Expectancy Report

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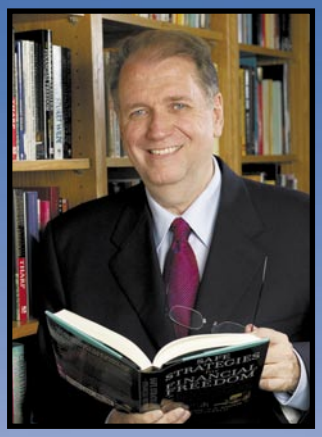


Expectancy Report

One of Dr. Tharp's clients begged him not to talk about expectancy in his courses and programs—it's that much of an edge. Yet most people look for systems with a high probability of winning, which is totally different. For example, you can have a method that is right 80% of the time that still won't make money. Why? The reason is because the gains are small and the losses are large. A lot of people are attracted to such systems, but they will usually result in financial disaster. Instead, Dr. Tharp's programs offer you real ways to develop a positive expectancy system.

Expectancy is how much you can expect to make on the average over many trades. Expectancy is best stated in terms of how much you can make per dollar you risk.

THE VAN THARP INSTITUTE

Positive Expectation

and Expectancy:

Mandatory for Success

by Chuck Branscomb

Let's take a global look at trading by exploring mathematical expectation. A thorough understanding of expectation will allow us to develop an appropriate money management model for our system, and it will allow us to compare different systems appropriately. In this issue we will (1) define *expectation* and its complementary component *opportunity factor,* (2) look at the components that make up that expectation, and (3) begin a discussion of the expectation of actual trading systems. By looking at the expectation of a system, and particularly the components that make up the expectation, you can then develop a more complete understanding of how a system obtains its results.

As we proceed through this series of articles, you will find it beneficial to refer back to various volumes of the Peak Performance Course. For example, now is an excellent time to review the section (Volume III) on beliefs. If you haven't already, develop your own set of useful beliefs based on those you think a very successful trader would have. Through this process you will uncover your problem areas. Also, take some time at this point to review the sections on filtering, deleting and distorting since everything that we discuss here will have to pass through your own mechanisms.

Expectation and Opportunity

All trading or investing of any type has an identifiable expectation. If your methodology does not have a ***positive*** expectation, no matter its winning percentage, then you will lose money trading it. In fact, if you continue to trade a negative expectation system, you can eventually lose all of your funds.

Expectation, along with opportunity (defined below), it is the essence of all successful trading. It is the average profit that you can expect to make from a method per trade. It is simply a combination of the winning/losing probability and the winning/losing payoff of a method.

Opportunity in this context is simply the frequency at which you will be able to apply your system to obtain its expectation. If two systems had identical expectations, but one generated five times as many trades during the same time period, the more active system will provide higher returns (all other items being equal). It's actually the combination of expectation and opportunity that is important.

The money management methodology that needs to be applied to these two systems could be dramatically different. *Money management* is the part of your overall trading plan that specifies **"how much**" at every point during a trade. In other words, it is an algorithm (set of rules) that determines the position size to take at the initial entry point and **also** the appropriate position size throughout the duration of the trade. Now let's take a look at this *thing* called expectation.

The mathematical definition for expectation is simple:

Expectation =

[% of wins * average winning payoff] - [% losses * average losing payoff]

Note that the components of the above equation are additive. You can sum the products of each winning trade's probability times its payoff. Then do the same for the losses, and subtract the winning sum from the losing sum. If we let:

WP_i = the winning probability

WF_i = the winning payoff

LP_i = the losing probability

LF_i = the losing payoff, then,

Expectation =

$\sum_{i=1 \text{ to } n} (WPi * WFi) -$

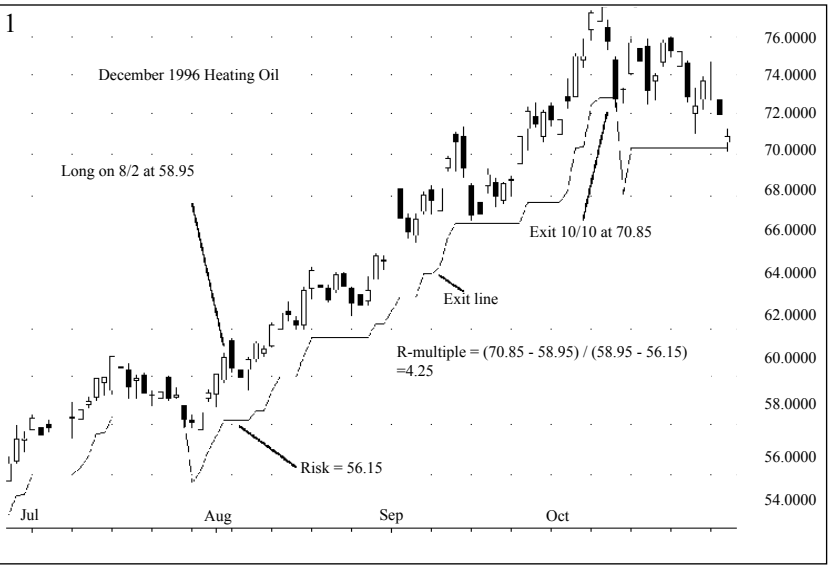
$\sum_{i=1 \text{ to } n} (LPi * LFi).$

A note from Van Tharp: Expectation, as Chuck has defined it, is really the average profit per trade. Expectancy on the other hand could be defined as the average profit per dollar risked. To determine a system's expectancy, simply take the result from the formula Chuck Branscomb gives above and divide it by the average loss (or better yet, the average risk per trade, if you know it).

The Concept of *Expectunity*

Expectunity is simply the combination of expectation and opportunity. It's the two of these combined that basically determine the worth of any trading system or method. Positive aspects of systems with greater opportunity include the ability to

Figure 1



determine whether or not you're on track with your objectives at an earlier date. If a system presents a greater number of trades within a given time frame, then there is a greater sample to evaluate performance. One simple method of comparing systems is to multiply the expectation times the opportunity for a given, fixed time frame, which gives the *Expectunity*.

A note from Van Tharp: We later defined Expectunity to be the expectancy (rather than the expectation) times the number of opportunities.

Prediction

Let's pause for a moment to discuss a common trap—prediction. Thinking about the concept of expectation a bit will allow one to more clearly see why so many people have been tripped-up over the years making *predictions* of what a market will do in the future. They all base their prediction algorithms on history—sometimes even assuming that it will repeat exactly. However, extremely successful prediction can even result in losing all of your capital. How? You can have a method that is 90% accurate and still lose all of your money trading it.

Consider the following *system*:

% winning trades: 90%

average winning trade: $275

% losing trades: 10%

average losing trade: $2700

***Expectation* =**

(0.90) * (275) - (0.1) * (2700) = -22.5

The expectation is negative. This is a system through which you get to be right 90% of the time while you eventually lose all of your money trading it. There is a strong psychological bias to be *right* about what we do with our investments. For most people, this bias greatly overrides the desire to make a profit overall in our approach, or it inhibits us from reaching our true profit potential. Most people have overwhelming needs to control the market. As a result, they end up with the market controlling them.

It should be clear by now that it is the combination of the payoff and the probability that allow you to determine whether a method is viable or not. That is what the concept of expectation defines. You also have to add in the *opportunity factor* (how often you get to play the game) to determine the relative worth of a system or method. Multiplying the expectancy (*refer to Van's previous note*) times the opportunity factor provides our concept of *expectunity,* which allows vastly different methodologies to be compared on more equal terms.

Understanding Expectancy

Expectancy is closely related to expectation, except that rather than giving us our average profit per trade, it gives us our average profit per dollar risked. Let's take a look at how expectancy is constructed.

The only way to understand a system is to take a look at ***how*** the expectation is constructed. This effort entails investigating individual trades in an attempt to understand the **reward/risk ratio** of each trade and its frequency of occurrence. After thoroughly performing this exercise, you will have a far greater understanding of the true nature of your methodology.

If you are purely a discretionary, non-systematic trader, you can review your past trading results to develop insight on how you are either making or losing money. Following a similar procedure to what we will present here, you should look at each trade on a *"one lot" (one contract)* basis. (Equity traders: make an assumption about what a *"one lot"* is—perhaps 100 shares.) Knowing your risk and the closed profit/loss going into the trade, you can then calculate your ***reward/risk*** ratio for each trade.

R-Multiples

I refer to a trade's reward/risk ratio as an ***R-multiple***—R simply being an acronym for reward/risk. To calculate a trade's R-multiple, simply take the number of points captured

Number and Color of Marbles	Win or Lose	Payoff
50 black marbles	Lose	1:1
10 blue marbles	Lose	2:1
4 red marbles	Lose	3:1
20 green marbles	Win	1:1
10 white marbles	Win	5:1
3 yellow marbles	Win	10:1
3 clear marbles	Win	20:1

Figure 2

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 1. Here you have an initial risk of 2.8 points and a final profit of 11.9 points. Thus the R-multiple is 4.25. Do this for all trades, winning and losing. The losing trades will simply be a negative R-multiple.

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

Think of your system's trades solely as R-multiples for the moment. Then pretend that each trade is simply a marble being drawn from a bag. 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 money management algorithm supporting the exploitation of the expectancy. 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.

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 money management algorithm that will allow you to withstand potential substantial strings of losing trades while being able to exploit the big winning trades.

