

UNDERSTANDING risk-reward and position sizing

How much should you risk on a trade?

The answer has more impact on your bottom line than you think.

BY VAN K. THARP, PH.D.

In 1962, when I was 16 years old, I bought 100 shares of an \$8 stock that, according to *Fortune Magazine*, had the highest earnings per share growth of any company during the prior 12 months. It proceeded to shoot up to \$20 per share over the next six months.

I then watched it fall to zero over the next three years. I even bought more when it fell to \$6 per share. In the end, I lost \$1,400, which was a lot of money for a teenager in the early 60s.

What's the moral? Most people would say that I simply picked the wrong stock. After all, I could have invested \$1400 in Berkshire Hathaway in 1964 and today my investment would be worth over \$5 million. However, for every Berkshire Hathaway stock, there are thousands of start-up companies that go bankrupt — just like the one I bought.

The stock *did* go up 250 percent after I bought it, but I made six major mistakes

— errors repeated frequently by most traders and investors — and those mistakes resulted in a 100-percent loss.

Correcting these mistakes can actually result in a new way of thinking about markets and investing. This thinking allows you to always look at each trade in terms of its risk-reward ratio and it helps you focus on the most important aspect of trading: “how much,” also known as position sizing.

The mistakes most people make over and over again represent the six Golden Rules of Trading.

1. Never open a position in the market without knowing your initial risk

You should always have an exit point when you enter a position. When you predefine your initial risk, you know when to get out of your position to preserve your capital. This point is your initial stop-loss, and it establishes your initial risk, which we'll call R for short.

Most people define a trade's risk by its potential volatility — how much you can expect your account (or the position) to fluctuate. However, that's not the definition of risk used here. In this case, risk is defined as *how much* you'll lose if you are wrong about the position.

In my first stab at investing, if I had said to myself, “Get out if the stock drops to \$6 per share,” I would have been following the first rule. My initial risk, or R, would have been \$2 per share, or \$200 on 100 shares.

Here's another example. Let's say you buy a stock at \$50 and decide to sell it if it drops to \$40. What's your initial risk?

The initial risk is \$10 per share, so in this case “1R” is \$10. If you bought 100 shares, your total initial risk (also 1R) is \$1,000 (\$10 times 100 shares).

If you buy the same stock at \$50, but decide you are wrong about the trade if it drops to \$48, your initial risk is \$2 per share, so 1R is \$2, or \$200 on 100 shares.

2. Think in terms of R-multiples

The next critical mistake I made was not thinking of my trade in terms of its risk-to-reward ratio.

Always define your profit and loss in a trade as some multiple of your initial risk, or “R-multiples.” For example, if your initial risk is \$100 and you make \$200, then you have a 2R gain. If your initial risk is \$100 and you lose \$150, then you have a 1.5R loss. In other words, you must start thinking in terms of risk and reward. It's a pretty simple concept.

In my first investment, I could have used a simple 25-percent trailing stop rule: Whenever my stock reached a new high my exit would be 25 percent below that point. This rule is a good substitute for buy-and-hold and would have protected a lot of people when the market fell sharply in 2000-2002. In my case,

The reason was because I wasn't thinking in terms of risk-reward ratios. And I didn't think in terms of cutting losses short and letting profits run.

Incidentally, the Nobel Prize for economics in 2002 was awarded to Daniel Kahneman and Amos Tversky for their discovery of Prospect Theory. What

result, many make the next major mistake because they don't understand their trading system as a set of R-multiples.

This means you can look at the profit and loss of each trade as a function of its initial risk. What you'll end up with is a distribution of R-multiples, which will tell you a great deal about your system (Table 1). The table shows a typical trading system expressed as a series of R-multiples. (Incidentally, if you have a series of profits and losses in a trading system and have no idea what your initial risk was for each trade, you can make your average loss equal to 1R and still have a rough idea of your system's R-multiples. In this example, the average loss was \$1,200.20, so you could have used that to represent a 1R loss if you didn't know your initial risk in each trade.)

The mean (average) R-multiple is your system's "expectancy," which tells you what to expect from your system over many trades in terms of R. The expectancy of our sample system was 0.965R when expressed in terms of the initial risk. Expectancy is great to know, because if the R-multiple distribution is an accurate representation of your sys-

continued on p. 31

The large variation in trading results can only be attributed to individual trader psychology and position sizing.

when the stock hit a high of \$20, my exit would have been at \$15. At \$15, I would have had a \$7 profit. And because my initial risk was \$2, that would have been a 3.5R profit — 350 percent bigger than my initial risk.

3. Cut your losses short and let your profits run

A common Golden Rule of Trading is to cut losing trades short and let winning trades run. You want your losses to be 1R or less. That means if you say you'll get out of a stock when it drops from \$50 to \$40, *you actually get out* when it drops to \$40 — you don't wait until it drops to \$30 and suffer a 2R loss. You want to avoid that possibility at all costs.

