

Quantitative Trading Analysis with Python

Section 3: Strategy Reporting

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Strategy Reporting

- **Strategy reporting** consists of evaluating simulated strategy risk adjusted performance using historical data.
- Main reporting areas are trading statistics and performance metrics.

Trading Statistics

- **Trading statistics** consists of evaluating simulated strategy position results.
- Main evaluation metrics include number of transactions and trades, net trading profit and loss, maximum drawdown and equity curve.

Trading Statistics

- **Position** consists of ownership relation of corresponding asset.
 - **Open position** consists of owning corresponding asset.
 - **Closed or flat position** consists of not owning corresponding asset.
- **Number of transactions** consists of amount of buying and selling trading signals being implemented.
- **Number of trades** consists of amount of open to close positions. Therefore, they include at least two transactions, one buy and another sell.

Trading Statistics

- **Net trading profit and loss** consists of difference between final and initial equity minus any open position profit or loss.

$$pl_{t=i \rightarrow f} = eq_{t=f} - eq_{t=i} - pl_{t=f,o}$$

Trading Statistics

- **Maximum drawdown** consists of portfolio maximum loss as minimum difference between peaks or maximum equity up to current equity and troughs or current equity.
 - **Percentage maximum drawdown** consists of portfolio maximum percentage loss as minimum value of troughs or current equity as share of peaks or maximum equity up to current equity.

$$\max(dd)_{t=i \rightarrow f} = \min(pk_{t=i \rightarrow f} - th_{t=i \rightarrow f})$$

$$pk_{t=f} = \max(eq_{t=i \rightarrow f})$$

$$th_{t=f} = eq_{t=f}$$

$$\% \max(dd)_{t=i \rightarrow f} = \min\left(\frac{th_{t=i \rightarrow f}}{pk_{t=i \rightarrow f}} - 1\right)$$

Trading Statistics

- **Equity curve** consists of sum of initial equity, net trading profit and loss and any open position profit or loss.

$$eq_{t=f} = eq_{t=i} + pl_{t=i \rightarrow f} + pl_{t=f,o}$$

Performance Metrics

- **Performance metrics** consist of evaluating simulated strategy risk adjusted returns.
- Main performance metrics include annualized return, annualized standard deviation and annualized Sharpe ratio.

Performance Metrics

- **Annualized return** is a performance metric that consists of the number of observations root of annually scaled cumulative product of daily returns.

$$r_a = \left(\prod_{t=1}^n (r_t + 1) \right)^{252/n} - 1$$

$$r_t = \frac{eq_t}{eq_{t-1}} - 1$$

Performance Metrics

- **Annualized standard deviation** is a risk metric that consists of daily standard deviation multiplied by square root of number of periods per year.

$$\sigma_a = \sigma\sqrt{252}$$

$$\sigma = \sqrt{\frac{1}{n} \sum_{t=1}^n (r_t - \mu)^2}$$

$$\mu = \frac{1}{n} \sum_{t=1}^n r_t$$

Performance Metrics

- **Annualized Sharpe ratio** is a risk-adjusted performance metric that consists of expected excess return by unit of risk multiplied by square root of number of periods per year.
- William F. Sharpe. "The Sharpe Ratio". *Journal of Portfolio Management*. Fall 1994.

$$sr_a = \frac{(\mu - rf)252}{\sigma\sqrt{252}} = \frac{\mu - rf}{\sigma}\sqrt{252}$$