

PERFORMANCE ANALYSIS USING RINA INDEX

RINA SYSTEMS

Performance Analysis has to be done using ratios. Analysis can be done based on equity performance or trade performance. Equity performance depends on the amount of capital at the beginning of analysis and does not depend on the price action during each trade. Examples of equity performance ratios are Sharpe, K-ratio and RRR.

Other ratios analyze trade performance. These ratios may depend on the price action during each trade or profitability of trades but do not depend on the amount of capital at the beginning of analysis. Examples of trade performance ratios are (Average Win)/(Average Loss) for all trades, Percent Profitable Trades and Profit Factor.

The objective of any of these ratios is to create a ratio that looks like Reward/Risk ratio. Or how much reward can be gained per one unit of risk.

There has been a lot said and done about equity performance ratios. However, trade performance ratios have not been sufficiently studied. Equity performance analysis is necessary to understand the return on equity for one unit of risk. There is another important element in each trade. That is a trade return. In money management it is called holding period return (HPR) and it is an important value to know. It has been introduced by R. Vince in his book "Portfolio Management Formulas", 1996. For example, if a trader puts only 10% of the total equity in the account into a trade and gets 150% on that trade the trader makes only 15% on the total equity and both 150% and 15% are important numbers to know.

Similarly, there is also risk associated with the total equity and with a trade equity. Again, there are many numbers proposed and used in trading to measure the equity risk, for example risk of ruin, variance or standard deviation of monthly returns on equity, etc. However there is no a statistically viable accepted by traders trade risk measure to be used in building trade performance ratios. Some of trade risk measures used in different charting and analysis software are represented by maximum equity drawdown and the largest trade loss or their analogues.

Below we consider these trade return and risk measures, describe a ratio called RINA Index and show the benefits of using this index for trade performance analysis. This ratio is widely used in software like TradeStation 2000i, ProSuite 2000i, Portfolio Evaluator, Money Manager and Performance Suite 2000.

The purpose of using Reward/Risk ratio is to relate a reasonable positive outcome to a reasonable negative outcome. That means that Reward/Risk ratio could be thought of (Reward With Reasonable Chance)/ (Risk With Reasonable Chance). Here "Reasonable Chance" could be expressed in terms of %, standard deviations from the average and others.

When we consider (Reward With Reasonable Chance)/ (Risk With Reasonable Chance) we use the average drawdown as an expected value of trade drawdown for the risk with a reasonable chance. Net profit figure can be used as the reward. However, to avoid any outliers we form a new number equal to Net Profit minus Profit/Loss of the outlier trades. Outlier is defined as a trade that has a return more than average+3 standard deviations or less than average-3 standard deviations.

It is interesting to note that the considered NetProfit/Maximum Equity Drawdown ratio may not represent any one of the ratios described. Net Profit may not be a reward with reasonable chance because it may include trades that have statistically unusually high (or

low) profitability and happened for reasons not related to the trading strategy (outliers). For example, a bad quote, equipment errors, poor communication between a trader and a broker, etc.

The problem with MaxDD is that it most likely is a very improbable event and may not reflect the risk taken by trader with any reasonable chance. It is the worst case scenario but could be a very much unlikely one. It should be considered by traders but not necessarily as a part of the ratio. To overcome that problem when we consider (Reward With Reasonable Chance)/(Risk With Reasonable Chance) we use the average drawdown as an expected value of drawdown for the risk with a reasonable chance.

The next issue is how much time it takes to achieve a given ratio. Let us assume there are 3 different trading performances that have the same Reward/Risk ratio. Trader would choose, of course, the one that has achieved that performance with the smallest exposure to the market. That is very logical, because to be in the market means to get exposed to risk. Not to be in the market means to make money at least at the rate of the interest bearing instrument or better. In other words, all ratios can be weighed per percent time in the market. This can be expressed as (Reward With Reasonable Chance)/ ((Risk With Reasonable Chance)*Percent Time In The Market).

To complete this we should take our Net Profit/Average Drawdown and divide by percent time in the market. This gives us RINA Index.

$$\text{RINA INDEX} = ((\text{NET PROFIT}) - (\text{NET PROFIT IN OUTLIERS})) / ((\text{AVERAGE DRAWDOWN}) * (\text{PERCENT TIME IN THE MARKET})).$$

It is reward with reasonable chance related to risk with reasonable chance per one percent time in the market.

Examples.

1. Consider two different performances where $\text{NetProfit1} = \text{NetProfit2}$, $\text{MaxDrawDown1} = \text{MaxDrawDown2}$, $\text{AvgDrawDown1} = \text{AvgDrawDown2}$, $\text{Time-in-the-market1} < \text{Time-in-the-market2}$. This is an obvious case because a trader makes the same amount of money with the same level of risk in a shorter period of time. In this example $\text{RINA Index1} > \text{RINA Index2}$.

2. $\text{NetProfit1} / \text{AvgDrawDown1} = \text{NetProfit2} / \text{AvgDrawDown2}$, $\text{Time-in-the-market1} < \text{Time-in-the-market2}$. This is an obvious case because if $\text{NetProfit2} > \text{NetProfit1}$ then a trader can increase the leverage to make the same amount of money with the same level of risk but in a shorter period of time. In this example $\text{RINA Index1} > \text{RINA Index2}$.

3. $\text{NetProfit1} = \text{NetProfit2}$, $\text{MaxDrawDown1} > \text{MaxDrawDown2}$, $\text{AvgDrawDown1} < \text{AvgDrawDown2}$, $\text{Time-in-the-market1} = \text{Time-in-the-market2}$. In the 1st case there is a trade that has an unusually high drawdown (more than 3-sigma away from the average). Using NP/MaxDD a trader would use the 2nd case, using RINA Index – 1st.

Even the most conservative trader should realize that by choosing the second case he increases the chance of experiencing a loss during a trade *without decreasing the chance of having a maximum loss smaller*. In this example $\text{RINA Index1} > \text{RINA Index2}$.

The calculation of RINA Index for portfolio is the same. However, the more diversified portfolio is the less chance that it has outlier trades and the more chance that at any time there is an open position. That means that Percent Time in the Market will be 100. That means that for a very diversified portfolio RINA Index will be equal to $\text{NetProfit} / \text{AvgDrawDown}$.