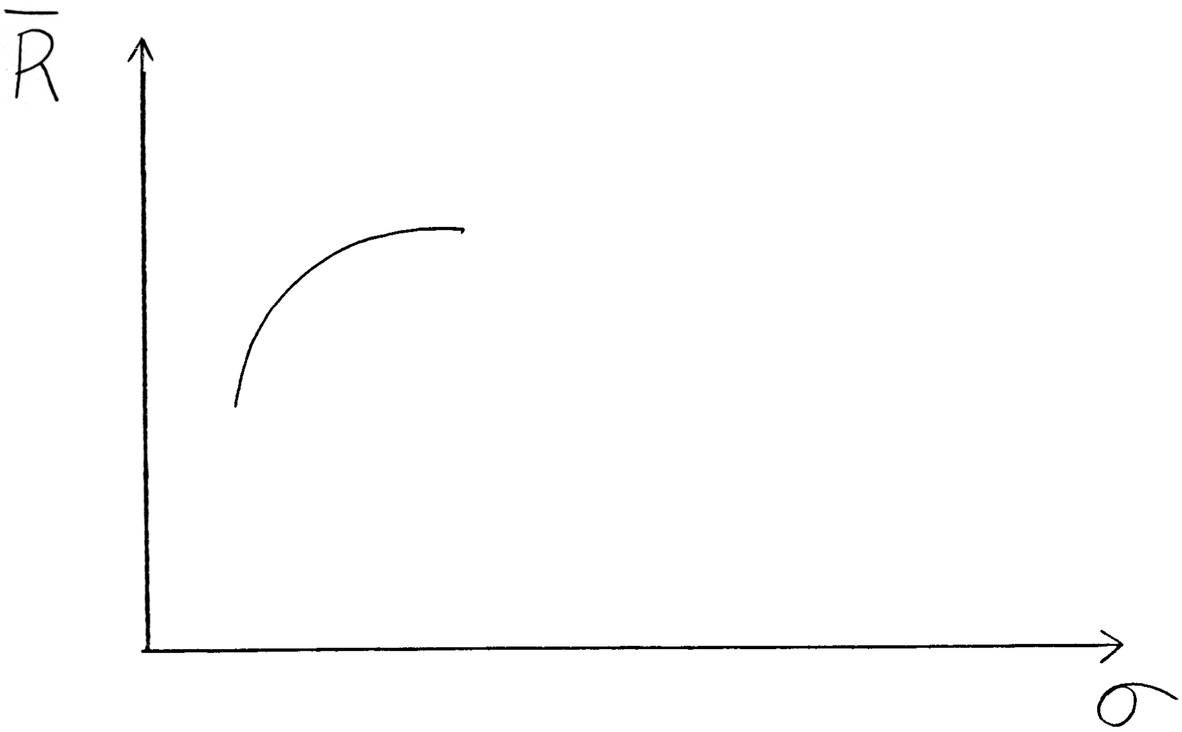
OBJECTIVE

FUNCTIONS

Fall 2000

Objective Functions

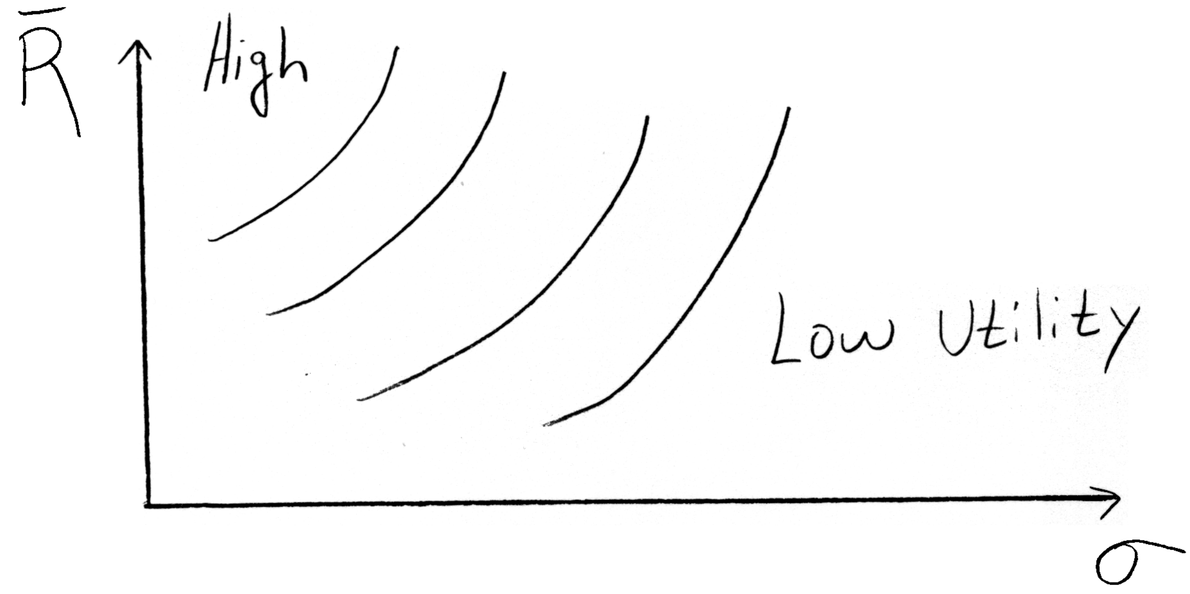
I. Classical Markowitz



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

$$- \text{risk penalty} = \frac{\text{variance}}{\text{risk tolerance}}$$

risk adjusted expected return

Example:

$\bar{r} = 12$
$S = 15$
Tolerance = 50

Risk adjusted expected return: $12 - \frac{225}{50} = 7\ 1/2$

