Chapter 9: Portfolio Performance Evaluation

Today's Questions

- What indicators can be used to evaluate portfolio performance?
  - Treynor, Sharp and Information Ratio
  - Factors affecting use of Performance Measures
  - Reporting Performance Measures

What is Required of a Portfolio Manager?

- Two Desirable Attributes
  - The ability to derive above-average returns for a given risk class.
  - The superior risk-adjusted returns can be derived from either
    - Superior timing
    - Superior security selection
  - The ability to diversify the portfolio completely to eliminate unsystematic risk relative to the portfolio's benchmark
    - A completely diversified portfolio is perfectly correlated with the fully diversified benchmark portfolio

Composite Portfolio Performance Measures

- Treynor Portfolio Performance Measure
  - based on non-diversifiable market risk (beta)
  - uses SML
- Treynor (1965) recognized two components of risk:
  - Risk from general market fluctuations
  - Risk from unique fluctuations in the securities in the portfolio

- Treynor Portfolio Performance Measure:

$$T_i = \frac{\bar{R}_i - \overline{RFR}}{\beta_i}$$

- $\bar{R}_i - \overline{RFR}$ is the risk premium
- β_i is the portfolio's systematic risk

- The expression is the risk premium return per unit of systematic risk
- Risk averse investors prefer to maximize this value
- This assumes a completely diversified portfolio, leaving systematic risk as the relevant risk

Example: Demonstration of Comparative Treynor Measures
Assume the Market return is 14% & risk-free rate is 8%. The average annual returns for Managers W, X, and Y are 12%, 16%, and 18% respectively. The corresponding betas are 0.9, 1.05 and 1.20. What are T values for the market & managers?

- The T Values

$$T_M = \frac{(14\% - 8\%)}{1} = 6\%$$

$$T_W = \frac{(12\% - 8\%)}{0.9} = 4.4\%$$

$$T_X = \frac{(16\% - 8\%)}{1.05} = 7.6\%$$

$$T_Y = \frac{(18\% - 8\%)}{1.20} = 8.3\%$$

- Sharp Portfolio Performance Measure
  - shows the risk premium earned over the risk free rate per unit of standard deviation (total risk)
  - Based on the CML
  - sharp ratios greater than the ratio for the market portfolio indicate superior performance.

The formula $$S_i = \frac{\bar{R}_i - \overline{RFR}}{\sigma_i}$$

Where; $\bar{R}_i - \overline{RFR}$ is the risk premium

σ_i the standard deviation of the rate of return for portfolio i

Example: Demonstration of Comparative Sharpe Measures
Assume the Market return is 14% with a standard deviation of 20%, and risk-free rate is 8%. The average annual returns for Managers D, E, and F are 13%, 17%, and 16% respectively. The corresponding standard deviations are 18%, 22%, and 23%. What are the Sharpe measures for the market & managers?

- The Sharpe Measures

$S_M = (14\% - 8\%)/20\% = 0.300$
$S_D = (13\% - 8\%)/18\% = 0.273$
$S_E = (17\% - 8\%)/22\% = 0.409$
$S_F = (16\% - 8\%)/23\% = 0.348$

- Sharpe Vs Treynor Measure
  - Sharpe
    - uses standard deviation of returns (total risk) as the measure of risk
    - therefore evaluates the portfolio manager on the basis of both rate of return performance & diversification.

  - Treynor
    - measure uses beta (systematic risk)

  - Both
    - The methods agree on rankings of completely diversified portfolios.
    - Both produce relative, not absolute rankings of performance.

- Jensen Portfolio Performance Measure
  - The formula for the empirical version of the CAPM

$$R_{jt} - RFR_t = \alpha_j + \beta_j [R_{mt} - RFR_t] + e_{jt}$$

Where;

α_j = Jensen measure.

- Jensen measure represents the average excess return of the portfolio above that predicted by CAPM
- Superior managers will generate a significantly positive alpha; inferior managers will generate a significantly negative alpha
- Estimated by linear regression.

