EXPECTED VALUE AND VARIANCE CRITERION

SINCE IN THE SHORT RUN THE AVERAGE OF A RANDOM VARIABLE MAY BE FAR REMOVED FROM ITS EXPECTED VALUE, OFTEN BOTH THE EXPECTED VALUE AND VARIANCE ARE BOTH TAKEN IN THE OBJECTIVE FUNCTION.

IN THE PREVIOUS PROBLEM ONE COULD MINIMIZE $E\,C(T) + K.\mathrm{VAR}\,C(T)$. ($K$ is a constant often referred to as the RISK AVERSION FACTOR).

Let us re-write the problem:

$$C(T) = \frac{c_1\left(\sum_1^T n_t\right) + c_2(n - n_T)}{T}$$

$$\mathrm{Var}\ C(T) = \frac{c_1^2 \sum_1 \mathrm{Var}(n_t) + c_2^2 \mathrm{Var}(n_T)}{T^2}$$

$$\mathrm{var}(n_t) = n p_t (1 - p_t)$$

$$\mathrm{Var}\,C(T) = \frac{c_1^2 n\left[\sum_1 p_t - \sum_1 p_t^2\right] + c_2^2 n p_T(1-p_T)}{T^2}$$

Hence $E\ C(T) + K.\ \mathrm{Var}\ C(T)$

$$= \frac{c_1 n \sum_1 p_t + c_2 n(1 - p_T)}{T} + \frac{c_1^2 n\left[\sum_1 p_t - \sum_1 p_t^2\right] + c_2^2 n p_T (1-p_T)}{T^2}.K$$

$$= n\left\{\left(\frac{c_1}{T} + \frac{c_1^2 K}{T^2}\right)\sum_1 p_t - \frac{c_1^2 K}{T^2}\sum_1 p_t^2 + \left(\frac{c_2}{T} + \frac{c_2^2 p_T K}{T^2}\right)(1-p_T)\right\}$$

An Aside

It may not be a good idea to add variance to mean. It is felt that standard deviation may be a better idea.