The Marble Game

Now that you understand R-multiples, you can appreciate the value of a simulation game played at some of IITM's seminars. The participants are divided into groups and each group gets the same trades—marbles drawn out of a bag. Each marble has a particular payoff (R-multiple) determined by its color. The game is won by the group with the best overall *return to peak drawdown percentage ratio.* (Peak drawdown is the maximum % retracement in equity from a peak to trough prior to a new equity high being made.)

Unlike real markets, the participants precisely know the contents of the bag. They can exactly calculate the expectancy of the game, and they also have a good idea of the percent of winners that will be drawn (on average, over a long number of draws). In actual trading, you only have history as your guide to the contents of your marble bag. With a well-designed, simple, non-curve, fitted system, your odds of understanding the future marbles available go up substantially.

The game has many things directly in common with real trading. Strings of winning and losing trades are common and in proportion to the winning percentage of the system. The game rewards appropriate money management. The emotions it evokes are similar; **perhaps most important of all it displays how extremely important money management and psychology are in trading results**. That last point cannot be stressed enough. Money management and psychology are **the only variables in the game** and **they determine who performs the best**. Some groups go broke, while others return 100% or more. Yet, they all get the same trades!

The game is always structured such that you can bet with or against the expectancy. Usually the number of winning trades (trades on the favorable side of the expectation) is in the **25%** range. However, their payoff ranges from **1:1** to as much as **30:1**. If you bet against the expectation, you will have **75%** winning trades, but you could suffer losses up to 30:1 on one trade. Typically, the losing trades (those on the unfavorable side of the expectation) have loss values of **1:1**, **2:1,** or **3:1**. Many successful, professional traders have played this game and learned a tremendous lesson on money management and expectancy. The groups that have gone broke were always betting against the expectancy, trapped in their beliefs about what the next marbles "have to be" (see Volume

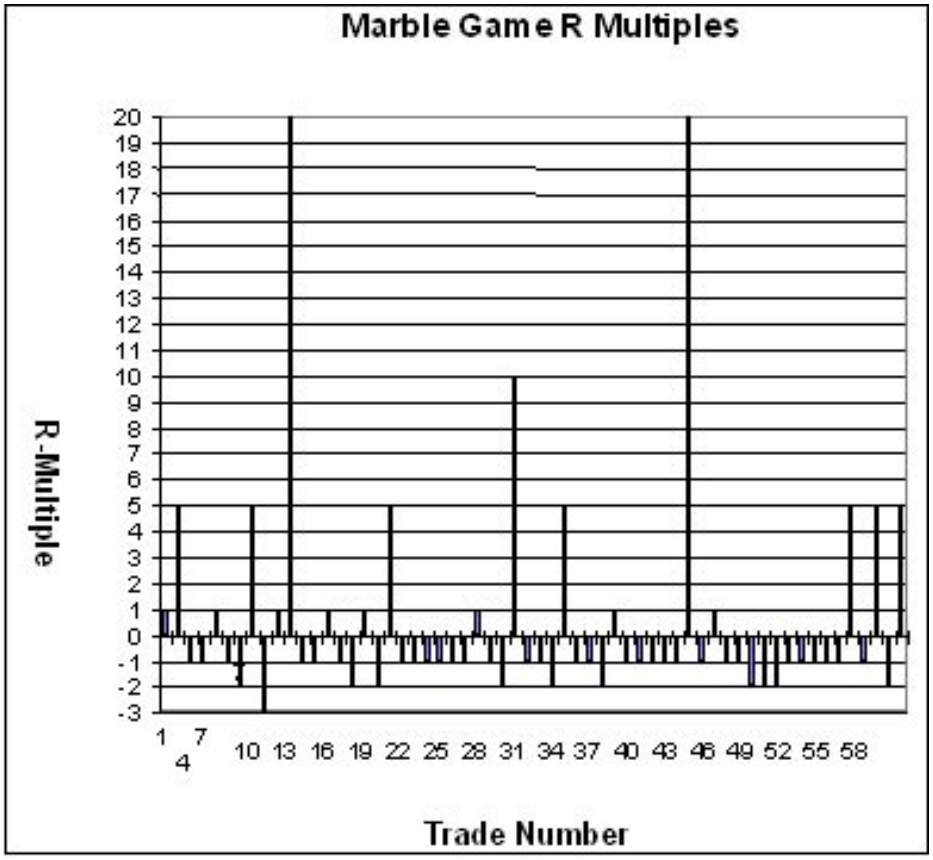


Figure 3

5 of the course on the gambler's fallacy).

Sample Marble Game

Now we will take a look at a typical marble game and explain how its expectation is composed. Figure 2 shows how the marbles in the bag are scored. There are 100 total marbles that are drawn and then replaced for each "trade." The bag is then well shaken. There are 64 losing marbles and only 36 winning marbles; therefore, the percentage of winning trades over a large number of trials should be approximately 36%.

Would you like to trade this system? Could you trade it and make money? What money management algorithm would you develop to exploit the expectation of the system? Perhaps most importantly, do you have supportive beliefs that will allow you to understand and exploit this system?

