A SHORT LESSON ON
R AND R MULTIPLES

"Let me be clear about what my research has proven to me:

Picking the right stocks has nothing to do with trading success and neither do amazing trading systems with high percentage wins." — Van Tharp

The golden rule of trading describes exits—abort losses, and ride winners. In Van Tharp Profit Trainer, position sizing controls how much equity you risk on any given trade.

As part of your Free Tools for Traders Registration, you can download the first three levels of the Position Sizing Profit Trainer tool (also referred to as game). In this trainer tool, as with real trades, there's only one position sizing question to answer when entering a trade: 'How much do I risk on each position?' You establish the risk amount through your initial stop price (what's your risk per share?) and your decision about how many shares to buy (which determines your total risk).

In the first few levels of the game, you will get the result immediately. This will be your experience in the free levels 1-3. Later in the game, one can manage risk from time period to time period in order to grow your profits (as you would in real trading).

Dr. Tharp designed *The Position Sizing Profit Trainer Game* to help you learn the secrets to trading success before you play the markets.

This game does not simulate picking stocks in the market.

Instead, it simulates trading a system that has certain characteristics. The system takes care of the 'stock picking' for you so that you can focus entirely on the most important aspects of trading-position sizing and letting your profits run. Our game has ten levels that get progressively more difficult to master. However, once you've mastered these principles, you'll know you've mastered some of the skills to trading success. (Levels 1-3 are the free levels).

Here are two definitions that will help you during your use of this profit trainer tool

R-value — The initial risk taken in a given position, as defined by one's initial stop loss.
R-multiple — All profits can be expressed as a multiple of the initial risk (R). For example, a 10-R multiple is a profit that is 10 times the initial risk. Thus, if your initial risk is $10, then a $100 profit would be a 10 R-multiple profit.

Introduction to The Position Sizing Profit Trainer
By Van K. Tharp, Ph.D.

Overview

In real trading you achieve your objectives through position sizing. Your system (i.e., entry and exit) only determines how easily it will be to achieve your objectives through position sizing.

To complete this game, you must master four key principles:

      (1) understanding the importance of R-multiples;
      (2) understanding the difference between expectancy and probability;
      (3) learning how to let profits run without letting them escape; and
      (4) using position sizing to make sure you have a low-risk trade.

The Position Sizing Profit Trainer Game is designed to drive these principles home by giving you the experience of making (or losing) money in a game environment where losing is safer. Through this game, you'll begin to understand these principles experientially without having real money at stake. *The Definitive Guide to Position Sizing* http://www.vantharp.com/products/definitive-guide-position-sizing.asp explains all of these ideas conceptually if you'd also like that. It's basically the text book on all things position sizing.

R and R-Multiples

Before you can effectively apply position sizing strategies, you must understand the principles of R and R-multiples.

R stands for the risk you take on any trade when you enter the market. Risk is the amount that you are willing to lose on the trade in order to achieve a profit. In terms of price, R is the point at which you plan to get out of your position in order to preserve your capital. It's the place where your rules say the reward-to-risk ratio will not be profitable on this trade, and it's better to exit now rather than lose more.

For example, if you buy a stock at $50 and you plan to get out if it drops to $47 or below, then your R-value per share in this trade is $3.00 (i.e., $50 - $47 = $3.00). If you buy 100 shares of stock your total risk for the trade is $300-which is your total 1R value.

Your R-multiple is simply the amount that you profited or lost in terms of your initial risk. If you purchased that stock at $50 with the initial stop price of $47 and exited at $47, then you have a -1R trade. You lost what you risked - $3. If, however, the stock went up and you exited at $56, then you had a +2R trade because you earned twice what you risked ($56 - $50 = $6, $6 ÷ $3 = 2)

You want your losses to have an R-multiple between 0 and -1. Losses can be bigger than -1R when the market gaps against you and goes through your "get me out" price. They can also be bigger than -1R when you make psychological mistakes and fail to get out at your stop point. Excessive costs (commissions and slippage) can also result in larger negative R-multiples.

You want your profits to be large, i.e., much bigger than +1R. For example, if 1R per share is $3 as above, then a $15 gain per share means the position earned a 5R profit.