- Applying the Jensen Measure
  - Jensen measure
    - requires using a different RFR for each time interval during the sample period
    - it does not directly consider the portfolio manager's ability to diversify
      - because it calculates risk premiums in terms of systematic risk
    - is flexible enough to allow for alternative models of risk and expected return from the CAPM.

Risk-adjusted performance can be computed relative to any of the multifactor models:

$$R_{jt} - RFR_t = \alpha_j + \beta_{j,1} F_1 + \beta_{j,2} F_2 + \ldots + \beta_{j,K} F_K + e_{jt}$$

- The Information Ratio Performance Measure
  - This is given by the formula

$$IR_j = \frac{\bar{R}_j - \bar{R}_b}{\sigma_{ER}} = \frac{\overline{ER}_j}{\sigma_{ER}}$$

where;
- R_b = the average return for the benchmark portfolio
- σ_{ER} = the standard deviation of the excess return

- Information ratio
  - measures the average return in excess of that of a benchmark portfolio
  - divided by the standard deviation of this excess return
- σ_{ER}
  - can be called the tracking error of the investor's portfolio and
  - it is a "cost" of active management

Application of Portfolio Performance Measures

- Total Rate of Return on a Mutual Fund

$$R_{it} = \frac{EP_{it} + Div_{it} + Cap.Dist._{it} - BP_{it}}{BP_{it}}$$

Where:

R_{it} the total rate of return on Fund i during month t

EP_{it} the ending price for Fund i during month t

Div_{it} the dividend payments made by Fund i during month t

$Cap.Dist._{it}$ the capital gain distributions made by Fund i during month t

BP_{it} the beginning price for Fund i during month t

- Total Sample Results
  - Selected 30 open-end mutual funds
    - from the nine investment style classes &
    - used monthly data for the five-year period
    - from July 2005 to June 2010.
  - Active fund managers performed much better than earlier performance studies
  - A primary factor for this outcome was the abnormally poor performance of the index during the middle of the sample period.
  - The various performance measures ranked the performance of individual funds consistently.

- Potential Bias of One-Parameter Measures.
  - Composite measures of performance should be independent of
    - alternative measures of risk because they are risk-adjusted measures
  - Positive relationship between the composite performance measures & the risk involved
  - the alpha measure can be biased downward for those portfolios designed to limit downside risk.

- Measuring Performance with Multiple Risk Factors
  - Form of the Estimation Equation

$$R_{jt} - RFR_t = \alpha_j + \{[b_{j1}(R_{Mt} - RFR_t) + b_{j2}SMB_t + b_{j3}HML_t + b_{j4}MOM]\} + e_{jt}$$

- Jensen's alphas are computed relative to:
  - A 3-factor model including the market $(R_m - RFR)$, firm size (SMB), and relative valuation (HML) variables
  - A 4-factor model that also includes the return momentum (MOM) variable.

- The one-factor & multifactor Jensen measures
  - produce similar
  - but distinct performance rankings

- Relationship among performance Measures
  - Implications of High Positive Correlations
    - Although the measures provide a generally consistent assessment of portfolio performance
      - when taken as a whole, they remain distinct at an individual level
    - Therefore it is best to consider these composite collectively
    - The user must understand what each means.

Factors That Affect User of Performance Measures

- Market Portfolio Is Difficult to Approximate
  - Benchmark Portfolios
    - Performance evaluation standard
    - Usually a passive index or portfolio
    - May need to benchmark for entire portfolio & separate benchmarks for segments to evaluate individual managers.
  - Benchmark Error (Roll's critique)
    - Can affect slope of SML
    - can affect calculation of beta
    - Greater concern with global investing
    - Problem is one of measurement
- Demonstration of the Global Benchmark Problem
  - Two major differences in the various beta statistics:
    - For many stocks, the beta estimates change a great deal over time
    - There are substantial differences in betas estimated
      - for the same stock over the same time period
      - when two different definitions of the benchmark portfolio are employed
- Implications of the Benchmark Problems
  - Benchmark problems do not negate the value of the CAPM as a normative model of equilibrium pricing
  - There is a need to find a better proxy
    - for the market portfolio or
    - to adjust measured performance for benchmark errors
  - Multiple markets index (MMI)
    - is major step towards a truly comprehensive world market portfolio

