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A note on why doesn't the choice of performance measure matter?

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ABSTRACT

Choosing an appropriate performance measure is important for fund investors, nevertheless, many researchers find empirically that the choice of measures does not matter because those measures generate identical rank ordering, even though the distribution of fund returns is non-normal. In this paper we certify their findings by proving the monotonicity of several widely used performance measures when the distribution is a location-scale family. The mutual fund monthly return data from 1997 to 2015, together with simulation results, collaborate with our proof.

1. Introduction

An adequate risk-adjusted return performance measure to select investment funds is crucial for financial analysts and investors. Sharpe ratio has become a standard measure by adjusting the return of a fund by its standard deviation (Sharpe, 1966), nevertheless, practitioners often question this measure mainly for its invalidity if the distribution of fund returns is beyond normal (Kao, 2002; Amin and Kat, 2003; Gregoriou and Gueyie, 2003; Cavenaile et al., 2011; Di Cesare et al., 2014). Several new measures have been proposed and investigated to overcome this limitation of the Sharpe ratio, however, Eling (2008) finds

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choosing a performance measure is not critical to mutual fund evaluation, Eling and Schuhmacher (2007) compare the Sharpe ratio with 12 other measures for hedge funds and conclude that the Sharpe ratio and other measures generate virtually identical rank ordering, despite the significant deviations from normal distribution. Similar evaluation includes Eling and Faust (2010) on funds in emerging markets, Auer and Schuhmacher (2013) on hedge funds, and Auer (2015) on commodity investments[1].

In this paper we prove the monotonicity of the Sharpe ratio and several other performance measures when the distribution of returns is a location-scale (LS) family, a family of univariate probability distributions parameterized by a location and a non-negative scale parameters, with several well-known distributions in finance including Cauchy, exponential, extreme value distribution of the maximum and the minimum, each of type I, Laplace, logistic and half-logistic, Maxwell– Boltzmann, normal and half-normal, uniform distribution, etc. (Rinne, 2010). We show that the rank ordering among the Sharpe, Omega (Shadwick and Keating, 2002), Sharpe– Omega (Kazemi et al., 2004), Sortino (Sortino and van der Meer, 1991) and Kappa ratio (Kaplan and Knowles, 2004) is the same in theory due to this monotonicity, therefore the choice of performance measure does not matter, certifying the results of Eling (2008); Eling and Schuhmacher (2007) and Auer (2015), among others.

The monthly net-of-fee mutual fund returns from February 1997 to June 2015 collaborate with our proof. The null hypothesis that the returns are logistically distributed cannot be rejected for over 85.83% mutual fund at the 10% level. The Spearman rank correlation for those funds performance measures is not significantly different from each other, suggesting they are virtually the same. Our further simulation results are consistent with this finding.

2. Performance measure and monotonicity proof

The Sharpe ratio is often used to measure performance of funds (Ackermann et al., 1999; Schneeweis et al., 2002), and is calculated as

$$\text{Sharpe ratio}_i = \frac{r_i - r_f}{\sigma_i}, \tag{1}$$

where r_i is the average monthly return of fund i, r_f is the risk-free rate, and σ_i is the standard deviation of the monthly return of fund i. Using the Sharpe ratio, however, is criticized for not being able to measure those funds whose returns are not normally distributed (Kao, 2002; Amin and Kat, 2003; Gregoriou and Gueyie, 2003). Numerous new measures have been invented to circumvent this limitation by considering lower partial moments, see for example, Eling (2008); Darolles and Gourieroux (2010); Homm and Pigorsch (2012), and Chow and Lai (2015).

In this paper we select several widely used measures to compare with the Sharpe ratio, including the Omega ratio (Shadwick and Keating, 2002):

$$\frac{E(r_i - L)_+}{E(L - r_i)_+} \tag{2}$$

the Sharpe– Omega ratio (Kazemi et al., 2004):

$$\frac{E(r_i) - L}{E(L - r_i)_+} \tag{3}$$

the Sortino ratio (Sortino and van der Meer, 1991):

$$\frac{E(r_i) - L}{\left(E[(L - r_i)_+]^2\right)^{1/2}} \tag{4}$$

[1] Schuhmacher and Eling (2012) claim that partial-moments-based performance measures are strictly increasing functions in the Sharpe ratio based on the location and scale property. However, more empirical tests should be done because the results in Schuhmacher and Eling (2012) are unsuitable for some widely applied distributions, especially when the shape parameter is unfixed. There are two differences that separate our work from theirs. First, we use both the real monthly net-of-fee returns of mutual funds and simulated data, fitting logistic distribution with MLE (maximum likelihood estimator) and assuming extreme value distribution of type I, respectively, while Schuhmacher and Eling (2012) use hypothetical investment funds under the assumption of normal and skew normal distributions. Second, our proof is more straightforward and from a different angle. Therefore our results have merits.

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