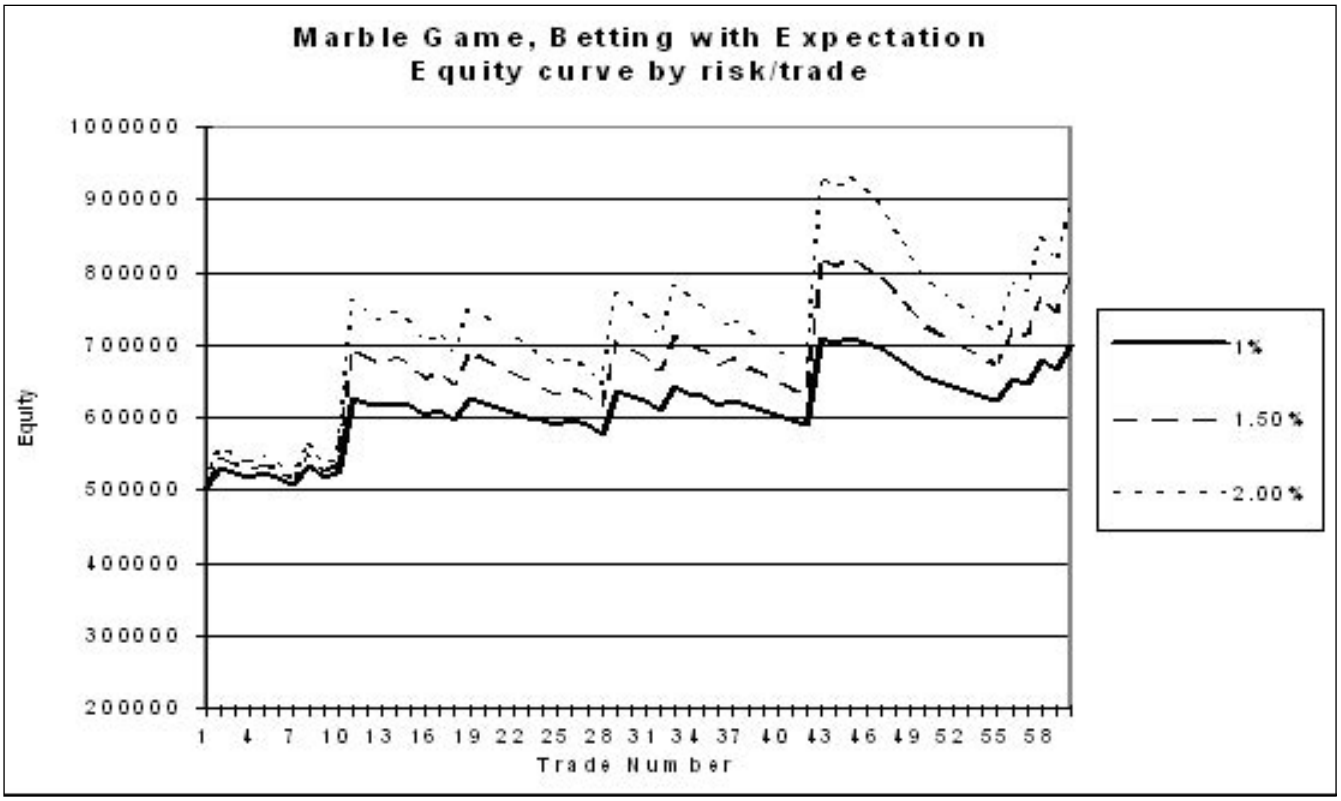


Figure 4

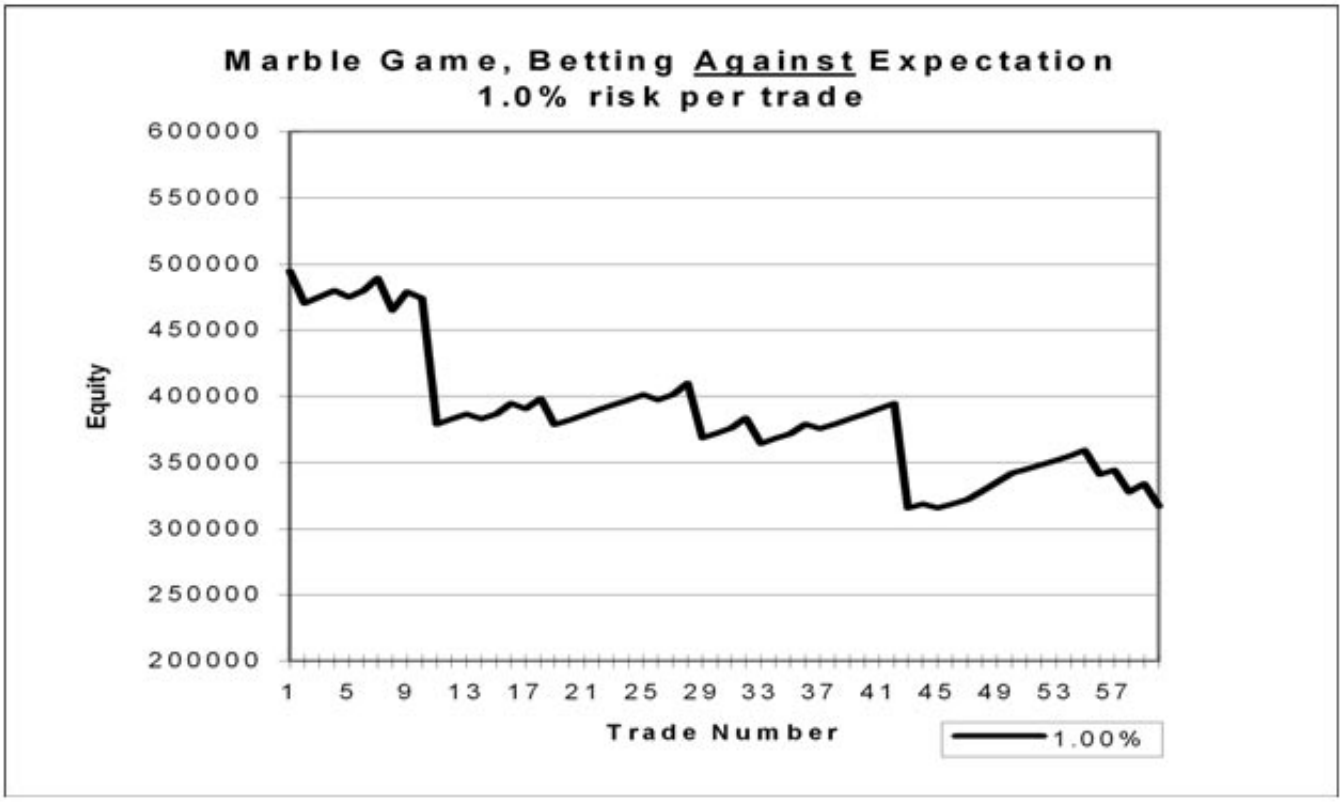


Figure 5

Now let's look at the expectancy of this system. If it's not sufficiently positive, it's not a worthwhile system no matter what money management algorithm is used. If you trade a negative expectation system with an outstanding money management algorithm, you'll simply go broke at a slower rate. Since the formula for expectancy is additive, you can multiply the probability and payoff of each type of winning marble and then sum all of these products to get the winning expectancy. Then you do the same for each type of losing marble to get the losing expectancy. Now you simply subtract to get the overall expectancy.

Expectancy =
[0.20*1.0 + 0.10*5.0 +
0.03*10.0 + 0.03*20.0] -
[0.50*1.0 + 0.10*2.0 + 0.04*3.0]
Expectation = [1.6] - [0.82]
Expectancy = 0.78

Note that expectancy, as opposed to expectation, is simply the average R-multiple of the system.

On average, over a large number of trials, this game will return an outstanding $0.78 for every dollar risked or 0.78R per trade. We now know that its expectancy is positive and well worth trading. However, the only way to realize this expectancy is to understand how it's composed and create a money management algorithm to exploit it. Without the proper money management strategy, you could easily lose a substantial amount of money trading it (as some of the seminar groups have proven).

Composition of Expectancy

The major aspects of expectation to consider are: (1) the R-multiples of the winning and losing trades (marble value); (2) the distribution of the trades (the order in which they appear); and (3) the frequency of the trades (how often a trade opportunity appears). Once you understand how your method works at this level, you will be able to design a money management algorithm to exploit the expectancy and prepare yourself mentally for trading the system in the future. Once you have determined the appropriate money management algorithm, you will then have a much better idea of the capitalization required to trade the portfolio.

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 overleveraged 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 3 shows the distribution of trades for one 60 trade sample of the above game. 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) they think that it's *time* for a winning marble to be drawn; (2) they decide to bet against the expectancy 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 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 succumbing to this impulse.

Figure 4 shows the equity curves for the 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 5, 6 and 10 trades.

Figure 5 shows the equity curve betting a constant 1.0% of current equity against the expectancy. 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 money management 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. 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 will reveal in the future, (i.e., the concept of *data dependency* discussed in the last issue). That's why part of your mental rehearsal should include rehearsing how you will respond to an event for which you are not prepared.

Expectancy Applied to Systems

In the literature that has been published on expectation in trading systems, an attempt has been made to come up with a formula that can be used for comparing different systems. In each case, the expectation as defined in the equation above was "normalized" by dividing by the *average losing trade value* to get expectancy. A December 1992, *Futures* magazine article presented an equation for expectancy that was derived in this manner. Unfortunately, this can be a very misleading number to use to "normalize" the expectation. What results is actually a fictitious value since there is really no *average* losing trade.

Consider a situation where two methods have identical average losing trade values. However, one system has a close distribution of trades about the average while the other has numerous small losses and a few large ones that average out to the same value. Clearly, these represent two dramatically different situations so that simply dividing the expectation by a simple *average* can be very misleading. However, it's a simple calculation to perform, and as long as you understand how the *average* is composed, you can then obtain an estimate of the *return per average dollar loss* in this fashion.

Ideally, one would like to obtain the *return per dollar risked* like we showed in the marble game example above. In that example, the losses used in the expectation calculation were based on a minimum loss of the 1:1 marble. Therefore, the equation provided the return per dollar risked on each trade. In fact, expectancy is really just the mean R-multiple. In evaluating real trading systems or results, we can determine the initial risk for each trade and thus look at the system's results as a distribution of R-multiples..

Once you've broken your trades into R-multiples, you can calculate the expectancy in the same way we did for the marble game as the mean R-multiple. And, you can use a bag of marbles to simulate your own trading.

My next article will go yet deeper into the composition of a system's expectancy and opportunity. We'll take a look at the R-multiples from a trend following system and see how they help us better understand how the system works —how it achieves its results. Many trading problems are related to not understanding in detail how a system achieves its long term return, or not understanding the *"game"* that is being played. Developing this understanding and accepting the issue of data dependency is a mandatory step to success in implementation.

The Law of Expectancy:

the Psychological Side

by Van. K. Tharp Ph.D.

There is another side to expectancy—the psychological side. Indeed, the psychological side may be much more powerful than the side that involves determining the historical expectancy of one's system. The psychological side revolves around one of the laws of the mind—whatever you expect to happen does.

Those of you who have completed my home study course know that I've written about my fire walking experiences. I am always looking forward to new ways to expand what I can do with my mind. In the early 1980s, when I first heard about seminars involving fire walking, I knew that I would sign up for one as soon as I could. About a year later, I got the opportunity to attend one of Tony Robbins' early seminars.

There were several hundred people in attendance. We went through three or four hours of psychological preparation in which we were anchored to a state of confidence. We were also told to walk in an erect "visual" state and say the words "cool moss" to ourselves.

I was at the seminar with a friend and neither of us were particularly eager to be first. I wanted to build up the anticipation and I think my friend was a little scared. As a result, there were several hundred people ahead of us. Most walked across the coals easily as far as I could tell. However, just before we were due to walk, the seminar leaders decided that it was time to stir up the coals. Suddenly, with only one person ahead of me, I went from facing smoldering coals to glowing, red-hot coals. However, I adopted my confident state, raised my eyes up to access visual imagery, and then successfully walked across the coals.

At that point, I was elated. I had done it! But my friend, who had followed me, wasn't so successful in her walk. And the next morning, I learned that she had 2nd and 3rd degree burns on her feet. Interestingly enough, I had been fine for the last 12 hours since the fire walk, but within 15 minutes of learning of my friends plight, I developed a sympathy blister. And that blister really hurt. In addition, at that point, I knew I had to do it again. Fire walking really was dangerous, so I had to prove myself by doing it again! As a result, I did it three more times and it became progressively easier.

The evidence tends to suggest that you get what you expect to get when you start to fire walk. If you are fearful, you get to justify that fear by getting burned. If you are confident, you get a successful walk. There are several incidents that indicate that the experience of the first couple of people sets the psychological expectation for the entire fire walk.

Tony Robbins once conducted a fire walk in the South Bronx for free to give poor people the confidence to know they could change their condition. Even though the seminar was free, only about 15 people attended the preparatory lectures. Somehow, people don't value things that are free as much as things they pay a great deal of money to purchase.

When the actual fire walk took place in the South Bronx, however, about 200 people actually walked across the coals. People showed up from everywhere to watch and as soon as they saw a few people do it successfully, they joined the line. As a result, just watching someone do the fire walk seemed to be enough to allow others to do it.

However, another NLP trainer conducted a fire walk training in Hawaii. One of the first people to cross the coals got severely burned. As a result, most of the next twenty or thirty people also burned their feet and the organizers eventually stopped the fire walk. What you see happening, shapes your expectancy, and strongly influences what you get.

The psychological role of expectancy is paramount. If you make two lists—what you value the most and what you most want to avoid—you'll find that the combination of the two lists perfectly describes your experiences in life. For example, if the most important values in your life include family, success, fun, honesty, and friendships, you'll probably have all of those things in your life. If money and success are not among the top five, however, you may not be bringing them into your life.

You also bring into your life the things you most want to avoid. For example, if you have a list of things to avoid that includes not being taken advantage of, avoiding rejection, avoiding change, avoiding confrontation, and avoiding anything risky, then you probably also have a lot of those qualities in your life. Why?

