Portfolio Risk and Return

Assume a two-stock portfolio with $50,000 in HT and $50,000 in Collections.

Calculate $k_p$ and $\sigma_p$.

Portfolio Return, $\hat{k}_p$

$\hat{k}_p$ is a weighted average:

$$\hat{k}_p = \sum_{i=1}^{n} w_i \hat{k}_i.$$

$\hat{k}_p = 0.5(17.4\%) + 0.5(1.7\%) = 9.6\%.$

$\hat{k}_p$ is between $\hat{k}_{HT}$ and $\hat{k}_{Coll}$.

Alternative Method

Estimated Return

<table>
<thead>
<tr>
<th>Economy</th>
<th>Prob.</th>
<th>HT</th>
<th>Coll</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recession</td>
<td>0.10</td>
<td>-22.0%</td>
<td>28.0%</td>
<td>3.0%</td>
</tr>
<tr>
<td>Below avg.</td>
<td>0.20</td>
<td>-2.0</td>
<td>14.7</td>
<td>6.4</td>
</tr>
<tr>
<td>Average</td>
<td>0.40</td>
<td>20.0</td>
<td>0.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Above avg.</td>
<td>0.20</td>
<td>35.0</td>
<td>-10.0</td>
<td>12.5</td>
</tr>
<tr>
<td>Boom</td>
<td>0.10</td>
<td>50.0</td>
<td>-20.0</td>
<td>15.0</td>
</tr>
</tbody>
</table>

$\hat{k}_p = (3.0\%)0.10 + (6.4\%)0.20 + (10.0\%)0.40 + (12.5\%)0.20 + (15.0\%)0.10 = 9.6\%.$

Two-Stock Portfolios

- Two stocks can be combined to form a riskless portfolio if $r = -1.0$.
- Risk is not reduced at all if the two stocks have $r = +1.0$.
- In general, stocks have $r \approx 0.65$, so risk is lowered but not eliminated.
- Investors typically hold many stocks.
- What happens when $r = 0$?

What would happen to the risk of an average 1-stock portfolio as more randomly selected stocks were added?

$\sigma_p$ would decrease because the added stocks would not be perfectly correlated, but $k_p$ would remain relatively constant.
**Stand-alone Risk** = Market Risk + Diversifiable Risk

Market risk is that part of a security’s stand-alone risk that cannot be eliminated by diversification.

Firm-specific, or diversifiable, risk is that part of a security’s stand-alone risk that can be eliminated by diversification.

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**Conclusions**

- As more stocks are added, each new stock has a smaller risk-reducing impact on the portfolio.
- $\sigma_p$ falls very slowly after about 40 stocks are included. The lower limit for $\sigma_p$ is about $20\% = \sigma_M$.
- By forming well-diversified portfolios, investors can eliminate about half the riskiness of owning a single stock.

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**Got questions? Get answers!!**

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