Semester : VIII Subject : AIFB Academic Year: 2024-25

ASSESSING RISK:

Risk assessment in finance involves measuring potential losses and managing risks through various methods like Value at Risk (VaR), Standard Deviation, Beta, Sharpe Ratio and Maximum Drawdown.

(1) Value at Risk (VaR):

VaR estimates the maximum potential loss over a given period at a certain confidence level.

Formula:

$$\boxed{VaR = Z \times \sigma \times \sqrt{T}}$$

Where,

Z = Z-score (eg. 1.645 for 95% confidence level).

σ = Portfolio standard deviation.

T = Holding period (days).

Example:

Cosider the portfolio value is \$1,00,000, Standard Deviation (σ) = 2% perday, Confidence level of 95% ($Z = 1.645$) and holding period is 5 days. Calculate VaR.

Solution:

$$VaR = 1.645 \times 0.02 \times \sqrt{5}$$

$$VaR = 7.35\% \times 1,000,000 \boxed{= 73,500}$$

At 95% confidence, the worst expected loss over 5 days is \$73,500.

(2) Standard Deviation :-

Standard Deviation measures how much returns deviate from the average return.

Formula :-

$$\boxed{\sigma = \sqrt{\frac{\sum (R_i - \bar{R})^2}{N}}}$$

where :

R_i = Individual returns.

$\bar{R}$ = Average return.

N = Number of data points.

Example :

Consider 5 days of stock return as : 2%, -1%, 3%, -2%, 4%. Calculate the volatility of stock returns.

Solution :

(1) Calculate the mean return :

$$\bar{R} = \frac{(2+(-1)+3+(-2)+4)}{5} = \frac{6}{5} \boxed{= 1.2\%}$$

(2) Calculate deviations and square them :

$(2-1.2)^2 = 0.64$, $(-1-1.2)^2 = 4.84$, $(3-1.2)^2 = 3.24$

$(-2-1.2)^2 = 10.24$, $(4-1.2)^2 = 7.84$

(3) Compute variance:

$$\sigma^2 = \frac{(0.64 + 4.84 + 3.24 + 10.24 + 7.84)}{5} = \frac{26.8}{5} = \boxed{5.36}$$

(4) Compute standard Deviation:

$$\sigma = \sqrt{5.36} = \boxed{2.31\%}$$

Thus, the volatility of stock return is $\boxed{2.31\%}$

(3) Beta (Systematic Risk)

Beta measures a stock's sensitivity to market movements.

$$\boxed{\beta = \frac{\text{Covariance}(R_s, R_m)}{\text{Variance}(R_m)}}$$

where:

R_s = stock returns

R_m = Market returns

Example:

Consider the covariance of the stock and market is 0.02 and market variance is 0.01. Calculate beta.

Solution:

$$\beta = \frac{0.02}{0.01} \boxed{= 2.}$$

A beta of 2 means the stock is twice as volatile as the market.

(4) Sharpe-Ratio (Risk-Adjusted Return)

Sharpe Ratio measures returns per unit of risk.

Formula:

$$\boxed{\text{Sharpe Ratio} = \frac{R_p - R_f}{\sigma_p}}$$

where:

R_p = Portfolio return

R_x = Risk free rate (eg. treasury bond rate).

σ_p = Portfolio standard deviation.

Example:

Portfolio return = 12%

Risk-free rate = 3%

Portfolio standard deviation = 5%

Solution:

$$\text{Sharpe-Ratio} = \frac{12-3}{5} = \frac{9}{5} = 1.8$$

A sharpe ratio of 1.8 suggests good risk-adjusted returns.

(5) Maximum Drawdown (MDD).

Measures the largest peak-to-trough decline before a portfolio recovers.

Formula:

$$\boxed{MDD = \frac{\text{Peak Value} - \text{Lowest Value}}{\text{Peak Value}} \times 100}$$

Example:

Portfolio peak = \$50,000

Lowest value = \$35,000

Solution:

$$MDD = \frac{50,000 - 35,000}{50,000} \times 100$$

$$MDD = \frac{15,000}{50,000} \times 100 \boxed{= 30\%}$$

The portfolio experienced a 30% drawdown.

By using these risk measures, traders and investors can quantify potential losses, evaluate volatility, and improve portfolio management.

STOPLOSS:-

A stop loss helps traders limit their losses by automatically closing a trade when the price reaches predetermined level.

Example 1: Fixed Stop Loss (Stock Trade)

A trader buys 200 shares of ABC Ltd. at \$100 per share and sets a stoploss at \$90.

Given Data:

Entry Price = \$100

Stop loss Price = \$90

Shares bought = 200