You want your profits to be much bigger than 1R. For example, say you buy a stock at \$8 and plan to get out if it drops to \$6, in which case your initial 1R loss is \$2 per share. Then the stock rallies to \$28 and you make a profit of \$20 per share. Because this is 10 times what you were planning to risk, it's a 10R profit.

Of course, when I bought my first stock I had no concept of risk-reward. I didn't define my initial risk to be \$200 (or \$2/share). When the stock was \$20, I didn't think that I had a great 6R profit. When the stock dropped to \$15, I didn't think, "It's dropped 25 percent — I should get out with a 3.5R profit." And when the stock went to zero, I had no idea that I had a 4R loss.

Kahneman and Tversky proved is that people have a natural bias to cut profits short and let their losses run — the opposite of the Golden Rule.

4. Understand your trading system as a distribution of R-multiples

When I made my first trade, I had no idea what a trading system even was, and that's still fairly common for most people who play the markets. As a

TABLE 1 KNOWING THE R-MULTIPLES OF YOUR TRADING SYSTEM

Transaction	Initial risk	Profit/loss (including costs)	R-multiple (based on Risk)
400 CSCO at \$23	\$1,000	\$2,317.00	2.32R
80 IBM at \$80	\$1,000	-\$813.00	-0.82R
300 VLO at \$50	\$1,000	\$3,413.00	3.41R
400 HRB at \$51	\$1,000	-\$1,531.00	-1.53R
500 IRF at \$13	\$1,000	\$3,890.00	3.89R
400 ISIL at \$16	\$1,000	-\$776.00	-0.78R
600 LSI at \$5.35	\$1,000	\$4,561.00	4.56R
500 MYL at \$17.50	\$500	-\$567.00	-1.13R
400 ORI at \$31	\$800	-\$2,314.00	-2.89R
300 SRA at \$40.77	\$600	\$1,571.00	2.62R
Total:		\$9,751.00	9.65R
Average:		\$975.10	0.965R
Standard deviation:		\$2,476.44	2.66R

Related reading:

"Conquering trading biases: Q&A with Dr. Van Tharp"

by Mark Etzkorn, *Active Trader*, October 2000

In this interview, trading coach Van Tharp explains why trading success is about accepting market realities, knowing yourself, and implementing a money-management plan that keeps the odds on your side.

The following articles are also part of the 22-article "Risk Control and Money Management" collection available at a discount through the *Active Trader* store (www.activetradermag.com/purchase_articles.htm).

"Principles of risk control and money management"

by *Active Trader* Staff (*Active Trader*, January 2003)

Learn three rules of position sizing, capital allocation, and stop placement that embody the principles of sound money management.

"Reining in risk"

by Gibbons Burke (*Active Trader*, July 2000)

A look at fundamental money-management concepts and resources for implementing them.

"Keeping track of the odds: The trader's equation"

by Dan Shirley (*Active Trader*, September 2002)

Explaining profitability with a few simple probabilities.

"Playing it safe"

by Chuck LeBeau and Terrance Tan, Ph.D.

(*Active Trader*, August 2000)

Adapting protective stops to the recent market action will help preserve trading capital.

"Doubly adaptive profit objectives"

by Chuck LeBeau (*Active Trader*, December 2000)

Where you set stops and where you take profits shouldn't be a guessing game. Learn how to use common volatility and trend indicators to improve your stops and profit targets by tying them to the current market activity.

"Limiting losses isn't always the answer"

by John Clayburg (*Active Trader*, November 2001)

While stop-losses are popular among traders, they don't always have the desired effect. In fact, using a fixed-dollar stop can actually limit the success of a strategy.

"Taking the guesswork out of stop orders"

by Thom Hartle (*Active Trader*, October 2001)

Stops work best when they are based on a thorough understanding of market conditions. Learn how to make your stops more effective.

"Equity curve drawdown management"

by Thom Hartle (*Active Trader*, February 2003)

Your system has resulted in four losing trades in a row. Should you take the next signal, or move to the sidelines? Here are some thoughts on how to determine when to stay out of the market and when to jump back in.

"Exit, trade left"

by Thomas Stridsman (*Active Trader*, May 2000)

Trailing stops can help lock in profits and reduce trading risk, but they can also take money out of your pocket if you don't use them correctly.

"Managing risk: Estimating future drawdowns"

by Tushar Chande (*Active Trader*, July 2001)

Find out how to estimate future drawdowns and make them part of your overall risk-management process.

"Dynamic position sizing"

by Dan Shirley (*Active Trader*, June 2003)

Good card players know when to "double down" on a hand — increasing their bet size when the odds are in their favor. Applying the same principle to trades can improve a system's returns.

"Putting stops to the test"

by Thomas Stridsman (*Active Trader*, March 2002)

Placing stops effectively requires understanding how your strategy, trade size, and account equity interact. Here's an approach that allows you to systematically find the best stop for your trading system.

