OBJECTIVE

FUNCTIONS

Fall 2002

<u>Objective Functions</u>

I.   Classical Markowitz

Trade-off is not explicitly made.

II.   **Trade-off explicit:**

A.   **Use utility functions**

Problem is specifying utility.

B.   Specify risk tolerance.

By tradition, divide variance by risk tolerance.

Mean Return

- risk penalty =   <u>variance</u>
**   risk tolerance**

risk adjusted expected
return

Example:

$$\bar{r} = 12$$
$$\sigma = 15$$
$$\text{Tolerance} = 50$$

Risk adjusted expected return: 12 - <u>225</u> = 7 1/2
**   50**

Same issue is how tolerance specified but maybe easier to work with investor to determine range.

III.   Safety first criteria (emphasis is on avoidance of risk).

A.   Roy's Criteria:

$$\textbf{Minimize Prob } \left(R_p < R_L \right)$$

B.   Katoka's Criteria

$$\textbf{Maximize } R_L$$

$$\textbf{Subject to: Prob } \left(R_P < R_L \right) \leq \alpha$$

C. Telser's Criteria

$$\text{Max } \overline{R}_P$$

$$\text{Subject to: Prob}\left(R_P \leq R_L\right) \leq \alpha$$

Analysis of criteria:

The following analysis assumes normal returns.

A. **Consider Roy's criteria:**

$$\text{Min Prob}\left(R_P < R_L\right)$$

Thus, want to maximize:

$$\frac{\overline{R}_P - R_L}{\sigma_P}$$

R_L **serves as role of** R_F

B.   Katoka's criteria

Maximize R_L

Subject to:

$$\text{Prob}\left(R_P < R_L\right) \leq \alpha$$

$$R_L \leq \overline{R}_P - K\sigma_P$$

Where K **is set to match above constraint - example 1.65.**

$$R_L \leq \overline{R}_P - 1.65\sigma_P$$

Expression of straight line

Note if riskless lending and borrowing get funny results.

Consider Telser's criteria:

$$\max \overline{R}_P$$

Subj to Prob $\left(R_P \leq R_L \right) \leq \alpha$

Constraint is:

$$R_L \leq \overline{R}_P - K\sigma_P$$