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:

Minimize Prob $\left(R_p < R_L\right)$

B. Katoka's Criteria

Maximize R_L

Subject to: **Prob** $\left(R_P < R_L\right) \leq a$

C. Telser's Criteria

Max $\overline{R}_P$

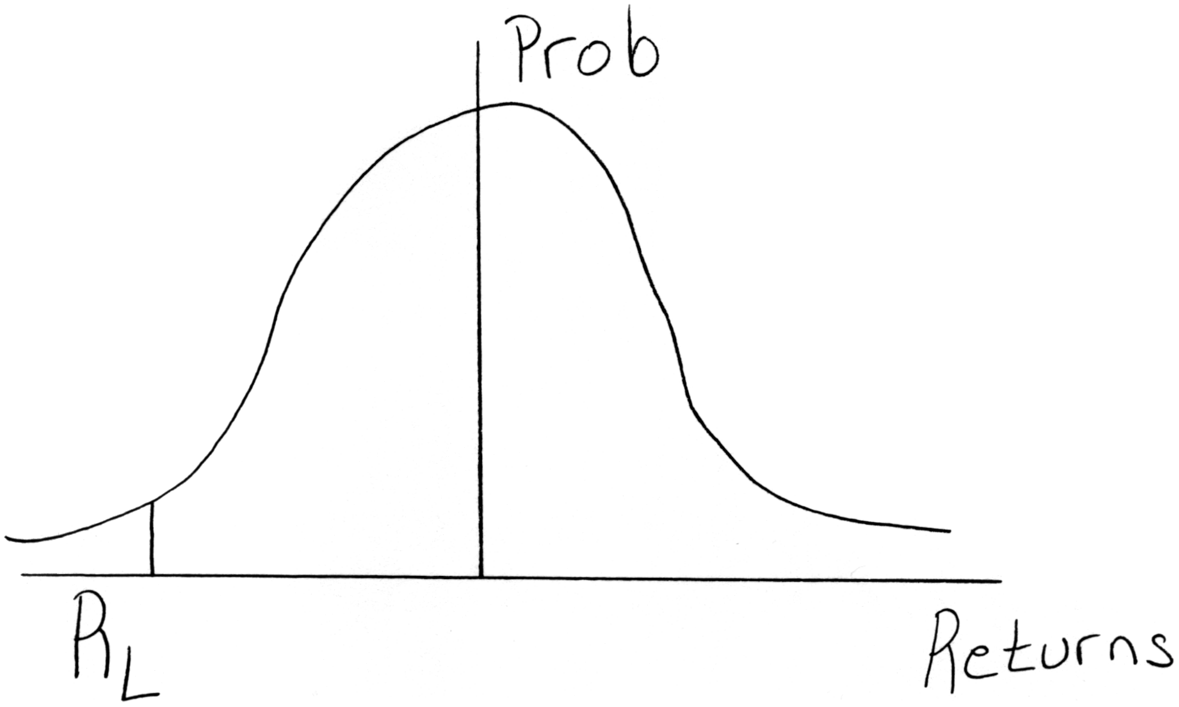
Subject to: Prob $\left(R_P \leq R_L\right) \leq a$

<u>Analysis of criteria</u>:

The following analysis assumes normal returns.