Now suppose you have a trading system where you make +5R on the winning trades. When your trades lose, however, you lose only -1R. If your system is right one time (+5R) for every three losses (3 × -1R = -3R), then the system averages a 2R gain (+5R - 3R = +2R) over four trades.

If we continue with this example and risk $3 for each share, then over four trades we would expect to see $9 in losses and $15 in gains for a net profit of $6 per share ($6 per share = $3 per share × 2R). Imagine that! You are right 25% of the time and you still make money. (If you were to risk 1% of your equity on each trade, this system would generate about a 2% gain in your equity every four trades.)

The principle of cutting your losses short (so you will have small R-multiple losses) and letting your profits run (so you will have big R-multiple gains) is critical for profitable trading. The first level of this game introduces how you might apply position sizing strategies to a simple system. As you progress through the levels in the game, the systems increase in complexity.

The game expresses each trade's results as an R-multiple. The level guide describes the statistics for each level's trading system. Once you start playing the game, you can view the "live" results of the trades in the statistics window.

In Level 1, 60% of the trades (on the average) will be winners. Most of them (55% of all trades on the average) will be 1R gains. Thus, on 55% of the trades, you'll earn whatever you risk. If you risk $1,000, you'll earn $1,000 on a 1R gain. In Level 1, 5% of all trades will be 10R gains. In other words, if you risk $1,000 when one of these trades comes along, you'll make ten times what you risked or $10,000. However, 35% of the trades in Level 1 will be -1R losers and 5% of the trades will be -5R losers. You'll get a chance to feel the impact of having a -5R trade in this level.

Level 1 has probability (60% winners) and big R-multiple winners on your side. You will have mostly winning trades and the potential of a 10R winner in your favor. That won't be the case in the higher levels of the game, which brings up our next topic-expectancy.

Expectancy versus Probability

Expectancy is a mathematical formula that tells you how much you will win on the average per dollar risked. It takes into account both the probability of winning (or losing) and the

size of the R-multiples. Casino gambling games are all negative expectancy games; you cannot make money in the long run unless you can do something to change the odds. In trading, you must play a different game from gambling. You must have a positive expectancy game on your side in order to make money in the long run. Expectancy is actually the average R-multiple that your system will give you per trade.

Most people look for games (or trading systems) that make them right. That is a mistake. Such games can have a negative expectancy (meaning that you'll lose money overall) if some of the losers have large R-multiples. More importantly, some of the best trading ideas have large R-multiples in your favor, but only make money 25-40% of the time.

Let's look at an example. Suppose you buy a stock at $50 and plan to get out when it drops against you by a dollar to $49. However, when you are right you expect that stock to move 30%. In this case, a 30% move is an additional $15.

When a trade fails, you lose one dollar per share. When a trade works, you make 15R or $15 per share! What if you were only right 30% of the time and you make money in three of ten trades? In ten trades you'd make $15 per share an average of three times. Your total gain would be $45 per share. In the same ten trades, you'd lose $1 per share on the average seven times. Your total loss would be $7 per share. Over the ten trades you'd end up making $38 per share (or 38R), even though you were only right 30% of the time. Large R-multiples in your favor are much more significant than 'being right' for making money in the market. Remember that! And if you had risked 1% of your total equity on this system, you would have been up about 38% at the end of 10 trades.

Even though more trades lose than win in that example, the large size of the winning trades outweigh the losses so the system has a positive expectancy. To calculate expectancy, determine the average R-multiple for the system, taking into account both the positive and negative Rs. The mean R is the system's expectancy.

Another (more difficult) way to determine expectancy is to multiply each R-multiple (both negative and positive) by its probability of occurrence. Then sum the results (i.e., subtracting the values of the negative R-multiples) to get the total expectancy. All of the probabilities, of course, must add up to 100%. If not, it means that you have missed some. In the case of our stock example just above, you multiply 0.3 by 15 (which is 4.5) and 0.7 by minus 1 (which is minus 0.7). When you add 4.5 and minus 0.7, you have a total expectancy of 3.8R. This means that you will average in gains, over many trades, 3.8 times your risk on each trade.