"Balancing stop size and trade length"

by Thomas Stridsman (*Active Trader*, April 2002)

How long you're in a trade and how much you risk on your stop loss are not unrelated elements of your strategy — they're inextricably linked.

"Looking for a target"

by Thomas Stridsman (*Active Trader*, May 2002)

By analyzing a trading system's characteristics, you can determine profit targets that result in more consistent and robust performance.

"Happy trails"

by Thomas Stridsman (*Active Trader*, June 2002)

How to determine trailing stops for basic swing trading systems.

tem, you can get a rough idea of what to expect from the system simply by multiplying the number of trades by the expectancy. For example, after 100 trades with the system given in the table, we would probably be up about 96.5R. (The actual result also depends upon the standard deviation of our trade sample — shown in the Table as 2.66R — in addition to the expectancy, but that is beyond the scope of this discussion. See “Key concepts and definitions,” p. 84, for more information on standard deviation.)

5. Understand the importance of position-sizing

The next mistake I made was ignoring one of the most important aspects of trading — how much of my equity to put into an investment.

In my example, I risked 100 percent of my equity, which will quite often result in ruin. Knowing “how much” means understanding how the size of your position can impact its results.

In 1989 I went to a traders retreat in Hawaii with one of the great traders of all time, Ed Seykota. Ed told our group the most important question to ask yourself as a trader, once you know your R-multiple distribution, is “how much?” As a result, I’ve been researching the topic of position sizing for the past 16 years.

I’ve been able to illustrate Ed’s point very well by playing a marble game. The game involves a bag of marbles representing a trading system with a known R-multiple distribution. The marble bag has seven black marbles, each representing a 1R loser. It has one pearl marble, representing a 5R loser. And the system has two yellow marbles, each representing a 10R winner. Thus, our sample system wins 20 percent of the time. But is it a good system?

Well, let’s add up the R-multiples and divide by the number of marbles. We have 20R total in winners and 12R total in losers. Thus, our overall total is 8R, giving us an expectancy of 0.8R. This tells us that over many trades we can expect to make, on average, 0.8 times our initial risk with this system per trade.

Notice how this bag of marbles illustrates perfectly how you don’t have to win most of the time to make money.

You can lose 80 percent of the time (as long as you have big R winners and small R losers) and still have an expectancy as high as 0.8R.

In our game, everyone begins with \$100,000 and they are asked to make as much money as they can in 30 trades. Each person in the room decides “how much” to risk on the first marble pull and then someone in the audience pulls out one of the marbles. If it is a 1R loss,

You must have core objectives for your trading.

then they lose what they’ve risked. If it is a 10R winner, then they make 10 times what they’ve risked. That marble is then replaced and we repeat the process 30 times, representing 30 different trades. At the end of the game, we might be up by a net of 24R, which is what the expectancy of the bag might tell us (i.e., 30 trades * 0.8R = 24R).

The person who wins the game usually has over a million dollars after 30 trades. At least 25 percent of the people in the room are usually bankrupt, and the equities of the other 75 percent are scattered widely. We’ll typically have ending equities ranging from the millions to \$10,000 or less — all based on the same trades! In fact, except for the bankrupt people, everyone else in the room will probably have a different ending equity.

I’ve played this game several hundred times with the same result each time. Everyone gets the same trades, so the varied results can only be attributed to individual psychology and each trader’s position sizing. This shows how important the question of “how much” really is.

6. Have core objectives for your trading

The final mistake I made was not having trading objectives. Like most people, I was hoping to turn my money into millions without any concern for risk. And my result was quite common for people

who don’t have any objectives — I lost everything. As a result, the next golden rule is that you must have core objectives for your trading.


In the marble game, I have found a way to dramatically influence the result is to shape the participants’ objectives. Usually, I give a nice prize to the person with the most money. Thus, the only incentive is to have the most money at the end of the game. When this is the only incentive, one-third of the room typically goes bankrupt, another third loses money, and the winner makes millions.

However, what do you think happens if I charge a \$5 penalty for bankruptcy and a \$1 penalty for losing money? The person with the most money at the end of the game would win all the money that is collected from the audience. In this case, there is still a wide variety of final equities, but very few people go bankrupt. Thus, your objectives can have a significant effect on how you position-size your trading system.

Most people never think about objectives and they don’t realize how many different possibilities there are for objectives. For example, your objective might be to make the highest possible ending equity. Or, it might be to make a certain level of return after so many trades and to maximum the probability of achieving that result. Your objective might also be to avoid a certain drawdown level, which might be considered ruin — e.g., if you were down 50 percent you would stop trading. Thus, your primary objective might be to avoid ruin at all costs. In addition, you could strive for both maximizing the probability of achieving your goal and minimizing your probability of ruin.

More to consider

The last two mistakes raise an interesting question: How do you use position-sizing to meet your objectives in using your trading system?

To answer that question you must simulate your trading system, a topic that will be covered in an article in next month’s *Active Trader*. 

For information on the author see p. 10.