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QF600 (Asset Pricing) – Homework 2

Capital Asset Pricing Model (CAPM)

Market_Portfolio.xlsx contains monthly nominal (net) returns (expressed as percentages) for the market portfolio, over the ten-year period from Jan 2004 through Dec 2013. Assume that the (net) risk-free rate is 0.13% per month. Create a table showing the mean return and standard deviation of return for the ten industry portfolios.

Market Model

1. Estimate the intercept coefficient (α) and slope coefficient (β) for each of the ten industry portfolio using the market model: regress the monthly *excess* returns for each industry portfolio on the monthly *excess* returns for the market portfolio.
    a. Create a table showing the intercept and slope coefficients for the ten industry portfolios.

    Answer:

Industry	Intercept (α)	Slope (β)
NoDur	0.369443	0.652647
Durbl	-0.415599	1.648536
Manuf	0.159771	1.169846
Enrgy	0.501719	0.969850
HiTec	-0.064020	1.132969
Telcm	0.194691	0.900729
Shops	0.275492	0.826492
Hlth	0.237841	0.673036
Utils	0.444585	0.538086
Other	-0.387135	1.207309

    b. Briefly explain (in words, without mathematical equations or formulas) the economic significance and pricing implications of the intercept and slope coefficients.

    Answer:

    Slope coefficient (*β*) in CAPM measures the sensitivity of an asset's return to market return, indicating the amount of exposure to systematic risk. β greater than one means the asset is more volatile than the market, and vice versa. Furthermore, asset will have negative beta when asset return has negative correlation with market, and vice versa.

    Intercept coefficient (*α*) in CAPM represents "pricing error" (relative to CAPM) for individual assets or "passive" portfolios. A positive α means that the asset has outperformed the expected return based on its systematic risk, while negative α means underperformance. If CAPM is correct, then intercept (α) will be zero.

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Security Market Line (SML)

2. Calculate the mean monthly return for each of the ten industry portfolios, as well as the market portfolio.

   Answer:

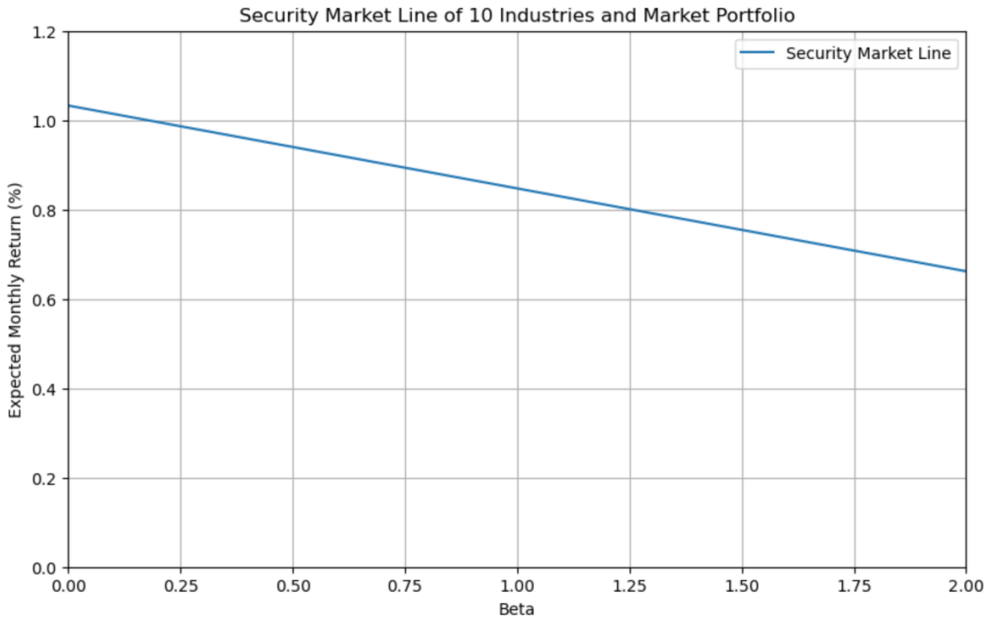
Industry	Mean Return (%)
NoDur	0.902833
Durbl	0.733333
Manuf	1.012833
Enrgy	1.231167
HiTec	0.76625
Telcm	0.881417
Shops	0.916333
Hlth	0.783833
Utils	0.907167
Other	0.489083
Market	0.748083

3. Regress the mean monthly returns of the ten industry portfolios and the market portfolio on the corresponding β's. This will give you the intercept and slope coefficients for the SML. (Note that the results may be very different from what you would expect!)
   a. Use the estimated intercept and slope coefficients for the SML to plot the SML in the range of β from zero to two on the horizontal axis.