If the calculation of expectancy seems complicated, we have good news. **The game calculates the expectancy for you-both of the system and the mean R-multiple of your trades.** You can find the expectancy of each level in the statistics window and your running expectancy within the level is displayed on the trade window. You'll also know the probability of each trade. Since the game randomly generates the trade results from the system's R-multiple distribution, you could easily get 10 losers in a row, which goes against the expectancy. However, at the end of the level, you'll probably be pretty close to the

expectancy of that level. It's just like real trading in that you won't know whether the next trade will be a winner or not. The game will also give you the expectancy of the trades to date as they are randomly picked. This way, you will know how far off the trades are from the likely expectancy that was built into the game.

There is a critical aspect to expectancy that you must understand. Expectancy and probability are not necessarily the same. As I said earlier, you must have expectancy on your side, but you don't need to have probability on your side. Let's look at the example given earlier. You win 30% of the time, and when you win it's a 5R gain. You lose 70% of the time, and when you lose it's a 1R loss. You only make money 30% of the time. Thus, the odds are against you. However, the game has a positive expectancy, giving you an average of 3.8 times your risk each trade or 3.8R

Probability and expectancy will be separate in every level after Level 2. This is a more advanced trading concept for you to master. Beginning with Level 5, you'll even have the option of going long or short on a trade, which means that you'll be able to go with the probability (i.e., winning most of the time) or with the expectancy. Hopefully, you'll learn how dangerous it is to bet against the expectancy, even though you get to win (or be right) more often.

Winning Trades

In the first six levels, getting a big R-multiple will be easy. If you hit one, you get the big win. If you hit a 10R multiple, you will win 10 times what you risk.

In the last four levels, you'll have to earn your big R-multiples by letting your profits run- just like in real trading. Losing trades will happen quickly, but winning trades will take time to develop. When a winning trade starts, it will probably just be a 1R win. You now have to wait another trade to determine if it will continue and how much of your gain you want to risk. When a winning trade starts, the chances of it continuing are good. However, you'll need to decide if you want to risk it all or just a portion of your profits.

For example, here's the start of a winning trade:

Joe's Foods, Inc.   Risk $1,000   Won $1,000   Amount at Stake $2,000

Do you want to risk the entire $2,000 or not? Let's say you do and you again have a 1:1 winner:

Joe's Foods, Inc.   Risk $2,000   Won $2,000   Amount at Stake $4,000

You now have a 3R gain (i.e., your initial risk of $1,000 plus another 3R or $3,000). Do you risk it all or just a portion of it? If you risk it all, you could allow a substantial gain to turn into a loss. Risking a portion of it is the equivalent to moving up your stop loss point in real trading. You decide to risk it all one more time. Fortunately, you win and your new situation is as follows:

Joe's Foods, Inc.   Risk $4,000   Won $4,000   Amount at Stake $8,000

You now have a 7R gain (i.e., your initial risk plus another 7R). If you risk it all, you'll have a huge profit if you win. On the other hand, you could get a 3R or 4R loser. If that happens, your loss would be huge. As a result, you decide to cut your risk back to $2,000.

Again, you win:

Joe's Foods, Inc.   Risk $2,000   Won $2,000   Winnings $10,000

You can now risk any portion of that $10,000 or all of it. You already have a 9R profit on this trade, based on your original $1,000 risk. Do you now understand how letting your profits run can produce big R-multiple gains? The seventh level you play will require that you master letting your profits run in order to make more money.

Using Position Sizing (i.e., how much you risk) so that you have a low risk idea

Imagine that you are playing the first level. You have $10,000 in equity. You know that 60% of your trades, on the average, will be winners. You also know that there is a 10R gain someplace in your future. You decide to risk $2,000 or 20% of your equity. The first trade occurs and it ends up being the 5R loser. You've lost five times your risk of $2,000 or $10,000. You are now bankrupt. You risked too much, despite having both expectancy and probability in your favor.

In any positive expectancy game, there is a percentage of your equity that will give you an optimum return. That optimum percentage will give you the maximum rate of return over time. It will also give terrible drawdowns. Lower percentages of risk will give you less return and smaller drawdowns. Lower percentages could actually increase your chances of meeting your objectives (in the game it is making 50%). But if you risk too much, you risk bankruptcy.

My definition of a low risk idea is *'an idea with a positive expectancy that is traded at a risk level that will allow you to survive in the short term, so that you can achieve the positive expectancy over the long term.'*

At each level, you will have to study thoroughly the Level Statistics under the View Menu to come up with a position sizing strategy for that level and decide how much you want to risk on each trade. One of the main lessons you must master in order to profit will be the art of position sizing. You can think about various strategies, such as playing the market's money or any of the other strategies presented in *Trade Your Way to Financial Freedom* or in *The Definitive Guide to Position Sizing* and try them out without risking real money.