If you dwell on what you want to avoid, you give it energy and that's what you get. As a result, your life will be a direct combination of the things you value and the emotions you want to avoid, depending upon how much time you dwell upon each of them.

Whatever you put into your mind, whatever you expect—whether positive or negative—you tend to draw into your life. Consequently, you are much more the architect of your own life than you probably ever thought.

Your reaction to what I've stated might be "If that's true, why should I do any research in the market? Why should I do historical testing to determine the expectancy of my system? If what you say is correct, then I should just think good thoughts, enter into a trade, and reap the reward of my good thoughts." Unfortunately, it's not that simple!

"Into Wishing" or "Hope" will not make you a lot of money in the market. Indeed, there's a great deal of difference between expecting to win and hoping to win.

Let me give you an example that will illustrate the point. Bucky, before he had been exposed to our material on systems development and psychological blocks, had not done well in the markets. The first thing Bucky discovered is that, although he thought he had a trading system, it really wasn't a system because he had no way of aborting or taking profits. He just entered, according to his magic formula, and then hoped it would turn out well. It usually didn't.

After two years of psychological clearing and extensive research into developing a mechanical trading system, Bucky was ready to start trading. However, he wanted to wait until he had paper traded his system for a while. After four months of paper trading, his trading system was in a fantastic winning streak. His account was up over 50% in paper profits. At that point, Bucky told me that he was going to start trading on the next Monday by just assuming the equity curve for the current trades in his winning streak. He also confessed to me that he thought he'd probably picked the top of the market to start trading and that he almost wanted to start off losing so he could see how he would handle it.

What do you think Bucky's psychological expectation was? Yes, he was expecting a big drawdown and he got exactly that—a 19% drawdown in his personal account right at the start of trading.

Because of the research he did, Bucky knew that he had an overall positive expectancy in the market. He knew he would do well over time. As a result, he handled his initial loss well and continued to follow his system with a positive expectancy. Today, he's now at new equity highs in his account. However, Bucky got exactly what he wanted when he started trading—a drawdown to test himself.

How to Use Psychological Expectancy in Your Trading

When I say that you get what you expect, it doesn't mean that you can forget to do any research or preparation and just expect to be a winner. Perhaps you could do that if you were totally clear psychologically, but very few people, if any, reach that condition. We all have issues in our unconscious mind that we tend to play out in real life over and over again. My guess is that the people who have done enough psychological work to be fairly clear will be eager to do the research to be sure (have the confidence and the positive expectancy) that they will trade well.

What I would suggest is that you make sure you have a mathematical positive expectancy in your trading. But in addition to the mathematical positive expectancy add some psychological expectancy.

At the beginning of each day, take about 20 minutes to meditate. The best way to do that is to relax and pay attention to the air going in and out of your lungs. Then, when a thought occurs, just notice the thought and allow it to flow away. Another one will then pop into your mind. Again, just notice the thought and then allow it to flow away. Every once in a while, you'll probably get caught up in your thoughts, meaning that you will be living them instead of watching them. That's fine. It happens. As soon as you notice it, just go back to watching your breathing and then moving back to watching your thoughts.

After about 20 to 30 minutes of this sort of meditation, spend about a minute giving thanks for your life. And then start to wonder what sort of wonderful things will happen today. If you want, you can even wonder about the special things that will happen to you in the market today. Know inside (believe, have faith, expect) that a lot of wonderful things will happen to you and give thanks for those things. What you'll find is that those wonderful things do happen—not necessarily in the form you might expect—but they will happen.

Expectancy:

Under the Covers

by Chuck Branscomb

Without a positive mathematical expectancy a trader or investor is destined to lose. If a negative expectancy method is continually used, eventually the trader/investor will lose all of their capital. We also discussed viewing the task of trading or investing as playing a game—*The Marble Game*.

This issue will cover the concept of expectancy in more detail as it relates to an actual trading system. The system we will use is a long-term trend-following system designed to trade a portfolio of markets. We will look at the composition of the system's expectancy to show how one can develop a much better understanding of how a system really works—how it achieves its positive expectancy. This is a necessary step to developing the mental rehearsal needed to prepare oneself for successfully implementing the system in real trading.

Recall that an overall "system" can be best described by the following:

Expectancy

Opportunity Factor

Money Management Algorithm, and

Psychology

The role of individual psychology affects every single part of the process of creating and implementing a system. Your supportive and limiting beliefs will shape and mold the level of success you achieve. For example, if you have the belief that *looking at the marbles* of my system is a ridiculous waste of time, you will eliminate a potentially very useful tool to understand how a trading system really works. If this describes how you feel right now, realize that you have just illuminated a potential limiting belief.

Let's set aside any profound beliefs we may have about the trading/investing process for a while and **pretend that it *is* only a game** where we are in total control over the rules we will use (within the limits of the rules of the exchange). We determine the entry criteria, the exit criteria and the money management algorithm. At the risk of sounding like a broken record, I will define money management again. Money Management is defined as the part of your system that determines ***how much*** (position size) at the entry point *and* every point in the trade until the exit. Of course, everyone's "problem" with this game is that we have absolutely **no** control over the data that is the input to our game—the market.

This again highlights the need to understand the concept of *data dependency*. We only *know* what has happened in the past. Our future results will be totally dependent on the *data* (market activity) that is available in the future. From historical research conducted with our objectives governing the process, we can determine what attributes of market activity we would like to trade or invest. However, we must maintain the understanding that this historical performance represents what happened in the past, not necessarily what will happen in the future. The key point to keep in mind here is to create a methodology that is based on a market concept (trend-following, counter-trend, "return to the mean," etc.). A useful belief to hold is that there are certain key attributes to freely traded markets, and one or more of those is to be the basis for a system. The past price patterns, volatility or magnitude of movement won't necessarily **ever** duplicate themselves exactly in the future, but a method designed to exploit the common attributes of a freely traded market can extract continuous positive returns over time.

It's Only a Game

That's our fantasy for the time being: trading/investing is only a game. Every trade we execute is simply another marble, another *R-multiple*. Recall the concept of R-multiples from last time: R is simply an acronym for reward/risk—the *R-multiple* is the reward of a trade divided by the initial risk at trade entry. Viewed in this context, every trade that comes along is simply another R-multiple. Once you take apart a trading system and view its R-multiples, you will have a much greater understanding of how it works. Consider each trade on a one-unit (perhaps 100 shares of stock) basis in this evaluation. At a later point, after investigating the R-multiples, you can develop the appropriate money management algorithm based on them.

You will begin to see a system as simply consisting of three factors: (1) the size and sign of the R-multiple, (2) the order of appearance of the various R-multiples, and (3) the frequency at which R-multiples (trades) occur. In addition, my belief is that only then can you truly begin to understand what type

of money management algorithm to apply to the method.

In the last issue when we discussed the marble game, "trades" were simply the drawing of marbles out of the bag. Unfortunately, in real trading with a long-term trend-following method, the marbles come out slowly—especially the winning marbles! We get the chance to bring to the table an enormous amount of psychological baggage during the course of the trade. This is where rigorous discipline becomes mandatory. With most successful trend-following methods, the losing trades are much shorter in duration than the winning trades. A trade with a 6:1 R-multiple may take three months to play out, while a 1:1 losing trade can happen in one day. Many successful methods have winning percentages in the 40% range, which implies that you have a good chance of a string of 12-14 losses in a row (and possibly more) at some point.

Two things become apparent once you look at a system from an R-multiple point of view: (1) you can clearly see how various creative money management strategies can be developed, and (2) you can get a sense for what you have to do to prepare yourself psychologically to adhere to your system rules.

Considering the necessary psychological aspects, you will begin to see that perhaps there are actually "different" kinds of big-R trades: some take months to play out to the exit while others are very fast, vertical market situations. Viewing the time frame ("days in trade") within which each R-multiple occurs will add this level of insight. Each of these scenarios will stimulate different parts of you at different times. Understanding how you respond to what the system and market are doing is critical to your success in implementation.

Let's take a look at what a sample system produced, in terms of R-multiples, trading a portfolio of 16 markets to help understand what this concept looks like in practice.

Sample System R-multiples

It is useful to organize the historical simulation results from a system in terms of R-multiples. The R-multiple results can be sorted by market, by long versus short, by losing versus winning, by trade duration and also by market group. Through doing this process, one can develop a number of insights into a system and the markets it trades that are very useful. For example, the trend-following system we will look at next shows clearly how money management strategies can substantially improve system results by having a bias to the long side in non financial markets. In fact, the long side money management algorithm could be substantially different from that used for the short side (going long on XYZ at 80 with the possibility that it may go to 300+ is a lot different than going short at 80).

