Key to 4:00 Quiz: 2/29/12

Quiz: Use the following information to calculate the beta of WFC (Wells Fargo) and the beta of a portfolio where you invest $600,000 in WFC and $400,000 in Microsoft which has a beta of 0.97.

<table>
<thead>
<tr>
<th>Year</th>
<th>Return on:</th>
<th>WFC</th>
<th>S&amp;P500</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>-8%</td>
<td>+2%</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>+14%</td>
<td>+20%</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>+54%</td>
<td>+30%</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>-42%</td>
<td>-40%</td>
<td></td>
</tr>
</tbody>
</table>

Note: You don’t have to solve anything. Just set up the appropriate equations and plug in all possible numbers.

\[
\beta_p = \left(\frac{600,000}{600,000 + 400,000}\right) \beta_{WFC} + \left(\frac{400,000}{600,000 + 400,000}\right) 0.97
\]

\[
\beta_{WFC} = \frac{Cov(R_{WFC}, R_{S&P})}{Var(R_{S&P})}
\]

\[
Cov(R_{WFC}, R_{S&P}) = \frac{1}{3}\left(\left((-8 - \bar{R}_{WFC})(2 - \bar{R}_{S&P}) + (14 - \bar{R}_{WFC})(20 - \bar{R}_{S&P}) + (54 - \bar{R}_{WFC})(30 - \bar{R}_{S&P}) + (-42 - \bar{R}_{WFC})(-40 - \bar{R}_{S&P})\right)\right)
\]

\[
\bar{R}_{WFC} = \frac{1}{4}(-8 + 14 + 54 - 42)
\]

\[
\bar{R}_{S&P} = \frac{1}{4}(2 + 20 + 30 - 40)
\]

\[
Var(R_{S&P}) = \frac{1}{3}\left((2 - \bar{R}_{S&P})^2 + (20 - \bar{R}_{S&P})^2 + (30 - \bar{R}_{S&P})^2 + (-40 - \bar{R}_{S&P})^2\right)
\]

Note: Bonus WSJ Questions on back of page