**PORTFOLIO PERFORMANCE EVALUATION**

* **Portfolio Performance Measures**

Portfolio performance evaluation involves determining periodically how the portfolio performed in terms of not only the return earned, but also the risk experienced by the investor. For portfolio evaluation appropriate measures of return and risk as well as relevant standards (or “benchmarks”) are needed. In general, the **market value of a portfolio at a point of time** is determined by adding the markets value of all the securities held at that particular time.

The essential idea behind performance evaluation is to compare the returns which were obtained on portfolio with the results that could be obtained if more appropriate alternative portfolios had been chosen for the investment. Such comparison portfolios are often referred to as **benchmark portfolios**. In selecting them investor should be certain that they are relevant, feasible and known in advance. The benchmark should reflect the objectives of the investor.

* **Beta**

Beta (β) measures the systematic risk of a portfolio. It is the sensitivity of a portfolio to an index, typically an equity index. If beta is one, then the portfolio carries the same systematic risk as the index. If beta is less than one, then the systematic risk is less than that of the index. If beta is more than one, then the systematic risk is more than the index. It should be noted that apart from systematic risk, portfolios also carry specific risk, which is the risk of individual securities making losses even when the index is going up. Thus beta is not a full measure of risk.

Beta can be calculated as:

$$β=\frac{Covariance between an asset and market }{Variance of the asset}=\frac{Cov(Asset,Market)}{Var(Asset)}$$

* **Capital Asset Pricing Model (CAPM)**

CAPM was developed by W. F. Sharpe. CAPM simplified Markowitz‘s Modern Portfolio theory, made it more practical. Markowitz showed that for a given level of expected return and for a given feasible set of securities, finding the optimal portfolio with the lowest total risk, measured as variance or standard deviation of portfolio returns, requires knowledge of the covariance or correlation between all possible security combinations (see formula 3.3). When forming the diversified portfolios consisting large number of securities investors found the calculation of the portfolio risk using standard deviation technically complicated.

**Measuring Risk in CAPM** is based on the identification of two key components of total risk (as measured by variance or standard deviation of return):

* *Systematic risk*
* *Unsystematic risk*

**Systematic risk** is that associated with the market (purchasing power risk, interest rate risk, liquidity risk, etc.)

**Unsystematic risk** is unique to an individual asset (business risk, financial risk, other risks, related to investment into the particular asset) while unsystematic risk can be mitigated through diversification by holding many different assets in the portfolio, systematic risk cannot be avoided through diversification.

In CAPM, investors are compensated for taking only systematic risk. Though, CAPM only links investments via the market as a whole. The CAPM predicts what an expected rate of return for the investor should be, given other statistics about the expected rate of return in the market and market risk (systematic risk):

**E(r** j**) = R**f **+** β**(j) \* ( E(r**M**) - R**f**)**

E(r j) - expected return on stock j;

Rf - risk free rate of return;

E(rM) - expected rate of return on the market

β(j) - coefficient Beta, measuring undiversified risk of security j.

* **Portfolio Beta**

Itcan be used as an indication of the amount of market risk that the portfolio had during the time interval. It can be compared directly with the betas of other portfolios. One cannot compare the ex post or the expected and the expected return of two portfolios without adjusting for risk. To adjust the return for risk before comparison of performance risk adjusted measures of performance can be used:

* Sharpe’s ratio;
* Treynor’s ratio;
* Jensen’s Alpha.

**Sharpe’s ratio** shows an excess a return over risk free rate, or risk premium, by unit of total risk, measured by standard deviation:

**Sharpe’s ratio = (rp– rf)**

**σp**

Here:

rp - the average return for portfolio p during some period of time;

rf - the average risk-free rate of return during the period;

σp - standard deviation of returns for portfolio p during the period.

**Treynor’s ratio** shows an excess actual return over risk free rate, or risk premium, by unit of systematic risk, measured by Beta:

**Treynor’s ratio = (rp –rf)**

**βp**

Here: βp – Beta, measure of systematic risk for the portfolio p.

**Jensen‘s Alpha** shows excess actual return over required return and excess of actual risk premium over required risk premium. This measure of the portfolio manager’s performance is based on the CAPM.

**Jensen’s Alpha = rp – {rf  + βp (rm – rf)}**

Here: r**m** - the average return on the market in period t;

(r**m** – r**f**) - The market risk premium during period t.

It is important to note, that if a portfolio is completely diversified, all of these measures (Sharpe, Treynor’s ratios and Jensen’s Alfa) will agree on the ranking of the portfolios. The reason for this is that with the complete diversification, total variance is equal to systematic variance. When portfolios are not completely diversified, the Treynor’s and Jensen’s measures can rank relatively undiversified portfolios much higher than the Sharpe measure does. Since the Sharpe ratio uses total risk, both systematic and unsystematic components are included.

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*