The overall objective of the game is to make a minimum of 50% return in each of the ten levels without going bankrupt.

Realistic Influences You Can Set

Some people play this game once, shoot for the moon and try to set a dollar record for their game earnings. With the previous version of the game, we had reports of people finishing with over $1 trillion dollars in equity. While that might be fun, it's not a useful objective or a valuable use of your time.

We've added several realistic influences that will impact your trading results just as they do in live trading-commissions, slippage, taxes, and trader efficiency. At first, leave those settings alone and play awhile in the easy game mode. You can experiment over and over in Levels 1-3 which are free and never expire. If you decide you'd like to purchase the full game (levels 4-10) after you've made it through Level 10 a few times, change the mode to realistic and add in commissions and some slippage. Enable the government to take out taxes. See what a difference those options can have on your results.

You can also experience the effects mistakes can have on your trading. No trader is 100% efficient-no one trades error free. When you have a good feel for position sizing, try lowering your efficiency to 95% (you can do this in the first three free levels in addition to the more advanced levels). That's only one mistake out of 20 trades. When you make a mistake on a losing trade (i.e., minus 1R) then it becomes a larger losing trade (i.e., minus 2R). But if it is a winning trade, then it suddenly becomes a losing trade (i.e., +10R might become minus 1R). I believe there are few traders who are 95% efficient in their trades. Try trading at 90% efficiency in the game. If you want a real challenge, try to get through level 1 at only 85% efficiency. It's very difficult.

After you go through my recommendations in this section and have completed the game a number of times, I suggest you use the customize feature in level 10 (not part of levels 1-3) to plug in the R-multiples from your own trading system. This way you will get a trade-by-trade feel for your system. You can even keep track of your worst R-drawdown without using real money to find out.
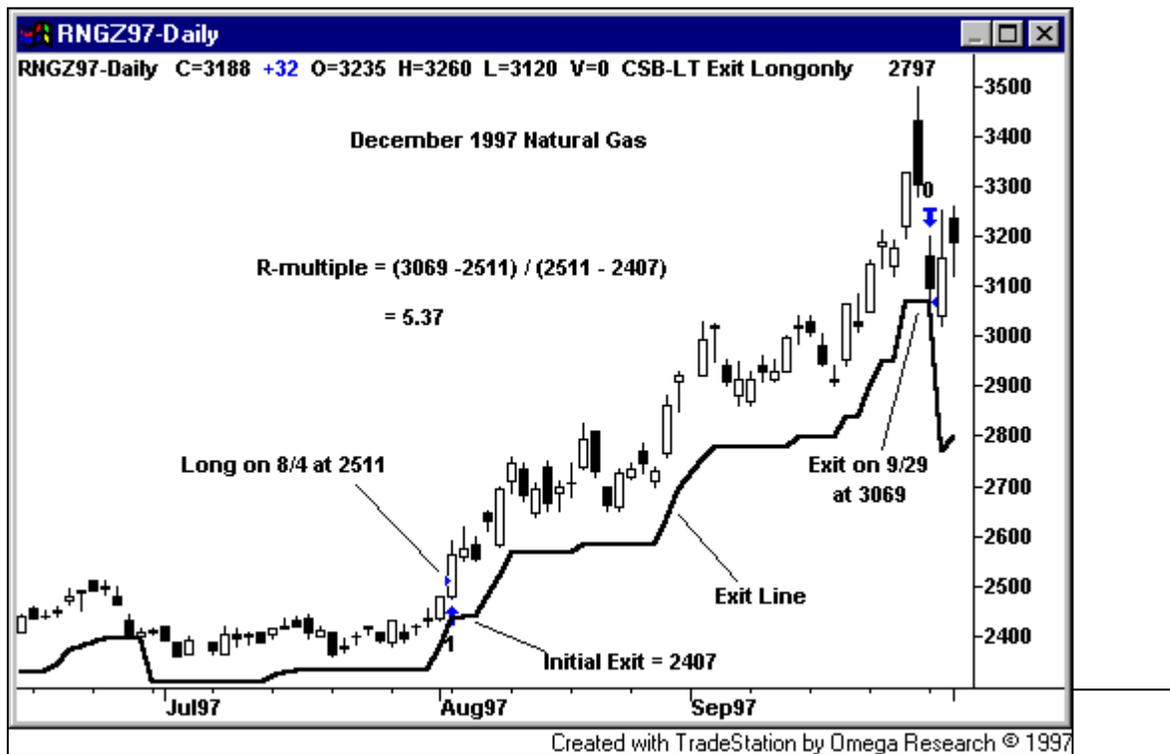
Bonus Chapter

