Lecture 4: Portfolio Diversification and Supporting Financial Institutions

Economics 252, Spring 2008

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Optimal Portfolio Diversification in General Case

- Drop assumption of equal weighting, independence and equal variance
- Put x_i dollars in ith asset, I=1,..,n, where the x_i sum to \$1.
- Portfolio expected value $r = \sum_{i=1}^{n} x_i \mathrm{E}(return_i) = \sum_{i=1}^{n} x_i r_i$
- Portfolio variance (two assets) =

$$x_1^2 \operatorname{var}(return_1) + (1 - x_1)^2 \operatorname{var}(return_2) + 2x_1(1 - x_1)\operatorname{cov}(return_1, return_2)$$

Efficient Portfolio Frontier with Two Assets

- Frontier expresses portfolio standard deviation in terms of portfolio expected return r rather than in terms of x_1.
- $$x_1 = \frac{r - r_2}{r_1 - r_2}$$

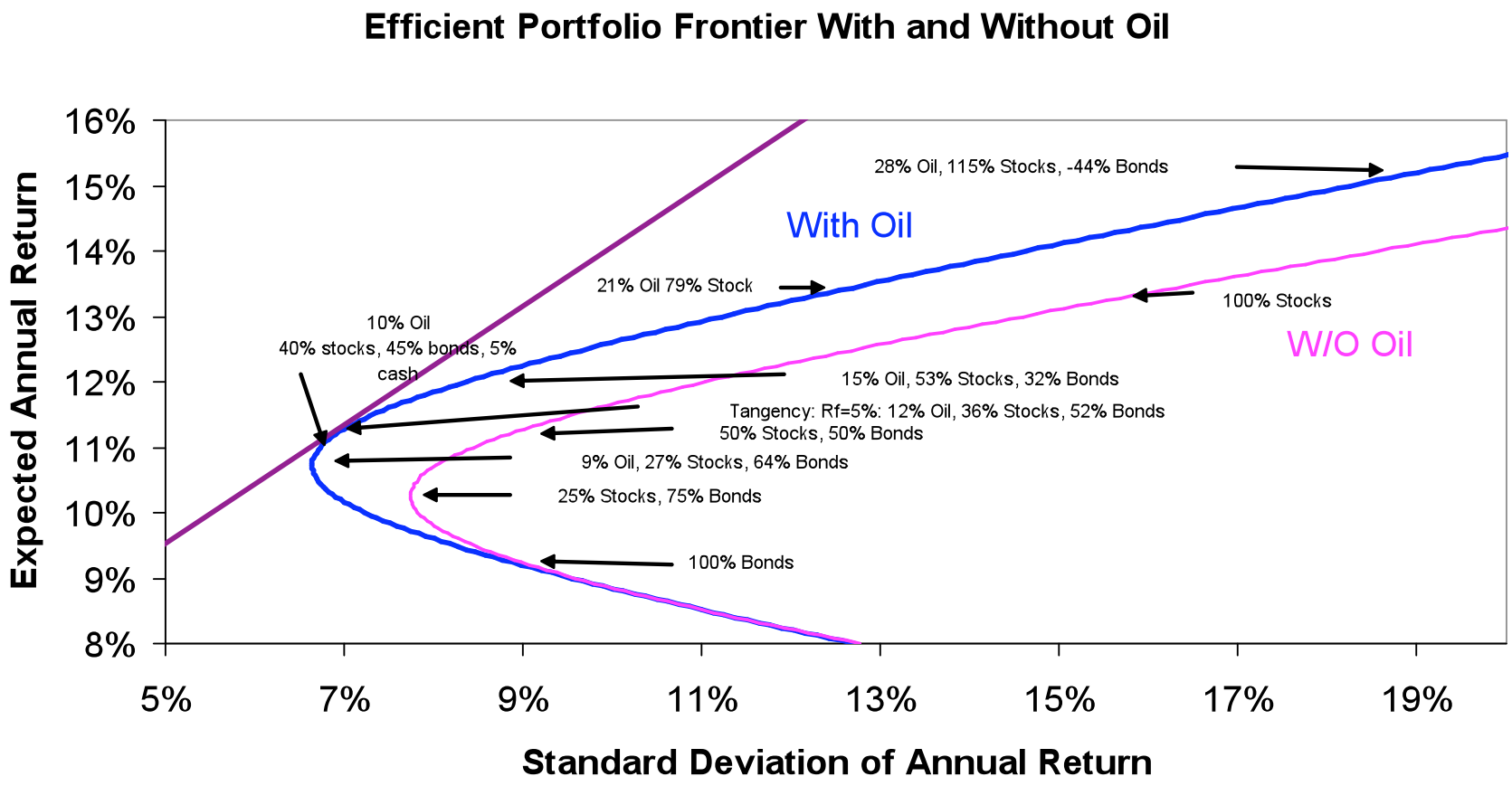
$$\sigma^2 = \left(\frac{r - r_2}{r_1 - r_2}\right)^2 \sigma_1^2 + \left(\frac{r_1 - r}{r_1 - r_2}\right)^2 \sigma_2^2 + 2\frac{(r - r_2)(r_1 - r)}{(r_1 - r_2)^2}\sigma_{12}$$