Figure 1 depicts the R-multiples for a trend-following system with an

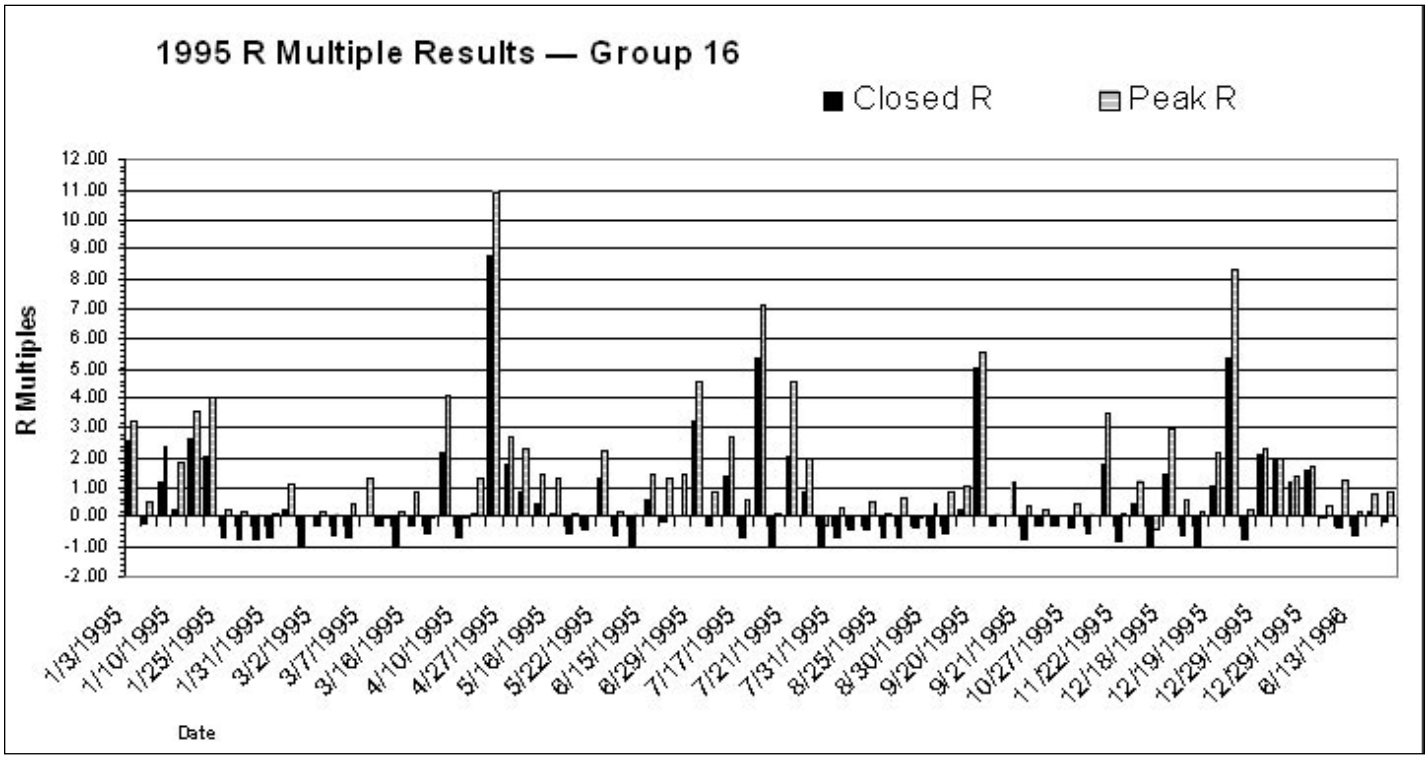


Figure 1

overall high, positive expectancy applied to 16 markets during 1995. The R-multiples are in chronological order from left to right. These are all "one-unit" results, and therefore do not depict the performance of any money management algorithm. The lighter shaded bar is the peak R value reached in the trade at the high (or low) price, and the darker bar is the closed trade R-multiple. This depiction also conveniently displays how effective the exit algorithm is at capturing open profits in any given trade.

Looking at an R-multiple graph like Figure 1 shows how important psychology can be in trying to stick with the system. Periods of numerous losses of 1:1 or less precede the "big R" trades that result from capturing a big move. Here an R-multiple of -1.0 is the maximum initial loss (assuming it's not slipped in the market). Note how the exit strategy works to reduce the size of losing trades such that few are actually 1:1 losses (trades closed out at their maximum initial risk). The R-multiple is shown on the closing date of the trade again illustrating a useful attribute of portfolio trading—while the system is experiencing perhaps eight losses in a row, your portfolio equity is being supported by a big trade in progress. It's even possible to experience a losing streak like that while you continually make new equity highs.

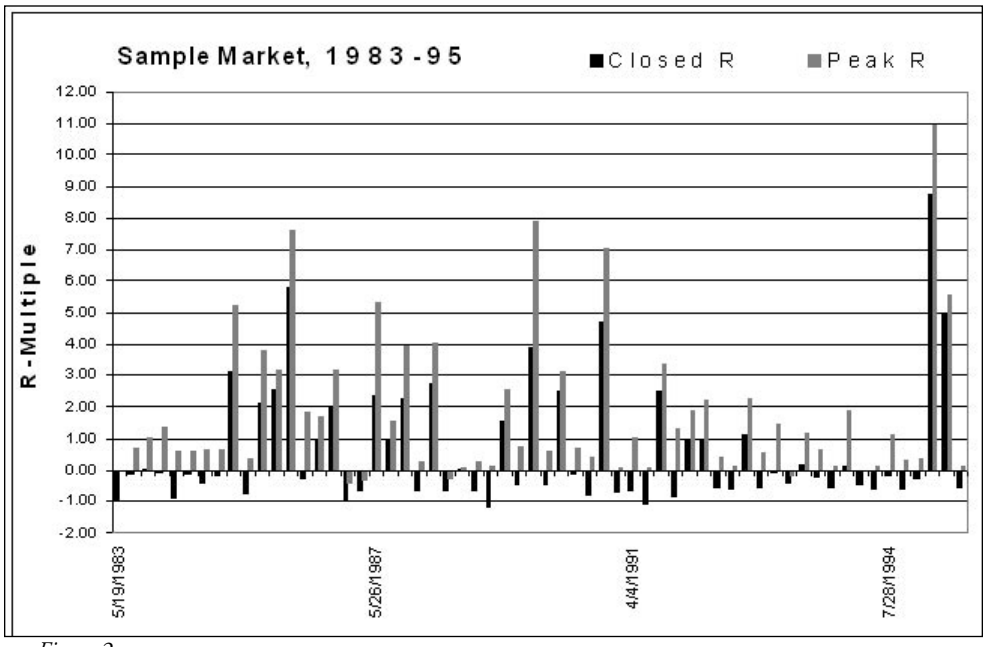


Figure 2

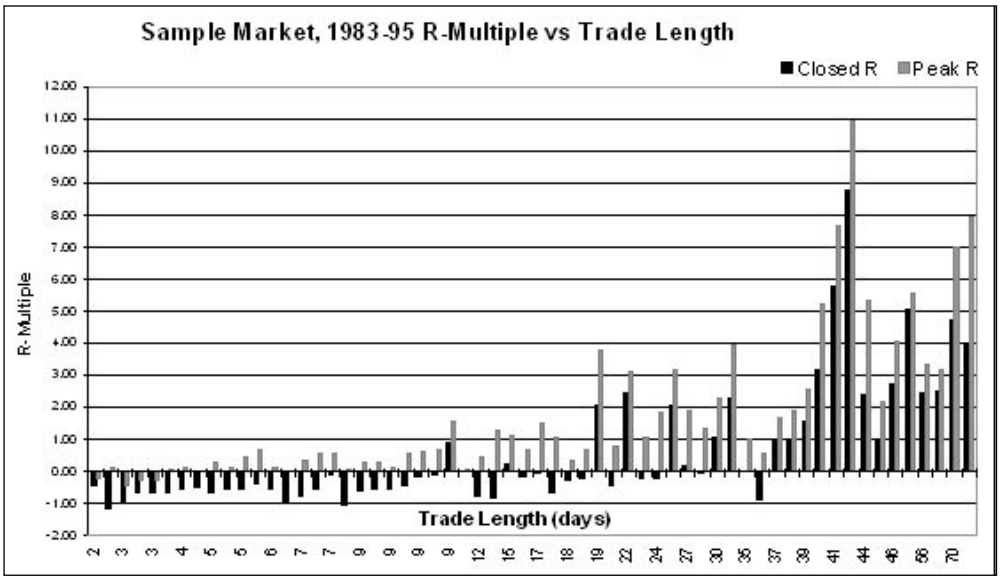


Figure 3

An example of an individual market graph is shown in Figure 2. Depicted are the R-multiples for that market from 1983 through 1995. As you can see, this system only indicates approximately four to five trades per year per market. If you did not apply it across a number of markets, it would not generate enough trades to make it worthwhile to use. Figure 2 shows that in order to trade this system effectively, you will likely have lengthy periods of time when a given market does not provide significant returns. In this case, Figure 2 shows that numerous small losses and wins are necessary in order to capture the large winning R-multiples.