From Tharp's best-selling book,

Trade Your Way To Financial Freedom

Chapter 6

R-Multiples

I refer to a trade's reward/risk ratio as an ***"R-multiple"*** — "R" simply being an acronym for the initial risk. To calculate a trade's R-multiple simply take the number of points captured at the exit of the position and divide by the initial risk. You can just as easily use dollar values per contract or per 100 share lot. For example, if you risked $500 and made $1,500 you would have an R-multiple of three. An example is shown in Figure 6-1. The entry was on 8/4/97 at 2511. The systems use a 3 times ATR stop which was 104 points. Thus, the initial exit is at (2511 – 104) or 2407. The system eventually exits on 9/29/97 at 3069 for a profit of 558 points. Since the initial risk (1R) was 104 points and the final profit was 558 points, the profit was a 5.37 R-Multiple. Do this for all trades, winning and losing. The losing trades will simply be a negative R-multiple.

RNGZ97-Daily   C=3188 +32 O=3235 H=3260 L=3120 V=0 CSB-LT Exit Longonly   2797

December 1997 Natural Gas

R-multiple = (3069 -2511) / (2511 - 2407)

= 5.37

Long on 8/4 at 2511

Exit on 9/29 at 3069

Exit Line

Initial Exit = 2407

Created with TradeStation by Omega Research © 1997

The many individual R-multiples that compose a historical simulation or previous trading results are the components of your expectation. The nature of these R-multiples will totally determine your method's overall expectation. It will help you to define the appropriate money management algorithm to apply to the trading method to meet your overall objectives. By *nature* of the R-multiple I am referring to the size, frequency and order of the individual R-multiples.

For a moment, think of your system's trades solely as R-multiples. Then pretend that each trade is simply a marble being drawn from a bag as in our previous examples. Once you draw the marble out, you determine its R-multiple and then replace it into the bag.

In playing this game you want to develop a position sizing algorithm which is supportive in exploiting the expectation. In addition, you want it to be linked to the initial risk for each trade and the on-going account equity. For starters, consider a percent risk algorithm where you decide to continuously risk a constant percentage of current account equity. This sort of position sizing algorithm basically means that a 1R risk becomes the same, no matter when it is take or in what stock or market it is taken. This is because your position size is always a constant percentage (i.e., 1%) of your equity no matter how big the initial risk (R) is. See Chapter 12.

In addition, you want to consider the potential *distribution* (the order) of the marbles being drawn. The system's winning percentage is inversely proportional to the length of strings of losing trades. Therefore, you need a position sizing algorithm that will allow you to withstand potential substantial strings of losing trades while being able to exploit the big winning trades.