Portfolio Variance, Three Assets

- Portfolio variance =

$$x_1^2 \operatorname{var}(return_1) + x_2^{\,2} \operatorname{var}(return_2) + x_3^2 \operatorname{var}(return_3)$$
$$+ 2x_1x_2 \operatorname{cov}(return_1, return_2) + 2x_1x_3 \operatorname{cov}(return_1, return_3)$$
$$+ 2x_2x_3 \operatorname{cov}(return_2, return_3)$$
$$(\text{where} \sum_{i=1}^{3} x_i = 1)$$

Efficient Portfolio Frontier



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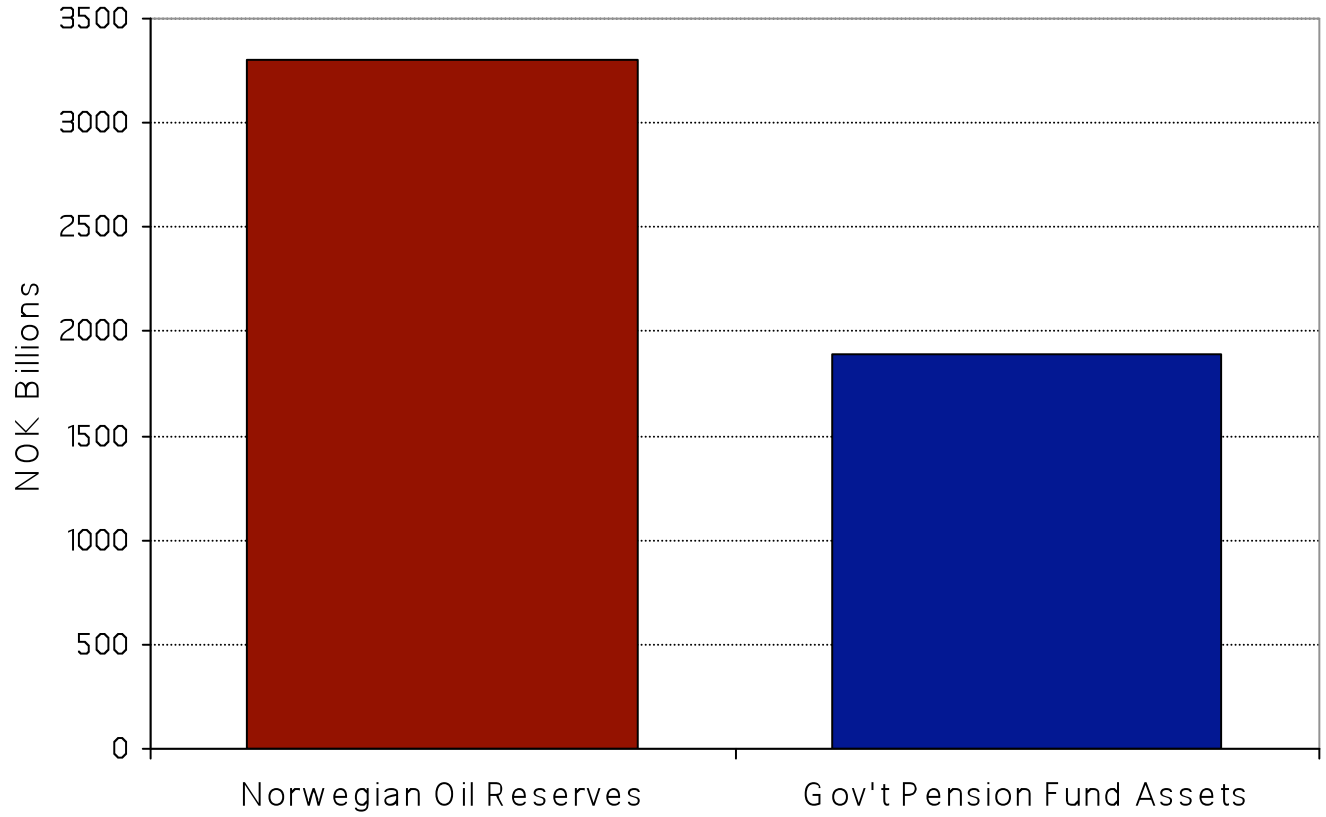
Oil Reserves vs. Pension Fund Assets, 2006



