

Supplement to Section 4.1.1

T-distributed growth

It is an empirical fact that the t-distribution describes the distribution of the growth much better than the normal distribution. The number of degrees of freedom for the daily growths varies in the literature between 3 and 7. Jungner studied 24 individual stocks on Stockholmsbörsen and found that the following approximate identity holds for the degrees of freedom, f , for arbitrary period lengths:

$$f \approx 3.6 + 0.2p = 3.6 + 50T.$$

Here p and T are the period length in days and years, respectively.

The variance of the t-distribution equals $f/(f-2)$, and hence the normal quantile z_ϵ shall be replaced by

$$t_\epsilon(f)/\sqrt{f/(f-2)}.$$

Example Let $\epsilon = 0.05$, and consider the daily growths. The normal quantile satisfies $z_{0.05} \approx 1.64$. Using the above identity we get $f = 3.8$. The t-quantile equals

$$t_{0.05}(3.8)/\sqrt{3.8/(3.8-2)} \approx 1.50.$$

Compare this with the empirical quantiles for *FIVE STOCKS* in Section 8.2.1. The quantiles 1.3, 1.4, 1.5 and 1.6 correspond to $f = 2.7, 3.1, 3.8$ and 7.0, respectively.

Reference

Niklas Jungner. Empirisk studie av t-fördelningens anpassning till log-avkastningen hos ett urval av aktier på Stockholmsbörsen. *Bachelor Thesis in Mathematical Statistics 2009:1*, Stockholm University.