Keep in mind that these results do not depict the effect of applying a money management algorithm to the system. For example, if you use a money management routine that risks 1.5% of current equity per trade (so R=1.5%), you can get an idea of the return to the account from the R-multiple graphs. A trade closed at an R-multiple of -0.5 would equate to a 0.75% equity loss while a trade closed at an R-multiple of 4.0 would equal an equity gain of 6.0%. In addition, if the money management algorithm had a creative aspect to it, such as being designed to take advantage of large R-multiple trades, what's

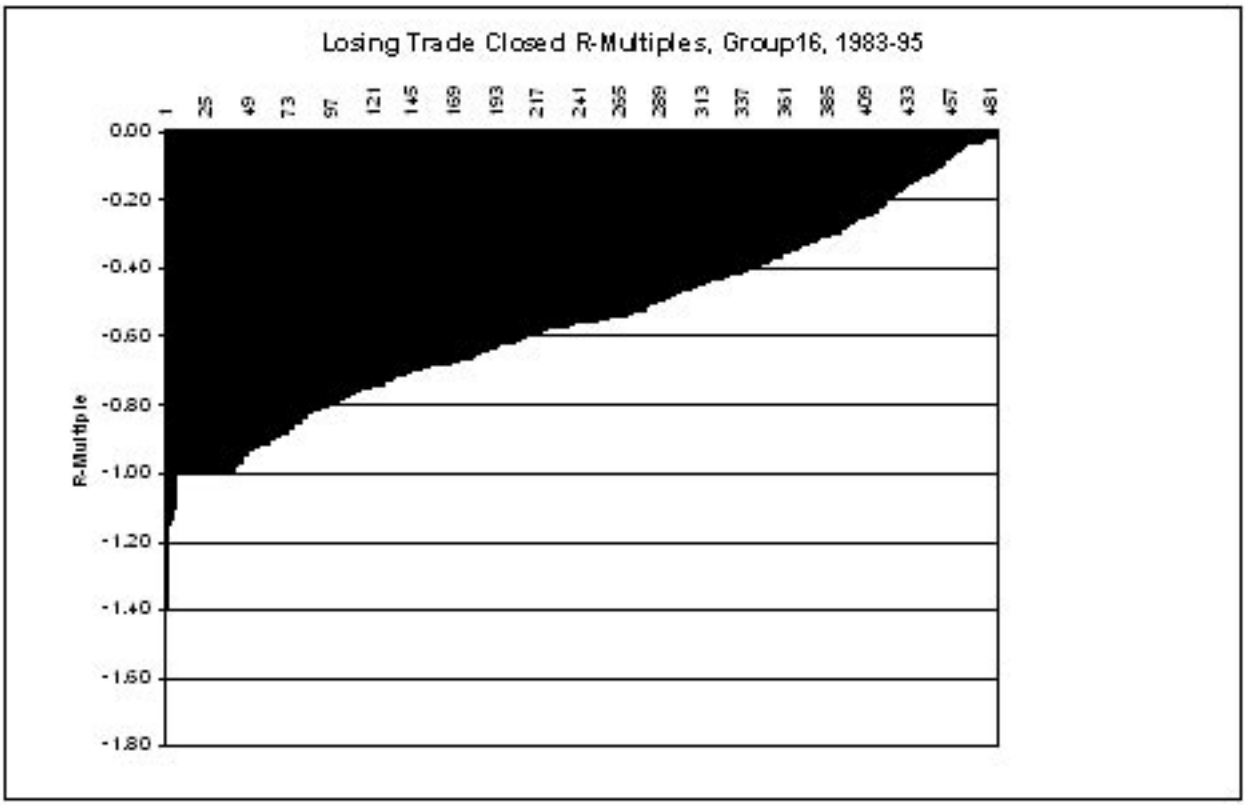


Figure 4

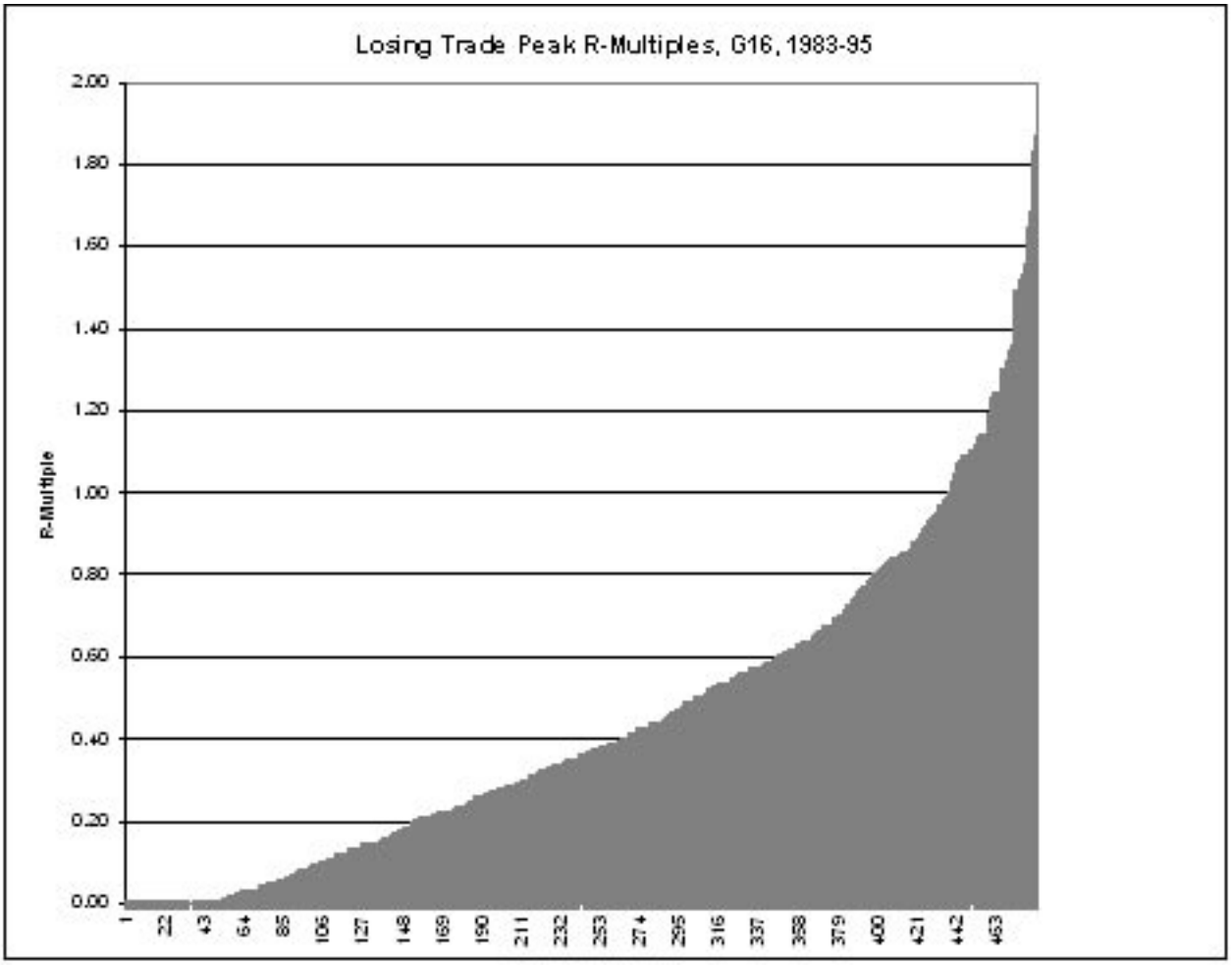


Figure 5

depicted as a 4:1 R-multiple could easily become a 10:1 return on the initial risk. In this case, the job of the money management algorithm is to maximize the return during a large R-multiple trade while maintaining portfolio risk within specified limits.

Figure 3 shows the same data as Figure 2 except now it is sorted by trade length (in days) along the x-axis. This is a very useful graph to inspect for each market to which the system is applied. Referring to Figure 3, you can see that there were no winners of any significance for trade lengths less than nine days. The really big R-multiple values required more than 40 days in the market. A graph like this one will provide a greater understanding of how the system operates in the markets— this is a critical component in understanding a system's behavior. Once you see the time frames in which the winning and losing trades occur, you gain greater insight into whether the system meets your design objectives. A graph like this one provides all the details underneath the typical summary page statistics labeled "average winning trade length" and "average losing trade length." Now you can really see ***when*** the system achieves its results.

Now let's take a look at some rank distribution charts. From 1983 through 1995 the system took a total of 865 trades across 16 markets. During this time there were 484 losing trades. Shown in Figure 4 are the closed trade R-multiples for all of the losing trades. In each case, the trade was opened with a maximum expected risk of -1.0R, and this is the value that would be used in the money management routine to determine the position size. Note how few of the trades actually experienced a loss of that size. The losing trade R-multiples are well dispersed from -1.0R up to 0.0R. This behavior depicts how well the trade exit algorithm helps to limit the size of losing trades. Note that seven out of the 484 losing trades slipped beyond the maximum initial expected exit—these are the hard to see values on the far left of the graph. The maximum loss R-multiple was -1.7R (again, assuming the money management routine risked 1.5% per trade, this would translate into a loss of [1.7 * 1.5%] or 2.55% of equity).

An even more interesting graph is shown in Figure 5. Here again is a rank distribution of all of the losing trades, but now the ***peak*** R-multiple is depicted. Losing trades are defined as trades with a zero or negative profit after deducting for slippage and commissions. The peak R-multiple represents how far the trade went positive prior to being closed at a loss. Approximately 50 of the trades were entered at or very close to the peak price in the direction of the trade, and they are depicted by the zero values on the far left of the graph. The rest of the graph shows you how the exit strategy gives plenty of room for a trade to work out. Peak R-multiples range all the way up to 1.8R with an average peak R-multiple of 0.44R.

Looking at the losing trades in this fashion allows you to see what you have to "*leave on the table*" in order to be able to capture the big winning trades. It allows you to determine how comfortable you are with how the system works for losing trades, and it perhaps yields some insight into where you want to do research to reduce the impact of losing trades. For example, you may decide that you would like to capture more of the peak R-multiple experienced by the losing trades, which may then direct your research into looking at ways to accomplish that goal while not impacting the ability to stick with the winning trades.

I know I sound like a broken record on this subject, but all research like this **must** be conducted with the mindset of not curve-fitting the system to the historical data. In other words, you don't want to simply go back and figure out an algorithm to meet your goal. You want instead to maintain as robust and simple of a system as possible. You must constantly be aware of the trade-off between adding degrees of freedom (a degree of freedom is a *variable* in your system such as the length of a moving average) and maintaining a robust system. In general, as you increase the degrees of freedom in a system, you reduce the robustness of the system thereby reducing its utility on future market data (i.e. you create better results by allowing the system to better conform to historical data at the expense of future market performance).