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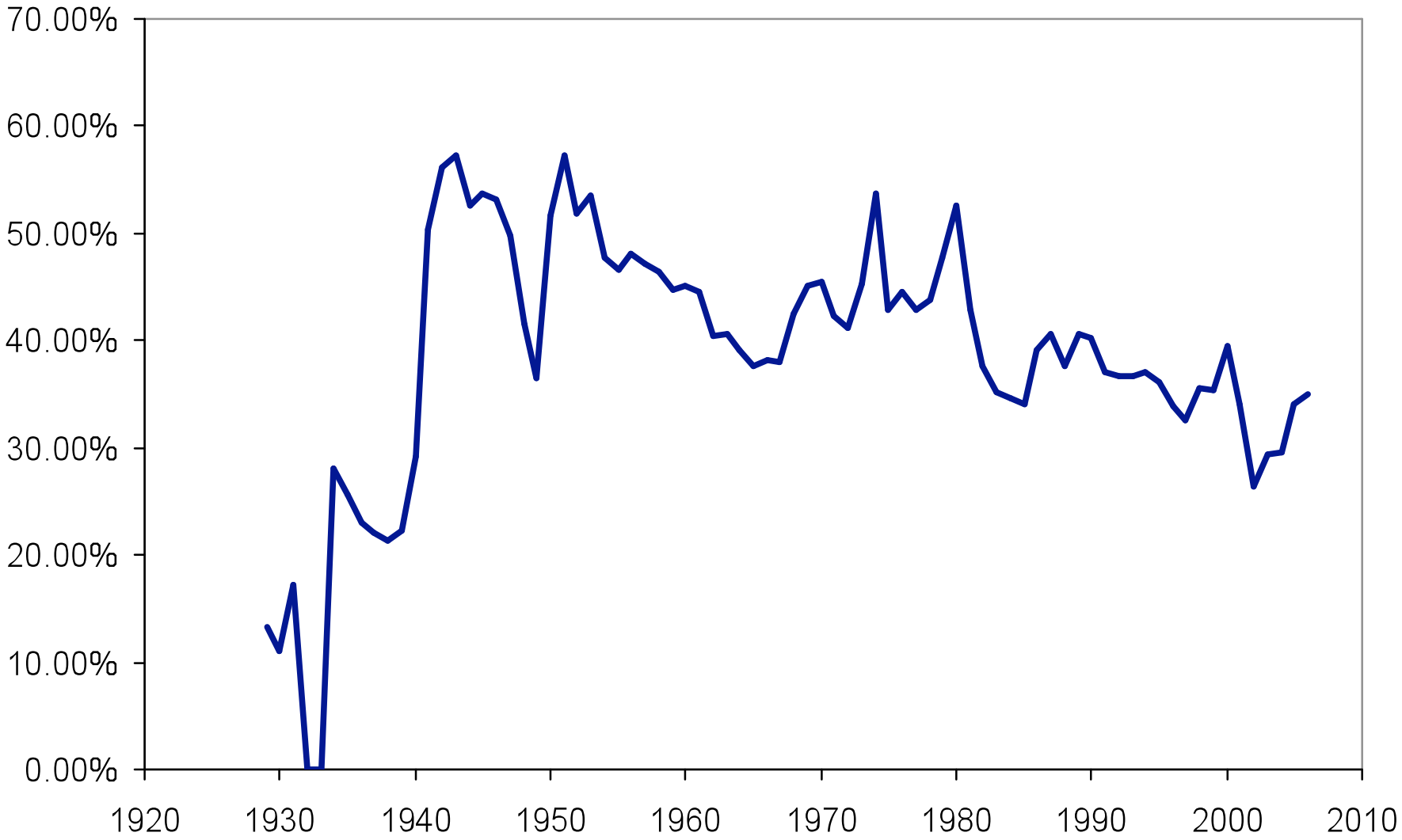
Beta

- The CAPM implies that the expected return on the ith asset is determined from its beta.
- Beta (β_i) is the regression slope coefficient when the return on the ith asset is regressed on the return on the market.
- Fundamental equation of the CAPM:

$$r_i = r_f + \beta_i (r_m - r_f)$$

US Corporate Taxes / Corporate Income (Income was negative 1932, 1933)



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Survey of Individual Investors 1999

"Trying to time the market, to get out before it goes down and in before it goes up, is:

1. A smart thing to do; I can reasonably expect to be a success at it. 11%
2. Not a smart thing to do; I can't reasonably expect to be a success at it. 83%
3. No opinion 5%

Survey of Individual Investors 1999

"Trying to pick individual stocks, for example, if and when Ford Motor stock will go up, or IBM stock will go up, is:

1. A smart thing to do; I can reasonably expect to be a success at it. 40%
2. Not a smart thing to do; I can't reasonably expect to be a success at it. 51%
3. No opinion 8%

Survey of Individual Investors 1999

"Trying to pick mutual funds, trying to figure out which funds have experts who can themselves pick which stock will go up, is:

1. A smart thing to do; I can reasonably expect to be a success at it. 50%
2. Not a smart thing to do; I can't reasonably expect to be a success at it. 27%
3. No opinion 23%