CAPM-based Portfolio Weighting Between and Within Sectors

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5/18/2021

Abstract

The Capital Asset Pricing Model (CAPM) is used to determine an appropriate rate of return for an asset based upon the riskiness of the asset. Specifically, the model looks at non-diversifiable risk of an asset, or the risk of an asset relative to the risk of the overall market, and calculates a rate of return which is commensurate with risk free rate of return plus a term scaling the market's excess return with the asset's level of relative risk. By subtracting the risk-free rate of return, the model can be used to estimate each assets Treynor reward to volatility ratio - simply the excess return (return minus risk free rate of return) divided by the beta for that asset (e.g. level of risk relative to the market). The belief is that assets with Treynor ratios greater than 1 would be expected to continue to generate excess returns greater than a well-diversified portfolio (e.g. of the risk-free asset and a market index) with the same level of risk. The use of the Treynor ratio to rank performance of assets is comparable to the use of Jensen's alpha, which represents the rankings in additive form instead of multiplicative form. A possible extension of this is to define excess returns as the residuals after regressing on some factors (e.g. Fama-French 3 factor model). In this case, the Treynor ratio is used because it provides non-negative values, which are used in this portfolio weighting scheme to dictate weight of individual assets within a sector and weight of sectors within the portfolio.

1 Required Packages

2 Loading Data

3 Calculating Sector Weights

4 Calculating Asset Weights within Sector

5 Determination of Target Portfolio