Applying the CAPM to Performance Measurement

Objective

Calculate, compare, and evaluate the Treynor measure, the Sharpe measure, and Jensen’ s alpha.

Compute and interpret tracking error, the information ratio, and the Sortino ratio.

APPLYING THE CAPM TO PERFORMANCE MEASUREMENT

➢ **MEASURES OF PERFORMANCE:**

Treynor Measure of a Portfolio = $\left[\frac{E(R_P) - R_F}{\beta_P}\right]$

Sharpe Measure of a Portfolio = $\left[\frac{E(R_P) - R_F}{\sigma_P}\right]$

Jensen Measure of a Portfolio = $\alpha_P =$

$$E(R_P) - [R_F + \{E(R_M) - R_F\}\beta_P$$

APPLYING THE CAPM TO PERFORMANCE MEASUREMENT

➢ MEASURES OF PERFORMANCE:

➢The Sharpe ratio and the Treynor ratio (both named for their creators, William Sharpe and Jack Treynor), are two ratios utilized to measure the risk-adjusted rate of return on either an investment portfolio or an individual stock.

➢The Sharpe ratio aims to measure how well an equity investment portfolio performs as compared to a risk-free investment.

➢The primary purpose of the Sharpe ratio is to determine how much greater return is generated in exchange for accepting the additional risk.

➢The Treynor ratio looks to examine how well a portfolio outperforms the equity market as a whole.

➢The Treynor measure is more appropriate for comparing well-diversified portfolio's.

➢Jensen's alpha also offers a way to measure returns on a risk-adjusted basis but applies the measure in relation to a benchmark to gauge performance.

➢Jensen's alpha is more appropriate for comparing portfolios that have the same beta.

APPLYING THE CAPM TO PERFORMANCE MEASUREMENT

➢ MEASURES OF PERFORMANCE:

Example : Calculating performance measure

For a portfolio of ten stocks, we may find, via fundamental analysis estimates of the individual stocks, that the portfolio's expected return is 14% with a standard deviation of 25%. The beta of the portfolio is 1.1. The expected return of the market is 12.5% with a standard deviation of 20.2%. the risk-free rate is 2.6%. Calculate the Trey nor, Sharpe and Jensen measures.

APPLYING THE CAPM TO PERFORMANCE MEASUREMENT

➢ MEASURES OF PERFORMANCE:

Extensions to Jensen's Alpha

Since Jensen's measure is simply a raw return in excess of some reference, we can simply replace that reference based on the CML. Another value of E($R_{reference}$) could be derived from a variation of the CAPM called the Black model, which uses the return on a "zero-beta" portfolio in place of the risk-free rate.

$$E(R_{reference}) = R_F + [E(R_M) - R_F]\left[\frac{\sigma_P}{\sigma_M}\right] \quad \text{and} \quad \alpha_P = E(R_P) - E(R_{reference})$$

Tracking Error is the term used to describe the standard deviation of the difference between the portfolio return and the benchmark return.
The **Information Ratio** is essentially the alpha of the managed portfolio relative to its benchmark divided by the tracking error.

$e_P = R_P - R_B$ Tracking error = σ_{e_P} Information ratio = $\left[\frac{E(R_P) - E(R_B)}{\sigma_{e_P}}\right] = \frac{\alpha_P}{\sigma_{e_P}}$

APPLYING THE CAPM TO PERFORMANCE MEASUREMENT

➢ MEASURES OF PERFORMANCE:

Extensions to Jensen's Alpha

Example: Calculating the information ratio
Manager typically generates an alpha of 1.5% with a tracking error of 2.25%. Calculate the information ratio.

APPLYING THE CAPM TO PERFORMANCE MEASUREMENT

➢ MEASURES OF PERFORMANCE:

Sortino Ratio $= \left[\frac{E(R_P) - R_{min}}{\sqrt{MSD_{min}}} \right]$

Where: $MSD_{min} = \frac{\sum_{R_{Pt} < R_{min}} (R_{Pt} - R_{min})^2}{N}$

- Sortino ratio measures the performance of the investment relative to the downward deviation.
- Unlike Sharpe, it doesn't take into account the total volatility in the investment.
- Since investors are only concerned about the downward volatility, Sortino ratio presents a more realistic picture of the downside risk ingrained in the fund or the stock.
- The Sortino ratio is more appropriate for a case where return are not symmetric.

APPLYING THE CAPM TO PERFORMANCE MEASUREMENT

➢ MEASURES OF PERFORMANCE:

Example : Calculating the information ratio and the Sortino ratio

Over a 10-year period, a manager uses a covered call strategy to enhance the return of the index fund she manages. The record of the fund's return is (0.095, 0.08, -0.022,0.11, 0.09, -0.05, -0.035, 0.124, 0.072, 0.055). the corresponding benchmark returns record is (0.087, 0.078, -0.034, 0.124, 0.10, -0.064, -0.042, 0.131, 0.062, 0.059). The minimum acceptable return is 4%. Calculate the information ratio and the Sortino ratio. Assume tracking error = 0.00992 and squared deviation (min) = 0.0017569.

Thanks
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