

Portfolio Measurement

Meaning

Portfolio measurement refers to the **process of evaluating the performance** using various **methods and metrics** to assess how well a **portfolio** has **achieved** its **investment objectives**.

Methods of calculating rate of return

Money-Weighted Rate of Return (MWRR)

The Money-Weighted Rate of Return (MWRR) takes into account **the size and timing of cash flows** (deposits or withdrawals) when calculating the return.

It is essentially the same as the **Internal Rate of Return (IRR)**.

Characteristics

1. Considers Timing of Cash Flows:

- **Meaning:** The return calculation changes depending on when you deposit or withdraw money.
- **Example:** Adding ₹10,000 **at the start** of the year affects **your return more** because that money has the **entire year to grow** and benefit from compounding. If you add the same amount **at the end of the year**, it has **less time** to earn returns, so its impact on your overall **return is smaller**.

2. Reflects Personal Experience:

- **Meaning:** MWRR shows the return you **personally experienced**, considering your specific deposits and withdrawals.
- **Example:** If you withdraw money before a big market rise, your MWRR will be lower because you missed out on those gains.

Characteristics

3. Same as Internal Rate of Return (IRR):

Meaning: MWRR is calculated in the same way as IRR, which finds the **return rate** that makes your **total investment gains equal to the money you invested**.

Example:

Initial Investment: ₹10,000

Year 1: You add ₹2,000 (total ₹12,000 invested).

Year 2: You withdraw ₹1,000 (total ₹11,000 invested).

End of Year 3: Your portfolio is worth ₹20,000.

MWRR/IRR finds the return rate r that balances the following equation:

$$-10,000(1 + r)^3 - 2,000(1 + r)^2 + 1,000(1 + r) + 20,000 = 0$$

Time-Weighted Rate of Return (TWRR)

The Time-Weighted Rate of Return (TWRR) is a method used to **calculate the return** on an investment portfolio, **focusing solely on the performance of the investments themselves.**

It **removes the effects of cash flows** (like deposits or withdrawals) made by the investor, **providing a clear picture** of how well the **portfolio's investments performed over time.**

Characteristics

Ignores Cash Flow Timing:

- **Meaning:** TWRR doesn't consider when you add or withdraw money; it focuses only on how the investments perform.
- **Example:** Whether you add ₹10,000 at the start or end of the year, TWRR will measure the return based on the growth of the investments themselves, not the cash added.

Ideal for Comparing Performance:

- **Meaning:** TWRR is useful for comparing different investment managers or strategies because it shows the true performance of the investments, without being skewed by cash flows.
- **Example:** If you're comparing two portfolios, TWRR helps you see which manager made better investment choices, regardless of when money was added or withdrawn.

Portfolio Performance and Risk Adjustment Methods

Sharpe Ratio

Sharpe ratio measures the **risk premium per unit of total risk** for a security or portfolio of securities.

It is called as **Reward to Variability ratio**

The **returns from portfolio are adjusted with risk free returns**. These excess returns attributable as reward for investing in risky assets.

Formula is as follows:

$$S = \frac{R_i - R_f}{\sigma_i}$$

Where,

R_i = Return on Security/Portfolio

R_f = Risk Free Rate of Return

σ_i = Standard Deviation of Return of Security/Portfolio

S = Sharpe Ratio

Sharpe ratio tells us weather the **returns earned** are due to **smart investment decisions** or a **result of excess risk**.

High Sharpe Ratio: Indicates that the investment has generated **higher returns relative to the amount of risk taken**. This suggests that the **returns are more likely due to smart investment decisions** rather than just taking on high levels of risk.

Low Sharpe Ratio: Indicates that the returns are **not sufficiently high** to justify the level of risk taken. This could imply that the returns are **more a result of excessive risk-taking rather than effective investment strategies**.

Treynor Ratio

This ratio is same as Sharpe ratio with only difference that it measures the Risk Premium per unit of Systematic Risk (β) for a security or a portfolio of securities. The formula is as follows:

$$T = \frac{R_i - R_f}{\beta_i}$$

Where,

R_i = Return on Security/Portfolio

R_f = Risk Free Rate of Return

β_i = Beta of Security or Portfolio

T = Treynor Ratio

Treynor ratio is based on the premise that unsystematic or specific risk can be diversified and hence, only incorporates the systematic risk (beta) to gauge the portfolio's performance. It measures the returns earned in excess of those that could have been earned on a riskless investment per unit of market risk assumed.

- **Sharpe Ratio:**

- Measures risk-adjusted returns.
- Risk is defined as **total risk** (both systematic (entire market) and unsystematic (specific risk)).
- Risk is captured through **standard deviation** of returns.

- **Treynor Ratio:**

- Measures risk-adjusted returns.
- Risk is defined as **systematic risk** only.
- Risk is captured through the **beta** of the portfolio.

Jensen Alpha

Jensen's Index Model helps assess **how well a portfolio performs compared to what we would expect based on its risk**. It uses the **Capital Asset Pricing Model (CAPM)** to make this comparison.

Expected Return (from CAPM): This is the return you would expect from a portfolio given its risk level (measured by beta). It's calculated using the CAPM formula:

$$\text{Expected Return} = R_f + \beta \times (R_m - R_f)$$

Actual Return: This is the real return you actually achieved with the portfolio.

Jensen's Alpha (α): Actual Return – Expected Return

- If Jensen's Alpha is positive, it means the portfolio performed better than expected given its risk.
- If Jensen's Alpha is negative, the portfolio underperformed compared to the CAPM prediction.