minus the benchmark return.

Pragmatically, the SR compares the return of an asset against the return of T-bills, whereas the IR measures 'excess return' in comparison with the most relevant equity (or debt) benchmark index. In spite of the title, 'excess' return can be negative or positive. In fact, it is precisely because excess return can be negative that this paper has been written. When the excess return is negative, the reliability of these two measures (both of which produce a quotient) decreases.

An example of the IR will be helpful and will suffice as an example for the SR as well, inasmuch as the mathematical properties of the two are identical.

Consider the case of fund X. The first step in calculating the IR is to calculate each period's excess return. In this