Many traders have failed to trade a sound system because; (1) they were not prepared for the distribution of trades that the markets presented to them through their method and/or (2) they were over-leveraged or undercapitalized. You can estimate the maximum number of losing trades in a row for 1,000 trials given the winning percentage of the system, but you really never know the "true" value. Even flipping a fair coin can yield some lengthy streaks of heads in a row for example.
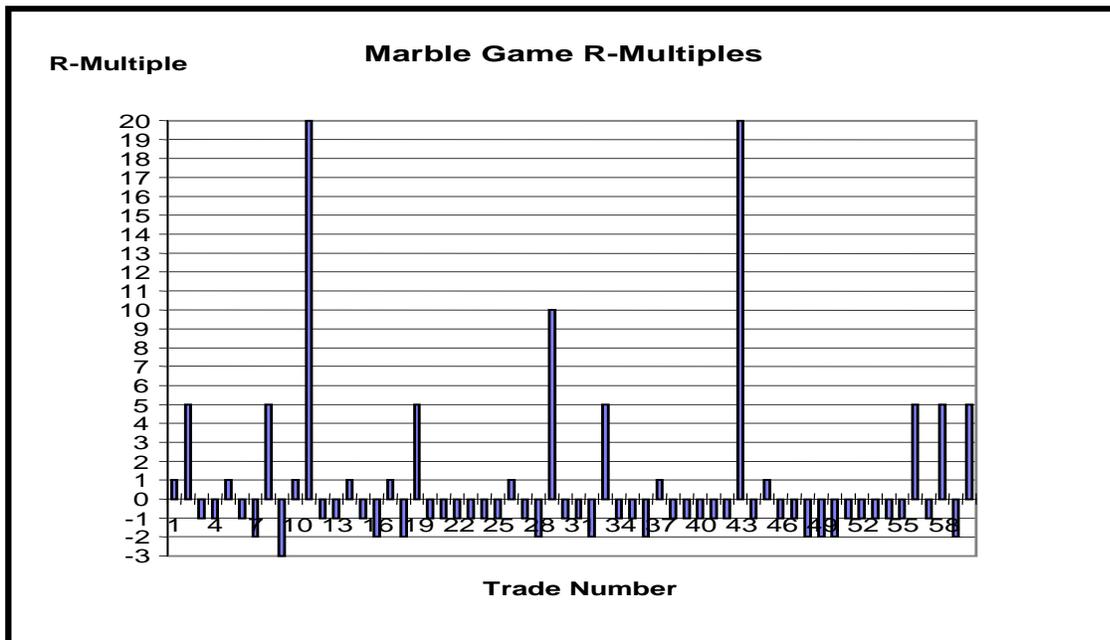
Figure 6-2 R-Multiples in Marble Game

Figure 6-2 shows the distribution of trades for one 60 trade sample of a marble game such as the one described with Table 6-1. Note the lengthy losing streak between trades 46 and 55. It's about this time that many people playing the game develop one of two opinions: (1) "it's *time* for a winning marble to be drawn;" or (2) they decide to bet against the expectation at some future point in the game so they profit from streaks like these. If the losing streak happens early in the game, option two above is common. If the losing streak happens late in the game, then option one is common. The psychology of some participants forces them to bet bigger the deeper they go into a losing streak since they *know"* a winner is just around the corner. I'm sure you can guess the typical results of such a game.

