Problem Set 6: ICAPM and Valuation

I. ICAPM. Let TERM(Jan) be the difference in the yield on a long term hi-grade corporate bond and 1 month T-bill at the end of January. Suppose each individual cares about \{E[R_p(Jan)], \sigma[R_p(Jan)], \sigma[R_p(Jan), TERM(Jan)]\} when forming his/her portfolio p for January. The following additional information is available:

<table>
<thead>
<tr>
<th>i</th>
<th>E[R_i(Jan)]</th>
<th>\beta_{i,M}</th>
<th>\beta_{i,TERM}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>18%</td>
<td>1.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Yellow</td>
<td>1.1</td>
<td>1.2</td>
<td></td>
</tr>
</tbody>
</table>

where \(\beta_{i,M}\) and \(\beta_{i,TERM}\) are regression coefficients from a regression of \(R_i(Jan)\) on \(R_M(Jan)\) and TERM(Jan):

\[R_i = \phi_{i,0} + \beta_{i,M} R_M + \beta_{i,TERM} \text{TERM}(Jan) + \epsilon_i\]

Also know that \(E[R_M(Jan)] = 14\%\) and \(R_i(Jan) = 8\%\).

A. What is the expected January return for Yellow?
B. What is the risk premium for bearing TERM risk?
C. Is the market on the minimum variance frontier? Why or why not?
D. Give one reason why an individual may care about the covariance of her portfolio return with TERM(Jan).
E. Characterize the portfolios that individuals hold in this economy.

II. Hedging Portfolios and the ICAPM. Suppose each individual cares about \{E[R_p(Jan)], \sigma[R_p(Jan)], \sigma[R_p(Jan), s_t(Jan)]\} when forming his/her portfolio p for January. The variable \(s_t(Jan)\) is a macroeconomic indicator that correlates positively with the state of the economy at the end of January. Investors care about the state of the economy because it affects their human capital values, though to differing degrees depending on the investor. Let \(R_{HML}(Jan)\) be the return on the hedging portfolio that all investors hold in combination with the market portfolio and the riskless asset; \(R_{HML}(Jan)\) has a large positive correlation with \(s_t(Jan)\). The following additional information is available:

<table>
<thead>
<tr>
<th>i</th>
<th>E[R_i(Jan)]</th>
<th>\beta^h_{i,M}</th>
<th>\beta^h_{i,HML}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market</td>
<td>10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HML</td>
<td>14%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KS Fund</td>
<td>?</td>
<td>1.1</td>
<td>-0.4</td>
</tr>
<tr>
<td>LM Fund</td>
<td>?</td>
<td>1.1</td>
<td>0.5</td>
</tr>
</tbody>
</table>

where \(\beta^h_{i,M}\) and \(\beta^h_{i,HML}\) are regression coefficients from a regression of \(r_i(Jan)\) on \(r_M(Jan)\) and \(r_{HML}(Jan)\):

\[r_i(Jan) = \phi_{i,0} + \beta^h_{i,M} r_M(Jan) + \beta^h_{i,HML} r_{HML}(Jan) + \epsilon_i\] ; and,
\[r_i(Jan) = R_i(Jan) - R_f, r_M(Jan) = R_M(Jan) - R_f, r_{HML}(Jan) = R_{HML}(Jan) - R_f.

Also know that \(R_f = 6\%\).
A. What is the expected January return for KS?
B. What is the expected January return for LM?
C. Explain why these two assets have different expected January returns?
D. Describe an investor in this economy who would choose to hold a combination of the riskless asset and the mean-variance tangency portfolio. Characterize qualitatively this investor’s portfolio in terms of the weight invested in the hedging portfolio.
E. Consider a highly risk-averse investor whose job prospects at the end of January are closely linked to the state of the economy at the end of January. Characterize qualitatively this investor’s portfolio in terms of the weight invested in the hedging portfolio.

III. Equity Valuation, Asset Composition and Leverage. A large computer manufacturer IBX has $1M of riskless debt and assets with a market value of $6M. The assets of IBX have a Beta of 1.3. Assume the CAPM holds. The riskless rate is 10% and the expected return on the market is 18%. IBX has just paid a dividend of $3.76 per share and IBX’s dividend per share is expected to grow at 6.48% per year.
A. What was price of IBX stock on the exdate?
B. How many shares of IBX stock were outstanding on the exdate?

IV. Equity Valuation, the Dividend Discount Model and ROE.
A. MF Corp has an ROE of 16%, a plowback ratio of 50% and no debt. The market requires a return on MF Corp of 12% and the coming year’s earnings are expected to be $2 per share.
   1. At what price will the stock sell today?
   2. What price do you expect MF shares to sell for in three years?
B. Assume:
   $20 = price of the ZW stock today
   8% = the expected growth rate of ZW dividends

   $0.60 = the annual ZW dividend one year forward

Using only this data and the constant growth dividend discount model, compute the expected long-term total return of ZW stock?
C. The FI Corporation’s dividends per share are expected to grow indefinitely by 5% per year.
   1. If this year’s year-end dividend is $8 and the market requires a 10% return per annum on FI stock, what must the current stock price be according to the DDM?
   2. If the expected earnings per share are $12, what is the implied value of the ROE on future investment opportunities?
   3. How much is the market paying per share for growth opportunities (i.e., for an ROE on future investments that exceeds the market’s required
return on equity)?