On the Maximum Drawdown of a Brownian Motion

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Abstract

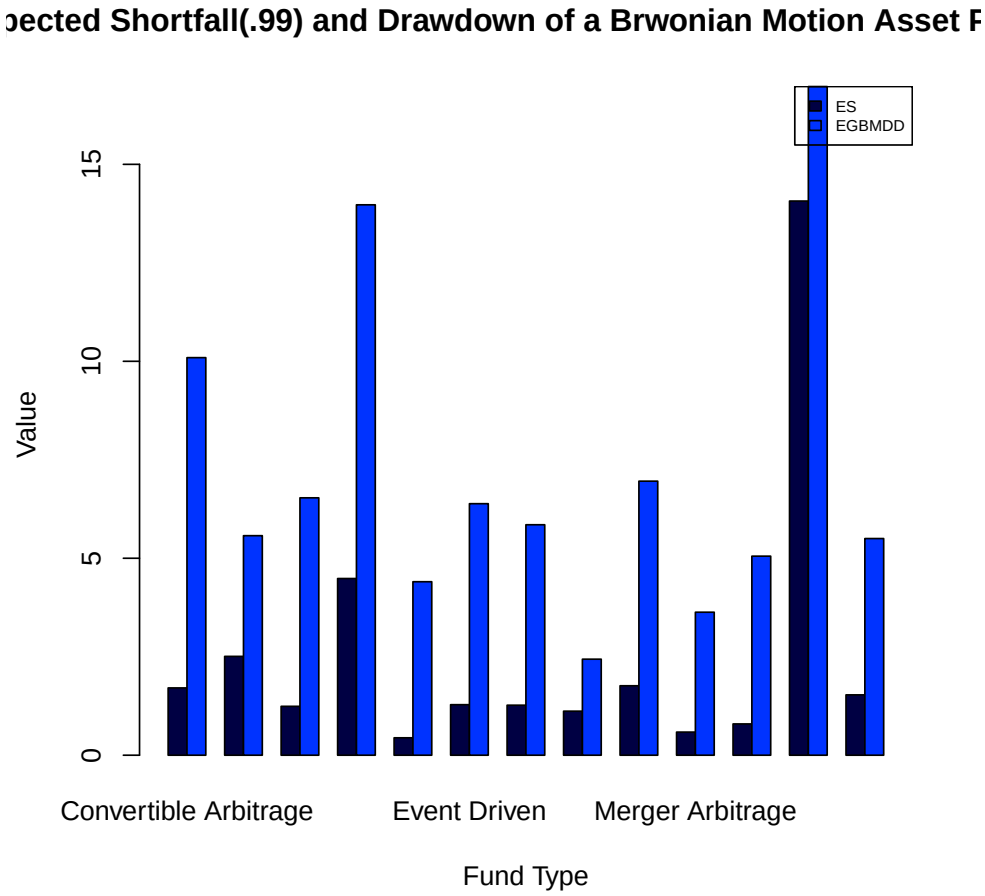
The maximum drawdown possible of an asset whose return series follows a Geometric Brownian Motion Process.

1 Background

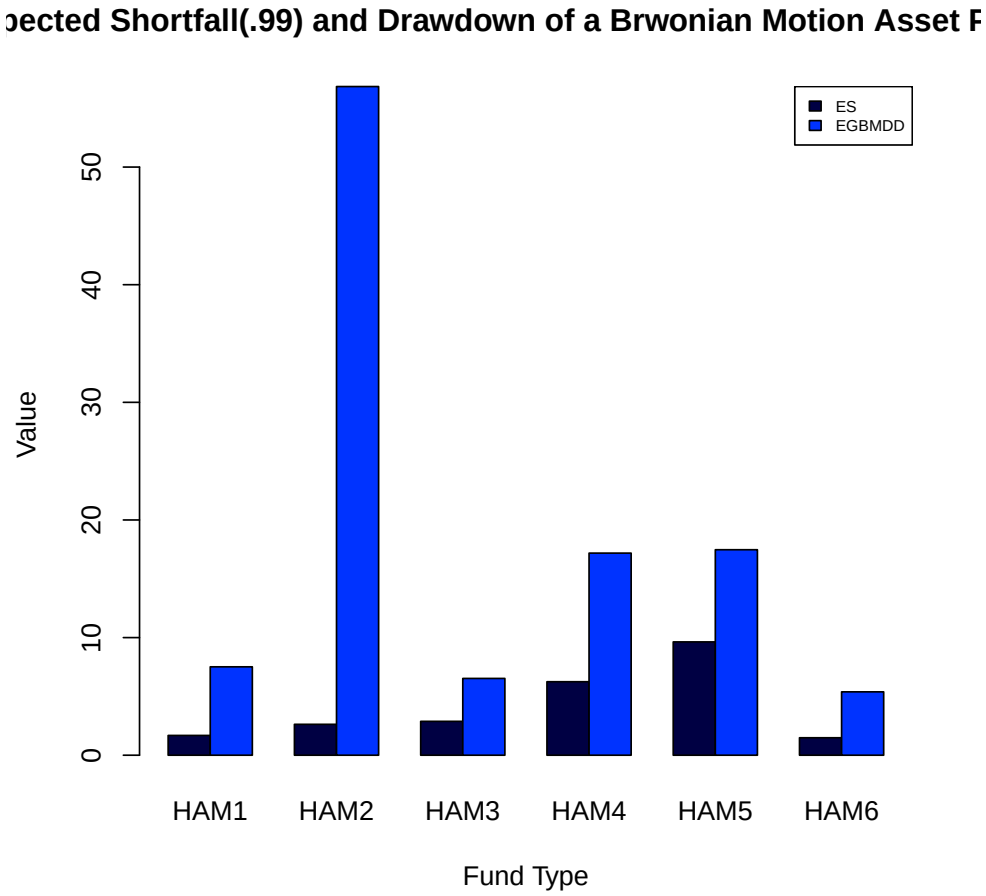
If X(t) is a random process on [0, T], the maximum drawdown at time T , D(T), is defined by where

$$D(T) = sup[X(s) - X(t)]$$

here s belongs to [0,t] and s belongs to [0,T] Informally, this is the largest drop from a peak to a bottom. In this paper, we investigate the behavior of this statistic for a Brownian motion with drift. In particular, we give an infinite series representation of its distribution, and consider its expected value. When the drift is zero, we give an analytic expression for the expected value, and for non-zero drift, we give an infinite series representation. For all cases, we compute the limiting $(T"tendsto"\infty$ behavior, which can be logarithmic ($\mu > 0$, square root ($\mu = 0$, or linear ($\mu < 0$.



We can observe that the fund "**Emerging Markets**", which has the largest drawdown and serial autocorrelation, has highest Drawdown , *decrease* most significantly as comapared to other funds.



We can see that the model, correctly ranks the highest drawdown fund managers, i.e. **HAM2**, which has the largest drawdown among all the funds.