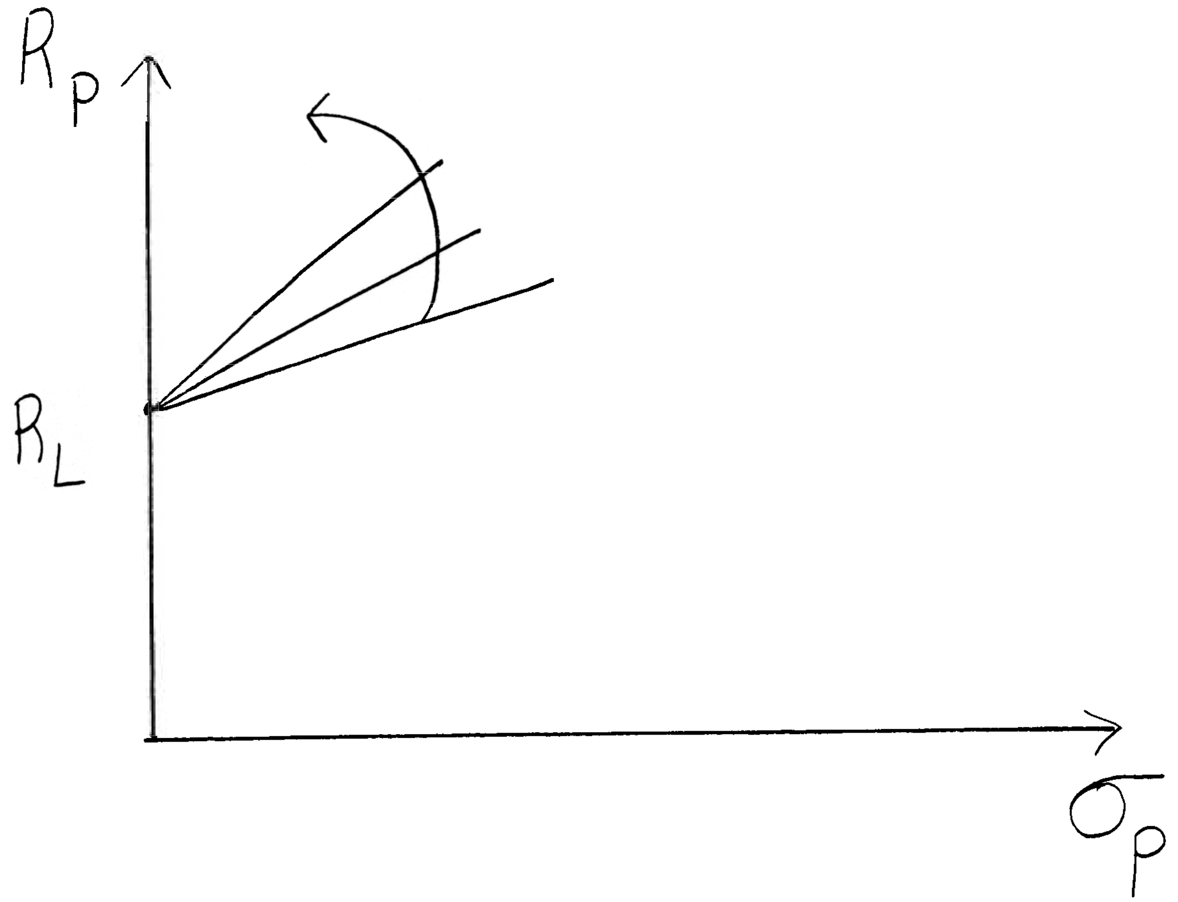
A. Consider Roy's criteria:

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



Thus, want to maximize:

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



R_L **serves as role of** R_F

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B. Katoka's criteria

Maximize R_L

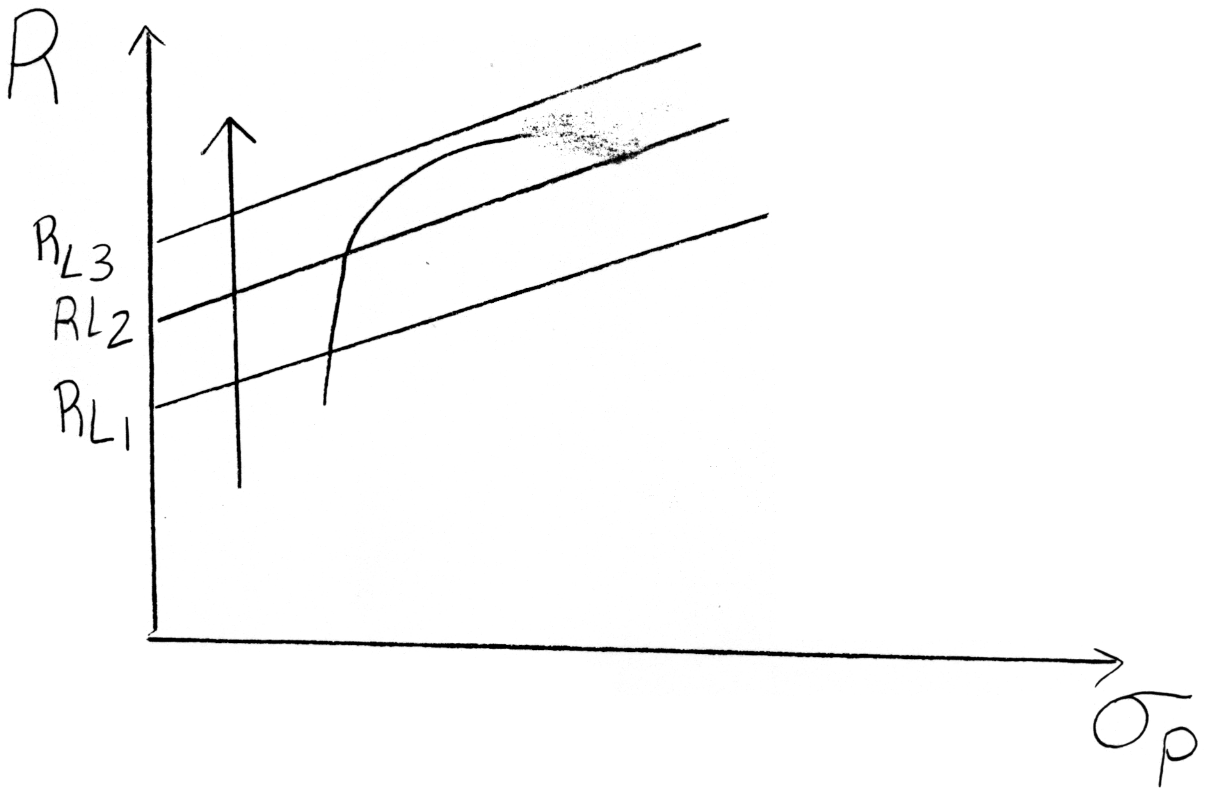
Subject to:

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

$$R_L \leq \bar{R}_P - K s_P$$

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

Expression of straight line



Note if **riskless lending** and borrowing get **funny** results.

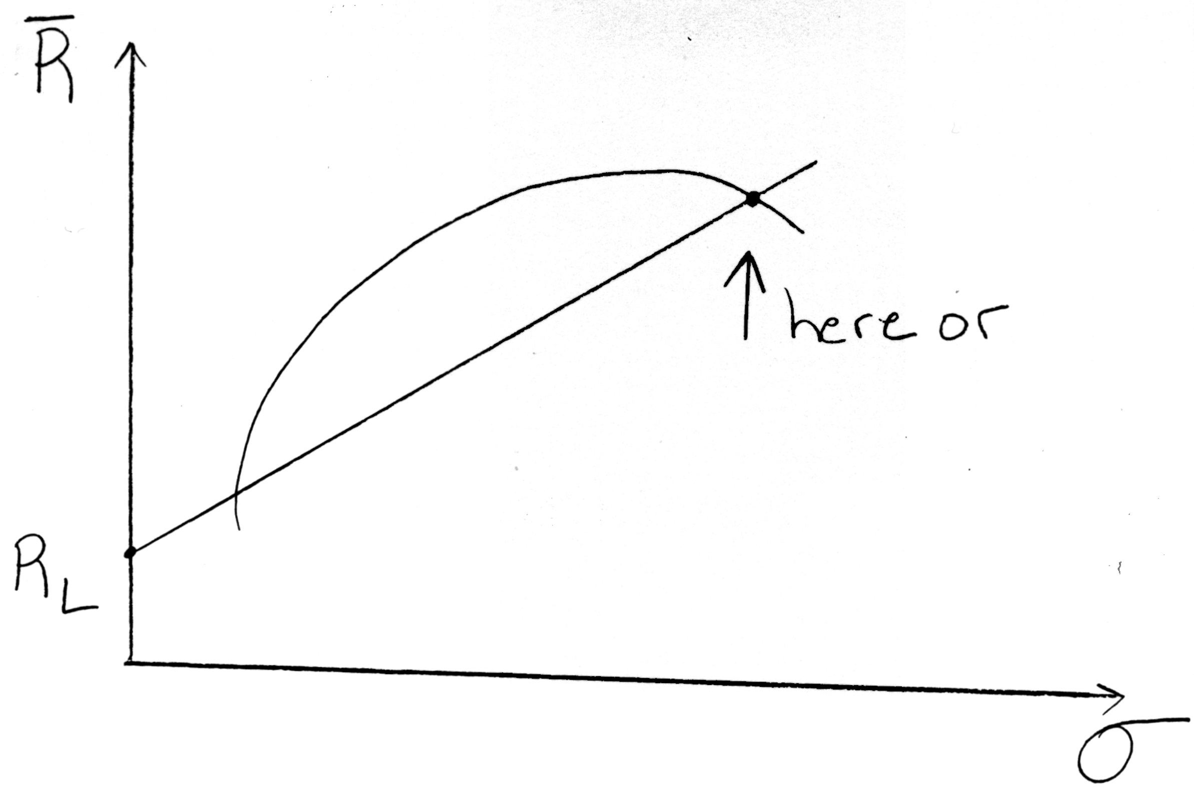
Consider Telser's criteria:

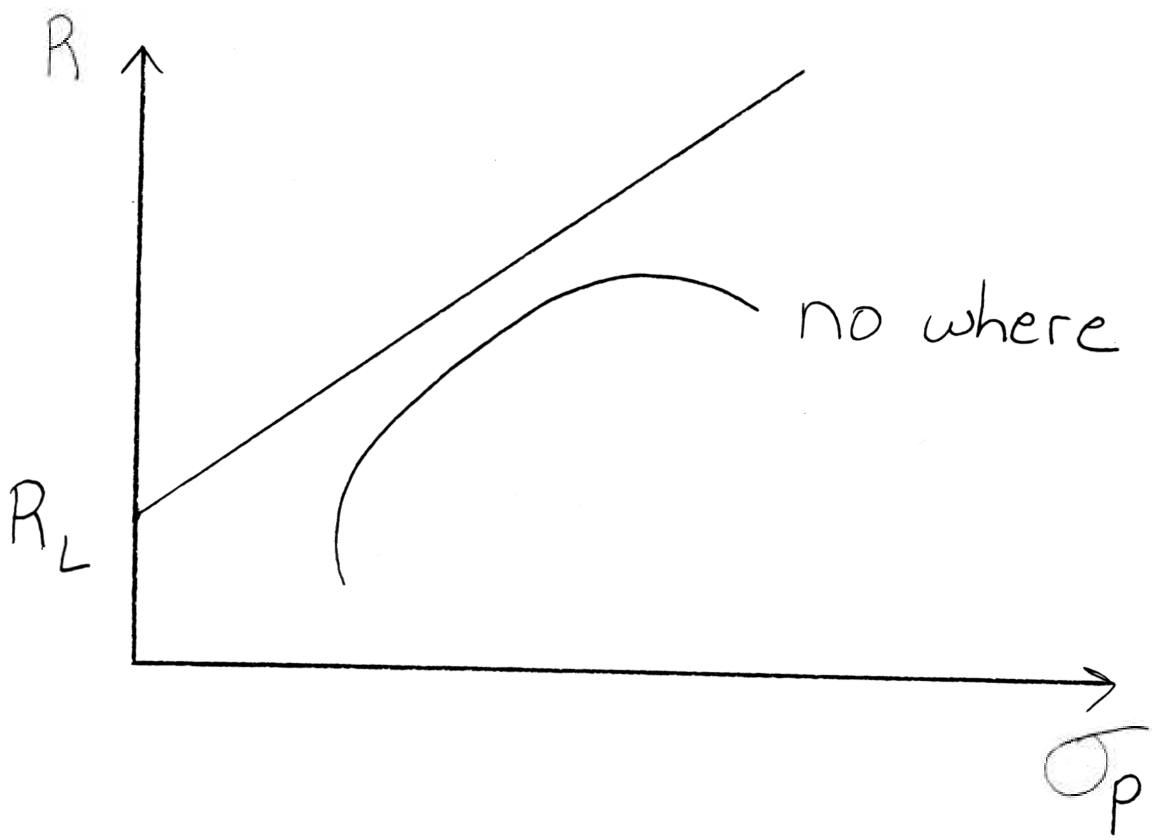
max $\overline{R}_P$

Subj to Prob $\left(R_P \le R_L\right) \le a$

Constraint is:

$$R_L \le \overline{R}_P - K s_P$$


$\bar{R}$
here or
R_L
σ


R
no where
R_L
σ_p