Let's assume that for the example shown you come up with an addition to the exit strategy to capture more of the peak R-multiple in a losing trade. That addition adds one new degree of freedom to the system. Now you can take your modified system and test it on your additional data groupings to assess its effectiveness. I know of no way other than experience in system design to gain perspective on the subject of adding degrees of freedom versus system robustness.

Now let's look at the winning R-multiples the system generated. Figure 6 shows the closed R-multiples for all of the winning trades. The range is from 0.01R to 22.5R, and the average is 2.1R. Recall that no money management algorithm is represented here. The trades with R-multiples greater than 2.0 can

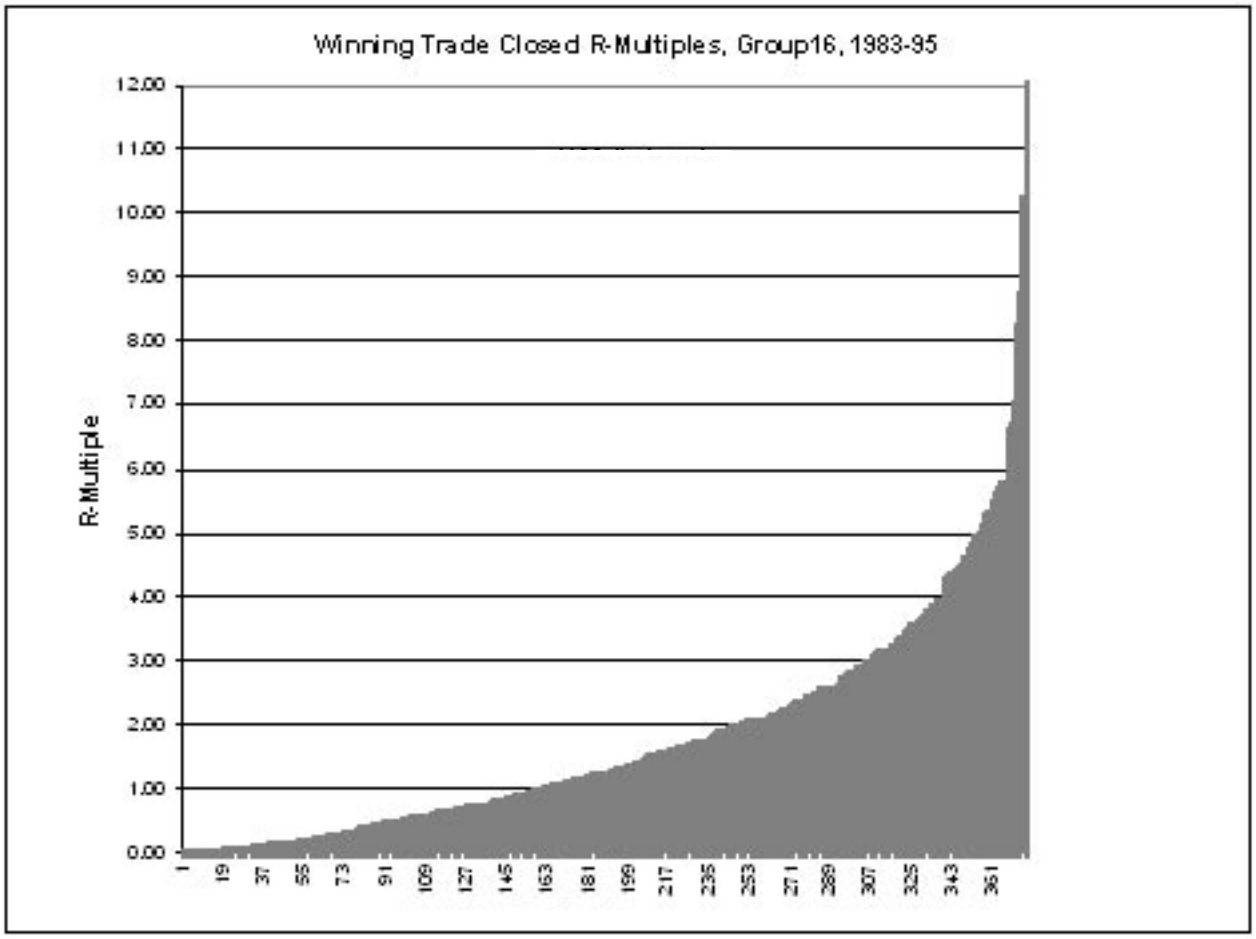


Figure 6

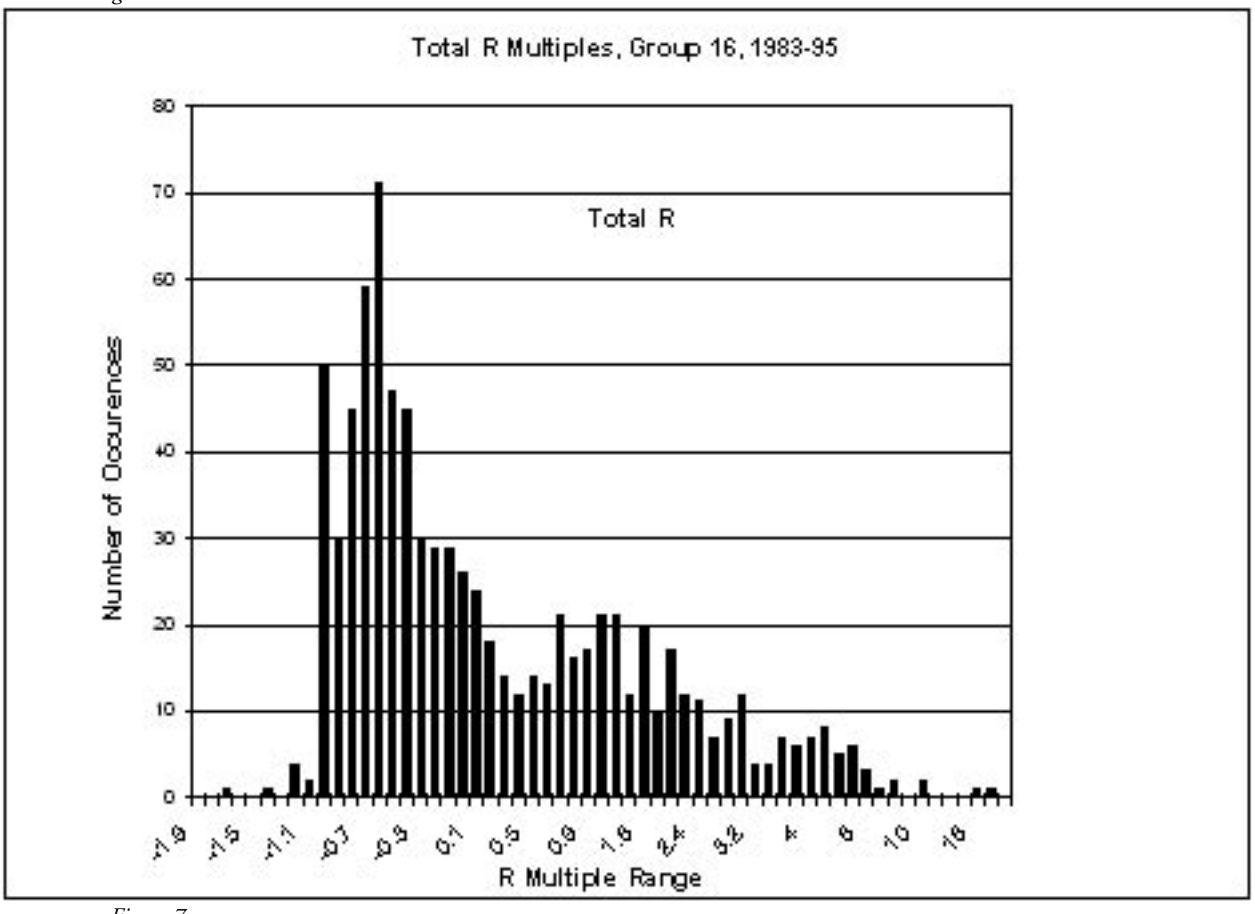


Figure 7

benefit from a creative, on-going money management algorithm.

Off the scale on the graph are two trades the system closed with R-multiples of 18 and 22.5. These are rare events, but they will likely surface in future trading, and they will severely test your discipline to stick to your exit strategy. *In fact, all of the trades for this system with R-multiples greater than about 4.0 should be reviewed in depth so that you can develop detailed mental rehearsals to allow successful execution of the system in the future.* This is the only way I know of to prepare yourself for executing your system as designed.

Finally, we will look at yet another useful depiction of the R-multiples of a system. You create the data for this graph by sorting the trades into ranges of R-multiple values and then tallying the number of trades that fit into each range. Through this process, a frequency distribution graph can be created which simply shows the number of occurrences of trades that fall within each range. Figure 7 depicts the frequency distribution of R-multiples for the same system as shown above. Note that about 58% of the trades were losers. The average losing trade was about -0.5R. The 42% winning trades averaged about +2.1R. Typical of successful trend-following systems, you have to accept a lot of small losses in order to achieve the overall positive expectation of the system. Let's quickly calculate the expectation of this system based on the R-multiples:

Expectancy =

(0.42 * 2.1) - (0.58 * 0.5) = 0.59.

A note from Van Tharp: Chuck could have simply found the mean R-multiples to determine the expectancy of the system.

The expectancy is positive and well worth trading to capture.

