Lo Sharpe Ratio

R Project for Statistical Computing

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Abstract

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

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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 SR^* , the observed Sharpe ratio $\hat{S}R$ can be expressed in terms of autocorrelated coefficients as

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

The estimator for the Sharpe ratio then follows directly:

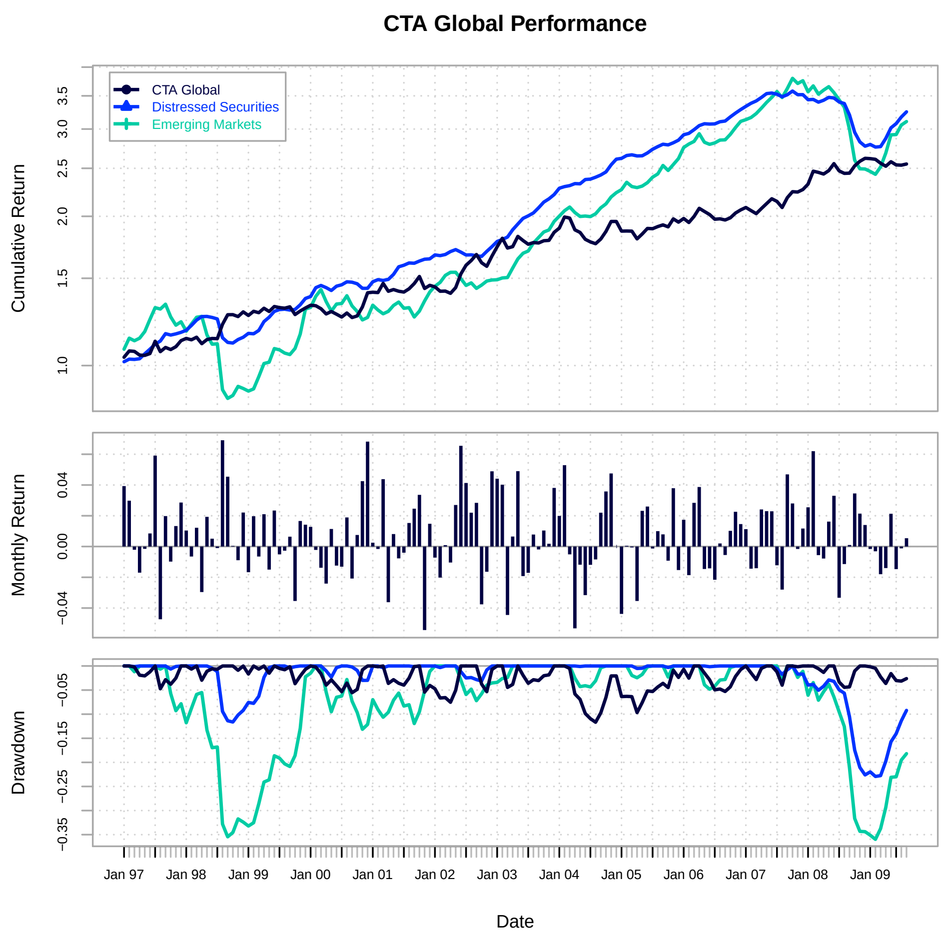
$$\hat{S}R(q) = \hat{\eta}(q) * SharpeRatio$$

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

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 it's Andrew Lo Sharpe ratio , *decrease* most significantly as comapared 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 Sha
+          xlab="Fund Type",ylab="Value", col=c("darkblue","red"), beside=TRUE)
>    legend("topright", c("1","2"), cex=0.6,
+                     bty="2", fill=c("darkblue","red"));
```