- Required Characteristics of Benchmarks
  - Unambiguous
  - Investable
  - Measurable
  - Appropriate
  - Reflective of current investment opinions
  - specified in advance
- Selecting a Benchmark
  - A global level that contains the broadest mix of risky asset available from around the world
  - A fairly specific level consistent with the management style of an individual money manager

Reporting Investment Performance

- Time-Weighted & Money-Weighted Returns: Introduction
- Recall that: the holding period yield is compiled as

$$HPY = \frac{\text{Ending Value of Investment}}{\text{Beginning Value of Investment}} - 1$$

- However, the ending value can also depend on factors unrelated to manager performance
  - Most notably, timing of investment

Example: Two managers, two periods:

- Each gets return of 25% in period 1, 5% in period 2
- Manager A gets $500,000 to invest at the beginning
- Manager B gets $250,000 at the beginning, $250,000 at the start of period 2

Final Values:

$V_A = \$500,000(1+0.25)(1+0.05) = \$656,250$

$V_B = \$250,000(1+0.25)(1+0.05) + \$250,000(1+0.05) = \$590,625$

- Returns need to be adjusted for the timing of investments
- Two main approaches exist:
  1. money-weighted &
  2. time-weighted returns

1. Money-weighted:

- All cash flows are discounted back to the beginning of the period
- The money weighted-return
  - is the discount rate at which all subsequent cash flows equal the original payment:

$$A: 500{,}000 = \frac{656{,}250}{(1+r_{mA})^2} \Rightarrow r_{mA} = 14.56\%$$

$$B: 250{,}000 = \frac{-250{,}000}{(1+r_{mB})} + \frac{590{,}625}{(1+r_{mB})^2} \Rightarrow 11.63\%$$

Problem: $r_{mB} < r_{mA}$, even though the managers had equal performance

2. Better: Time-weighted return:

- Defined as the compounded growth rate of $1 over the period being measured
- Thus, simply the geometric mean of a number of holding-period returns

In our example:

$$r_{tA} = r_{tB} = \sqrt{(1+0.25)(1+0.05)} - 1 = 14.56\%$$

- In practice, we start a new holding period
  - whenever changes happen to the portfolio
- For each holding period,

$$HPR = ((MV_1 - MV_0 + D_1 - CF_1) / MV_0)$$

where;

- MV_0 = beginning market value
- MV_1 = ending market value
- D_1 = dividend/interest inflows
- CF_1 = cash flow received at period end
  (deposits subtracted, withdrawals added back)

- The dollar-weighted & time-weighted returns
  - are the same when there are
  - no interim investment contributions within the evaluation period
- Since the time-weighted returns
  - are robust to investment timing
  - they are the preferred measure

- Performance Presentation Standards (PPS)
  - CFA Institute introduced in 1987 & formally adopted in 1993 the Performance Presentation Standards
  - The Goals of PPS
    - Achieve greater uniformity & comparability among performance presentation
    - Improve the service offered to investment management clients
    - Enhance the professionalism of the industry
    - Bolster the nation of self-regulation

Fundamental Principles of PPS

- Total return must be used
- Time-weighted rates of return must be used
- Portfolios must be valued at least monthly & periodic returns must be geometrically linked
- Composite return performance (if presented) must contain all actual fee-paying accounts
- Performance must be calculated after deduction of trading expenses
- Taxes must be recognized when incurred
- Annual returns for all years must be presented
- Disclosure requirements must be met