Capital Asset Pricing Model

I. CAPM: Assumptions and Prediction

1. Perfect markets
   - Perfect competition: Each investor has no effect on prices or returns
   - No taxes
   - No transaction costs
   - All assets are traded and perfectly divisible
   - No short sale constraints
   - Borrow and lend at the same risk-free rate, total borrowing = total lending

2. Investors only worry about mean and variance of end-of-period wealth

3. Homogeneous expectations

Under these assumptions, CAPM says that the return of any Stock i, r_i, should satisfy

$$E[r_i] = r_f + \beta_i \left[E(r_M) - r_f \right]$$

Where r_f is the risk free rate, r_M is the market portfolio return, and

$$\beta_i = \frac{Cov(r_i, r_M)}{Var(r_M)}$$

II. CAPM Market Portfolio and Risk-Free Rate

A. How do we know that everyone would invest only in same portfolio?

B. How do we know that the market will be "cleared"—that everyone gets to invest however much they want in the efficient portfolio?

Notice that if some investors become less risk-averse, the market portfolio becomes more risky.

Note: Under the assumption of CAPM, the market portfolio should include all wealth. However, we typically use a portfolio of exchange-traded stocks. For example, we might use the value-weighted index of NYSE stocks

III. Beta Pricing

A. Where does the beta pricing formula come from?

B. What does the CAPM Beta formula says?

1. β measures each asset's contribution to the variance of the market portfolio, which we know is the optimal portfolio. (You will be asked to derive this property of β in Assignment 1.)

2. Investors only care about the risk and expected return of their *optimal portfolios*. Therefore, they are only concerned with the impact of an additional asset on the risk and return of their portfolio.

3. Since the only relevant risk of an asset is its *marginal contribution to the risk of the market portfolio*, this is the only risk that gets compensated.

   For an asset that goes against the market, its return should be negative! Why?