Market risk, which is relevant for stocks held in well-diversified portfolios, is defined as the contribution of a security to the overall riskiness of the portfolio. It is measured by a stock's beta coefficient, which measures the stock's volatility relative to the market. What is the relevant risk for a stock held in isolation?

How are betas calculated?
- Run a regression with returns on the stock in question plotted on the Y axis and returns on the market portfolio plotted on the X axis.
- The slope of the regression line, which measures relative volatility, is defined as the stock's beta coefficient, or \( b \).

Use the historical stock returns to calculate the beta for KWE.

<table>
<thead>
<tr>
<th>Year</th>
<th>Market</th>
<th>KWE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25.7%</td>
<td>-25.0%</td>
</tr>
<tr>
<td>2</td>
<td>8.0%</td>
<td>-13.1%</td>
</tr>
<tr>
<td>3</td>
<td>-11.0%</td>
<td>-15.0%</td>
</tr>
<tr>
<td>4</td>
<td>15.0%</td>
<td>10.0%</td>
</tr>
<tr>
<td>5</td>
<td>32.5%</td>
<td>30.0%</td>
</tr>
<tr>
<td>6</td>
<td>13.7%</td>
<td>42.0%</td>
</tr>
<tr>
<td>7</td>
<td>40.0%</td>
<td>10.0%</td>
</tr>
<tr>
<td>8</td>
<td>10.0%</td>
<td>-10.0%</td>
</tr>
<tr>
<td>9</td>
<td>-10.8%</td>
<td>25.6%</td>
</tr>
<tr>
<td>10</td>
<td>-13.1%</td>
<td>25.0%</td>
</tr>
</tbody>
</table>

Calculating Beta for KWE

\[
K_{KWE} = 0.83K_M + 0.03
\]

\( R^2 = 0.36 \)

How is beta calculated?
- The regression line, and hence beta, can be found using a calculator with a regression function or a spreadsheet program. In this example, \( b = 0.83 \).
- Analysts typically use four or five years' of monthly returns to establish the regression line. Some use 52 weeks of weekly returns.

How is beta interpreted?
- If \( b = 1.0 \), stock has average risk.
- If \( b > 1.0 \), stock is riskier than average.
- If \( b < 1.0 \), stock is less risky than average.
- Most stocks have betas in the range of 0.5 to 1.5.
- Can a stock have a negative beta?
Expected Return versus Market Risk

<table>
<thead>
<tr>
<th>Security</th>
<th>Expected return</th>
<th>Risk, $b_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>HT</td>
<td>17.4%</td>
<td>1.29</td>
</tr>
<tr>
<td>Market</td>
<td>15.0</td>
<td>1.00</td>
</tr>
<tr>
<td>USR</td>
<td>13.8</td>
<td>0.68</td>
</tr>
<tr>
<td>T-bills</td>
<td>8.0</td>
<td>0.00</td>
</tr>
<tr>
<td>Collections</td>
<td>1.7</td>
<td>-0.86</td>
</tr>
</tbody>
</table>

Which of the alternatives is best?

Use the SML to calculate each alternative’s required return.

- The Security Market Line (SML) is part of the Capital Asset Pricing Model (CAPM).
- SML: $k_i = k_{RF} + (R_{PM})b_i$.
- Assume $k_{RF} = 8\%$; $k_M = 15\%$.
- $R_{PM} = (k_M - k_{RF}) = 15\% - 8\% = 7\%$.

Required Rates of Return

- $k_{HT} = 8.0\% + (7\%)(1.29) = 17.0\%$.
- $k_M = 8.0\% + (7\%)(1.00) = 15.0\%$.
- $k_{USR} = 8.0\% + (7\%)(0.68) = 12.8\%$.
- $k_{T-bill} = 8.0\% + (7\%)(0.00) = 8.0\%$.
- $k_{Coll} = 8.0\% + (7\%)(-0.86) = 2.0\%$.

Expected versus Required Returns

- Overvalued: $2.0\%$ Collections
- Fairly valued: $8.0\%$ T-bills
- Undervalued: $12.8\%$ USR
- Fairly valued: $15.0\%$ Market
- Undervalued: $17.0\%$ HT

Calculate beta for a portfolio with 50% HT and 50% Collections

- $k_i = k_{RF} + (R_{PM})b_i$
- $k_{HT} = 8\% + (7\%)(1.29)$
- $k_M = 15\%$
- $k_{Coll} = 8\% + (7\%)(-0.86)$
- $b_i = 0.22$.
What is the required rate of return on the HT/Collections portfolio?

\[ k_p = \text{Weighted average } k \]
\[ = 0.5(17\%) + 0.5(2\%) = 9.5\%. \]

Or use SML:

\[ k_p = k_{RF} + (R_{PM}) b_p \]
\[ = 8.0\% + 7\%(0.22) = 9.5\%. \]

**Impact of Inflation Change on SML**

Required Rate of Return k (%)

<table>
<thead>
<tr>
<th>New SML</th>
<th>Original situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>SML_1</td>
</tr>
<tr>
<td>15</td>
<td>SML_2</td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

**Impact of Risk Aversion Change**

Has the CAPM been verified through empirical tests?

- No. The statistical tests have problems that make empirical verification virtually impossible.
- Investors may be concerned about both stand-alone risk and market risk.
- Furthermore, investors’ required returns are based on future risk, but betas are based on historical data.

**Got questions? Get answers!!**

- Email: mba8622@hotmail.com or chodges@westga.edu
- MSN Messenger or Net Meeting: mba8622@hotmail.com
- Telephone: (770)836-6469