

Lo Sharpe Ratio

R Project for Statistical Computing

September 7, 2013

Abstract

This vignette gives an overview of the Lo Sharpe Ratio which have addressed the issue of IID in the financial time series data.

1 Background

The building blocks of the **Sharpe Ratio** : expected returns and volatilities are unknown quantities that must be estimated statistically and are, therefore, subject to *estimation error* . This raises the natural question: How *accurately* are Sharpe ratios measured? To address this question, Andrew Lo derives explicit expressions for the statistical distribution of the Sharpe ratio using standard asymptotic theory.

2 Lo Sharpe Ratio

Given a predefined benchmark Sharpe ratio , the observed Sharpe ratio can be expressed in terms of autocorrelated coefficients as

$$\hat{SR}(q) - SR(q) = NormalDistribution(0, V_{GMM}(q))$$

The estimator for the Sharpe ratio then follows directly:

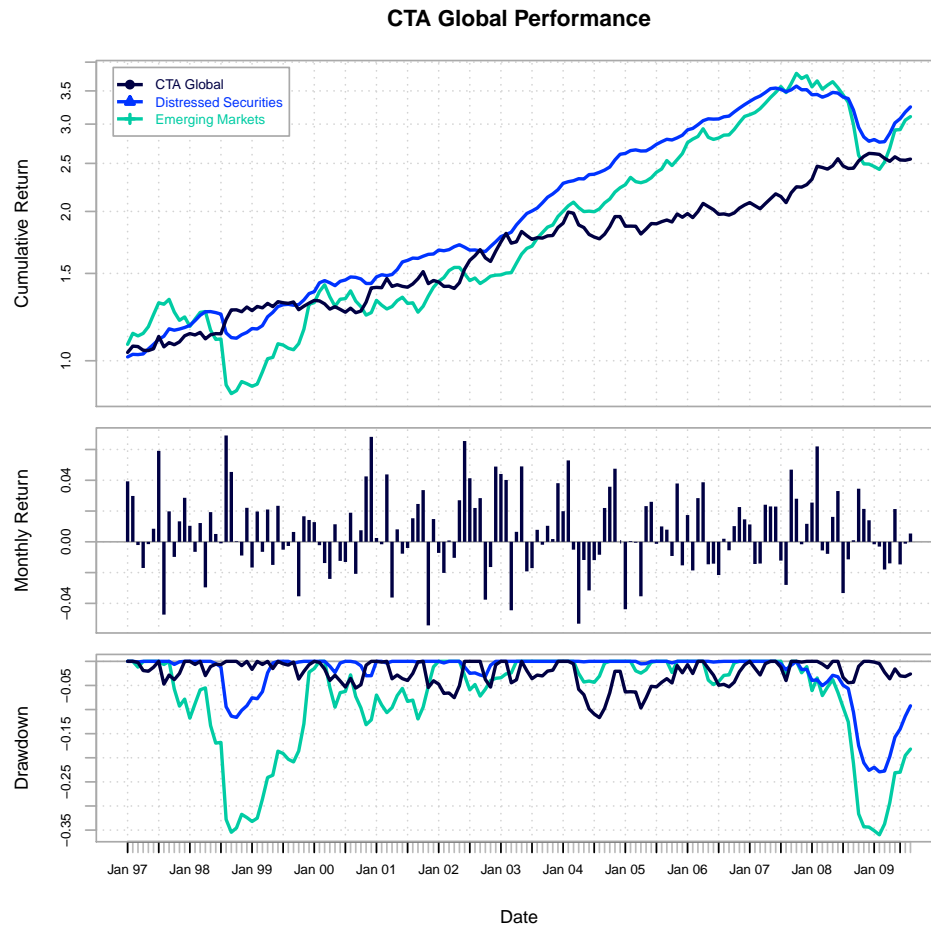
$$\hat{SR}(q) = \hat{\eta}(q) * SharpeRatio$$

$$\hat{\eta}(q) = q / \sqrt{q + \sum_k^n \rho}$$

3 Example

In an illustrative empirical example of mutual funds and hedge funds, we find results, similar reported in paper, that the annual Sharpe ratio for a hedge fund can be overstated by as much as **65 %** because of the presence of **serial correlation** , and once this serial correlation is properly taken into account, the rankings of hedge funds based on *Sharpe ratios* can change dramatically.

```
> data(edhec)
> charts.PerformanceSummary(edhec[,2:4],
+ colorset = rich6equal, lwd = 2, ylog = TRUE)
```



We can observe that the fund "**Emerging Markets**", which has the largest drawdown and serial autocorrelation, has its Andrew Lo Sharpe ratio , *decrease* most significantly as compared to other funds.

```

> Lo.Sharpe = LoSharpe(edhec[,2:4])
> Theoretical.Sharpe= SharpeRatio.annualized(edhec[,2:4])
> barplot(rbind(Theoretical.Sharpe,Lo.Sharpe), main="Theoretical and Andrew Lo Sharpe Ratio Observed",
+         xlab="Fund Type",ylab="Value", col=c("darkblue","red"), beside=TRUE)
> legend("topright", c("1","2"), cex=0.6,
+       bty="n", fill=c("darkblue","red"));

```