      Answer:

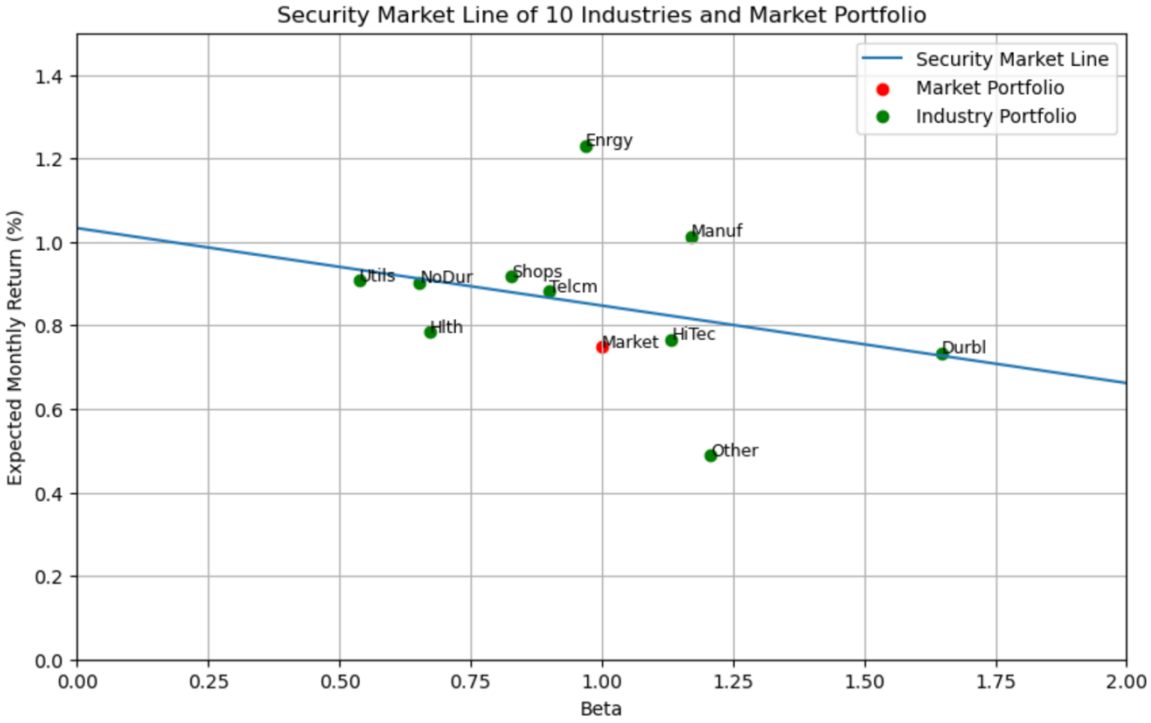
      SML slope coefficient = -0.18546745836573272

      SML y-intercept = 1.0327683682657056



b. Also plot the positions of the ten industry portfolios and the market portfolio. (You are NOT required to label the individual portfolios.)

Answer:



c. Briefly explain the economic significance and pricing implications of the SML.

Answer:

Security Market Line (SML) is a graphical representation of CAPM pricing formula. The slope of SML represents the ratio of risk premium to beta, or Treynor ratio (all risky assets and portfolios must have the same Treynor ratio, in equilibrium). Assets above SML are underpriced, which will offer higher returns for their risk level, so investors will buy, which drives up the price and will eventually lower the expected return. Conversely, assets below the SML are overpriced, leading to selling pressure, which will lower the price and raise expected return. Price will rise or fall until the asset is back to SML, reflecting their fair price given the level of risk.