Fixed Fractional Position Sizing

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Many experienced traders use the *risk percent* method, also known as *fixed fractional method,* for calculating position size. This is a practical method with no rigorous theoretical justification for its use other than the fact that it has worked well for many successful traders in the past and it is highly recommended in the literature.

Many experienced traders risk no more than 1 to 2 percent of available account equity (current bankroll) on each trade. This range of risk percent values appears to offer a good trade-off between risk and reward while keeping the probability of ruin low[i].

Application of the risk percent method for calculating position size requires that before a trade is opened, the exit price level is know quite accurately. Obviously, this method cannot apply to trading strategies with varying, or unknown in advance, exit price levels. This is a drawback of the method but it may also be an indication that effective risk management can only be accomplished with simple position exit strategies.

The formula for the risk percent position-sizing method is obtained after one realizes that the amount risked on each trade must be equal to the fraction of the current bankroll one is willing to lose. The amount risked on each trade is equal to the difference between the entry and exit price, times the number of contracts or shares. The fraction of the current bankroll one is willing to lose on each trade if found by multiplying it by the allowable risk percent. Then, the account equity M is equal to:

$$M = \frac{|P_o - P_i| \cdot N}{R} \qquad (1)$$

where R is the percent risk, P_i is the entry price, P_o is the exit price, and N is the number of shares or contracts.

The absolute value of the difference between the entry price and the exit price is taken in equation 1 to account for both long and short positions.

Point stops

If the stop-loss is a fixed number of points, then

$$P_o = P_i \pm S_i \qquad (2)$$

which means that the exit price is equal to the entry price, plus or minus the stop-loss S_i in points, depending on whether the trade is long or short.

After combining equations 1 and 2 we obtain

$$M = \frac{S_i \cdot N}{R} \qquad (3)$$

The absolute value operator is no longer required in equation 3 since S_i is by definition a positive number. After solving equation 3 for the number of shares N, we obtain the following equation:

$$N = \frac{M \cdot R}{S_i} \qquad (4)$$

Thus, we have derived the risk percent position-sizing formula in the case that the stop-loss is defined in points.

Examples:

(a) Stock trading:

Account equity: $100,000

Risk percent: 2%

Stop-loss: 4 points

Position size (equation 4) N = (100,000 x 2/100) / 4 = 500 shares

(b) Futures trading (T-Bonds)

Account equity: $200,000

Risk percent: 2%

Stop-loss: 2 points equivalent to 2 points x $1,000/point = $2,000

Position size (equation 4) N = (200,000 x 2/100) / (2 x 1,000) = 2 contracts

In general, the value to use in the denominator of equation 4 for S_i is equal to the number of points used for stop-loss times the full point value.

Percent stops

Next, we consider the case of a stop-loss percent as follows:

$$P_o = P_i \pm S_p \cdot P_i \; (5)$$

In this case, the exit price is equal to the entry price, plus or minus a fraction S_p of the entry price, depending on whether the trade is long or short. After combining equations 1 and 5 we obtain

$$M = \frac{S_p \cdot P_i \cdot N}{R} \qquad (6)$$

and we can now solve for the number of shares N to get the final formula:

$$N = \frac{M \cdot R}{S_p \cdot P_i} \qquad (7)$$

In this case, the position size depends on the entry price P_i. The price to open a position is not always known, because that depends on the order type. If unknown, an approximate entry price can be used without impacting the calculation greatly. For instance, many trading systems generate entry signals on the open of the next day and the orders are entered as *MOO* (market on open). In that case, the opening price is not known in advance but the last closing price can be used without a significant impact on the calculated number of shares N.

Example:

Account equity: $100,000

Risk percent: 1%

Stop-loss percent: 5%

Entry price: $20.00

Position size (equation 5) N = (100,000 x 1/100) / (20.00 x 5/100) = 1000 shares

The number of shares calculated using the formulas derived should always be checked against the maximum number of shares allowed based on available capital and the minimum of the two numbers should be used. The maximum number of shares allowed is simply equal to the available capital divided by the entry price in the case of equities. In the case of futures and forex the maximum number of contracts allowed equals the available capital divided by the margin requirement per contract bought long or sold short.

Simple but effective

The risk percent position method is simple but very effective. It is evident from equations 4 and 7 that as the account equity M increases due to accumulated trading profits, the position size N also increases proportionally. The reverse happens when the account equity decreases. Thus, this method, even though it is fundamentally simple, is nevertheless dynamic in nature. It is also classified as an *anti-Martingale* betting strategy, as opposed to a *Martingale* one.

Martingale betting strategies increase the bet size if the account equity drops, in an attempt to recover losses and even make a profit, provided of course there is a strategy with a winning bias. Similarly, the bet size is decreased when the equity increases, for the purpose of limiting risk exposure and securing realized profits. This type of betting strategy can be used for position sizing but many experienced traders do not recommend it. The reason that Martingale betting systems can fail and lead to disaster is that in the presence of a very long streak of losers, such methods guarantee in theory an eventual win if, and only if, the available equity is infinite. In reality, however, accounts have a finite size, and there are always a number of consecutive losers that, when combined with a Martingale betting method, can result in total ruin.

In contrast, anti-Martingale betting strategies increase the bet size while net equity increases and decrease it the other way. The risk percent position-sizing method and the optimal method based on the Kelly formula[ii] can be classified as anti-Martingale betting systems. This type of betting system promises higher returns in exchange for a more volatile equity curve as compared to, for example, the equity curve that is obtained when using the starting trading account value instead with a fixed number of shares or contracts.

References

[i] For more details see *Profitability and Systematic Trading*, Michael Harris, Wiley, May 2009. http://www.wiley.com/WileyCDA/WileyTitle/productCd-047022908X.html

[ii] For a discussion of the Kelly formula application to position sizing see "Relation of Expected Gain to Kelly Formula", by Michael Harris, http://www.priceactionlab.com/Literature/Kelly.pdf