**Marble Game, Betting with Expectation
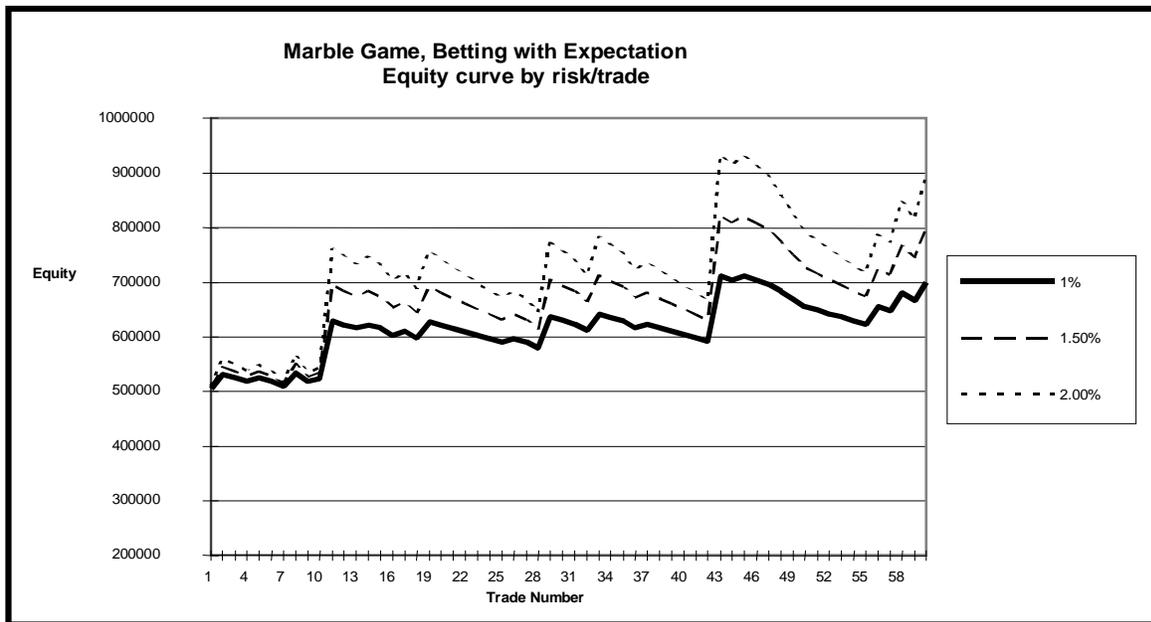Equity curve by risk/trade**

Figure 6-3 Equity Curves on Marble Games According to Bet Size

Figure 6-3 shows the equity curves for the above game betting a constant 1.0%, 1.5%, and 2.0% of current equity for each trade (and staying completely calm and detached the whole time). The return for the 60 trials at 1.0% was 40.1% and the peak-to-trough drawdown was 12.3%. There were three significant losing streaks of length 5, 6 and 10 trades.

Figure 6-4 shows the equity curve betting a constant 1.0% of current equity **against** the expectation. Here you get to be "right" 64% of the time and even enjoy a 10 trade winning streak while you lose 37% of the starting equity.

If we were trying to better understand how this system works, we would probably evaluate at least 10 times as many trades. At that point we could make a better decision about the position sizing (i.e., in this case, bet sizing) algorithm to use and at what leverage level. In addition, we would be able to train ourselves on what to expect from this system in future trades.
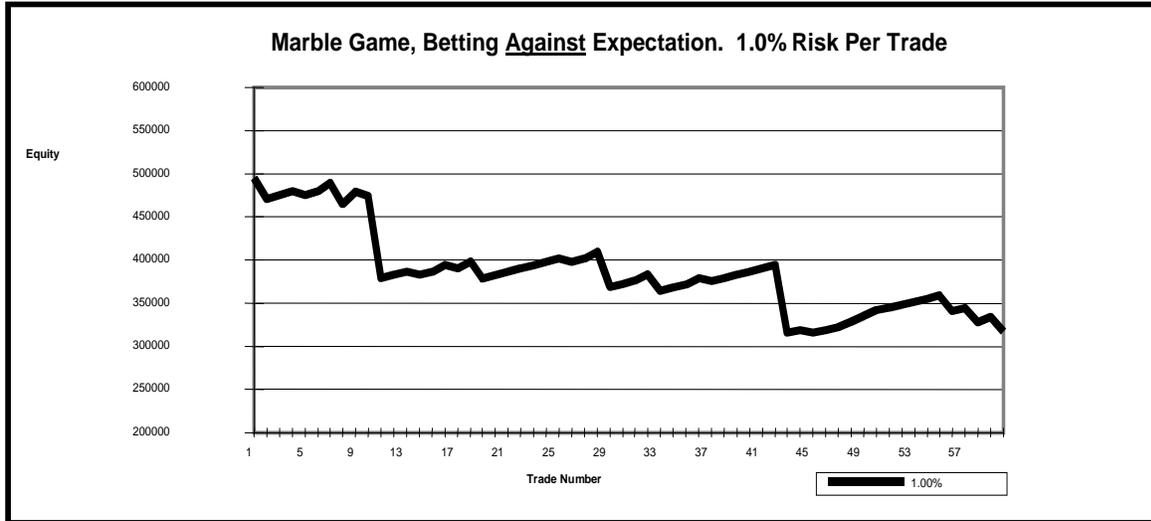
Marble Game, Betting <u>Against</u> Expectation. 1.0% Risk Per Trade

Figure 6-4 Equity Curve Betting with the Probabilities and Against the Expectancy

We could develop mental rehearsals for many scenarios that we could dream up that may occur in the future—rehearsing how we will respond given each outcome. Keep in mind that even then you don't know *for sure* what the marble bag (or the market) will reveal in the future. That's why part of your mental rehearsal should include rehearsing how you will respond to an event for which you are not prepared.

⟨end⟩

Thank you for downloading and reading this special report on R, R-multiples, and the basics on playing the free levels of the Position Sizing Profit Trainer.

If you'd like to purchase the full game ($195), or the Definitive Guide to positing sizing Strategies book ($249), email us at customerservice@vantharp.com or go to our products section on www.Vantharp.com

Thank You