Taking apart a system in this fashion provides a unique and necessary view into how it generates returns. Actually generating all of the data necessary to evaluate a system in this manner is a time consuming and difficult process, but it is a great tool to stimulate your creativity to think of ways to improve the system and to allow you to prepare yourself to actually trade the system in real time. I can't emphasize enough how critical the preparation step is to achieving successful implementation of a system in real-time. As I have said before, "If you don't have the appropriate belief structure and emotional stability to achieve the historical results, your chances of successfully implementing the system in real-time are nil."

Assembling the Overall Picture

Pretend that any trading methodology is simply a game of picking R-multiples (marbles) out of a bag called the markets. These R-multiples have the following attributes: (1) the "big-R" trades take more time in the market to complete than the losing R-multiples; (2) in most cases, there will be many small R-multiples (winners and losers) compared to the big-R multiples; (3) the big-R trades are ones where creative money management strategies can be truly effective; (4) an effective money management algorithm based on account equity is vital to exploit the nature of this game; (5) available capital and individual psychology will determine who will be able to succeed in this game and who won't.

Now instead of viewing a trading system based on its net profit and largest drawdown, you can look under the covers at what's going on with a particular method. Research on new or improved entry methods, exit methods or money management methods can be based on improving the important features of the R-multiples: (1) the size and sign, (2) the frequency of occurrence (opportunity factor), and (3) their order of appearance. Unfortunately, while we can have some influence over the opportunity factor (by the sensitivity of the system) and over the R-multiple size (through leverage), we have no influence on the R-multiple sign or order of appearance.

R-multiple Size and Sign

The *size* of an R-multiple (winner or loser) is completely determined by the exit strategy of a method and the assumed initial risk of the trade. This statement emphasizes how exit strategies are far more important than entry strategies. After a position is opened, the *only* thing that affects the size of the R-multiple is the exit strategy. The entry strategy can be focused in the attempt to generate winning R-multiples; however, when working only with a data series for a given market, most of these attempts can easily result in curve fitting the past. One area to investigate is how to reduce the initial risk (the denominator in the R-multiple equation) without sacrificing your ability to stay with the winning trades. If you can reduce this value by 25% without affecting the ability to capture the winning trades, you will increase the size of your winning trade R-multiples by 33%!

Consider making the initial risk in a trade (the base for your R-multiple evaluation) market-based as opposed to a fixed dollar amount. For example, in the sample system, the initial risk is based on a market volatility factor. Then determine the position size of the trade based on your account equity and the risk

per trade you want to take. Through this process you automatically scale your system to the market's condition at the time of the entry signal.

Now as opposed to simply trying to play with various system ideas to *"see what works,"* you can view trading system development in terms of finding methods to extract large marbles out of the markets on any time frame.

The *sign* of an R-multiple determines whether it was a winning trade or a losing trade. In most cases, **efforts focused on allowing winning trades to fully develop are more fruitful than those focused on preventing losing trades**.

Frequency of Appearance

The frequency of appearance of a trade in a system is dependent on the *sensitivity* of the system. For example, buying 20 day breakouts will provide a lot more activity (increased frequency of appearance) than buying 100 day breakouts. The key is finding the balance point for your system between winning trades versus the trading frequency versus the size of the closed profit. This is not a trivial endeavor.

Order of Appearance

Consider your historical test results as consisting of a huge bag of marbles. In the past, these marbles appeared in a given order. Now you can take these same marbles and scramble the order of their appearance. Software can be written to randomly select from the "marble bag" (without replacement) to create many different potential simulations from your same historical data. Of course, you have no control over the order of appearance in the future. However, you can use your historical simulations to create worst case scenarios in addition to the many different possible distributions of marbles.

Summary

It is extremely useful to look at the results of a trading system broken down as R-multiples or marbles. Pretending that trading is simply a game of drawing these marbles out of a bag helps one to step back and view a trading system with a different frame of mind. Through this process you can achieve a new level of understanding of how your method really works and how you can improve upon it. If you assume that your goal in system design is to create a method that provides a positive expectancy with the types of R-multiples that you desire, then you can set about creating a method like this in any trading time frame. By looking at your trading system broken down as R-multiples, you are much better able to understand the requirements for a creative money management algorithm to take advantage of the big-R trades.

Finally and most importantly, **by looking at the requirements that will be placed upon <u>you</u> to properly close out "big-R" trades and accept all other aspects of the system's behavior, you can work on yourself to prepare for the future, successful implementation of your system.**

The Psychology of Trend Following

by Chuck Branscomb

In this article, we will take a look at the some of these emotional traps that are common for many people when they try to implement a trend following approach to the markets. Many of these issues are the result of a lack of understanding and acceptance of the actual nature of the system or method being used. In any event, an investor or trader must understand the total picture of what is to be achieved without allowing common biases to interfere with the process.

Linear Thinking in a Logarithmic World

One very common distortion people have with respect to the world is perhaps a source of many different emotional traps. This distortion is assuming that the recent past, projected linearly into the future, is a reasonable expectation to have about a given market. This is a very common, "natural" mode of thinking that is capable of being supported with all sorts of evidence over the short run, but yields potentially very disappointing results over the long run.

For example, the results achieved with a good trend following system are anything but linear—especially during winning trades. The sometimes lengthy period of small losses and small profits coerces one into an emotional trap of expecting the future to look like the recent past. When a trade that will be a very large winner arrives, a trader can be trapped by limited thinking based on recent experiences of small losses and small profits. This recent experience tends to create a very debilitating emotional state in the trader, making it very easy to cut profits short on this big winning trade.

A prime example of this situation occurs in just about every marble game that is played at most of the IITM seminars. The game is usually structured such that it has a very low winning percentage (less than 30% winners), but a very high, positive expectancy. This design creates a game that simulates real trading closely in many ways. Participants are almost always lured into the trap of betting against the expectancy (you are allowed to bet with or against the expectancy) at some point during the game by projecting linearly into the future. Long streaks of losing marbles encourage participants to think that *"expectancy is for the birds—look at how much we would have made so far betting against it!"* Of course, about that time, a huge winning marble is pulled from the bag just as some participants are persuaded that it's time to bet against it. Even only betting 1% of equity in these situations can result in a 20% - 30% loss. Why does this phenomenon seem to occur repeatedly among traders and investors? Invariably, their recent past has convinced them that they can take a chance to try to get a "winner" over the short-term without regard to the long-term consequences. One part of the answer to this perplexing question is linear thinking in an exponential world.

The universe that we live is logarithmic with respect to time—meaning that properties of the world around us change in an exponential fashion. Think of the many examples supporting this belief such as the expansion of the universe, the shape of a conk shell, radioactive decay, acceleration of gravity, the growth of a successful business, etc. The list is endless, and it includes the growth of account equity during big winning trades!

As humans, it seems that we continually fall into the trap of drawing upon our most recent experience and projecting that linearly into the future. As long as the subject of our projection is changing slowly, our feedback from our senses tells us that we are "right" about our projection. We can gather an enormous amount of evidence over the short term to support and *"prove"* that our linear expectations are correct. After all, portions of an exponential curve can be approximated by a straight line over short time periods. In Figure 1, a straight line is shown drawn tangent to the curves $y = x^2$ and $y = x^{2.5}$. As you can see, over a small change in time, the straight (linear) line approximates the exponential curve. However, over larger changes in time, the linear approximation is way off as shown in Figure 2.

Figures 1 and 2 illustrate very simple math concepts, but they are presented to stimulate your thinking about how dramatic an exponential change can differ from a linear change over time. The stock market is great example of the concept of people being stuck in their linear maps of the world. The media stirs itself into a frenzy every time the Dow Jones Industrial Average moves 100 points or more. I do not recall the same frantic "***news***" when the Dow made a 13 point

move in the early 1980s, but the two are equivalent. The newspapers all clamor over the *"biggest point moves"* in the market's history, which simply perpetuates the linear thinking prevalent throughout our world. In addition, they print long term charts of the stock market with linear price scaling, which dramatically distorts one's understanding of the chart. Only on a logarithmically scaled price axis can you view a long-term graph in an appropriate fashion (on a log scale to the base 10, all the price movement is shown in percentage terms so that a 5% move today compares equivalently to a 5% move 70 years ago).

When creating trading systems, it's easy to fall into this linear trap. Look at all of the systems that use "points" or "ticks" in their system rules. For example, a system may have an entry criteria whereby it enters on a failed price break-out level minus 10 ticks. Without including a scaling factor related to the price level of the asset being traded, this system will be continually making linear assumptions in a non-linear environment. Ten price ticks at a price level of 20 are significantly different from ten ticks at 100, but system designers/sellers continue to use points and ticks in their methods. Over small changes in price, the method is perhaps an acceptable approximation. However, large changes in price will quickly show the defect in this thinking.

Formerly useful trading methods in the S&P 500 index have become useless now that the S&P has almost doubled over the past four years. Some traders are finding that their methods have degraded, so they are now off making yet more linear assumptions to refine their model. These methods all included "point" values in their decisions (such as buying at a given number of points off the low of the day). There have been recent days when the *opening range* was wider than this fixed number of points not to mention the point volatility in general.

Part of the solution to the issue of linear thinking is to realize that you may have a lifetime of conditioning anchoring it in place. Since we tend to focus on the most recent past at any given time (the most easily recalled) and then make that the basis for our current thoughts, the pattern has the opportunity to repeat itself forever—particularly if we blame the world around us for the results of our thinking. Accepting that you likely have a similar bias in your map of the world is the first step to overcoming the inhibiting pattern.

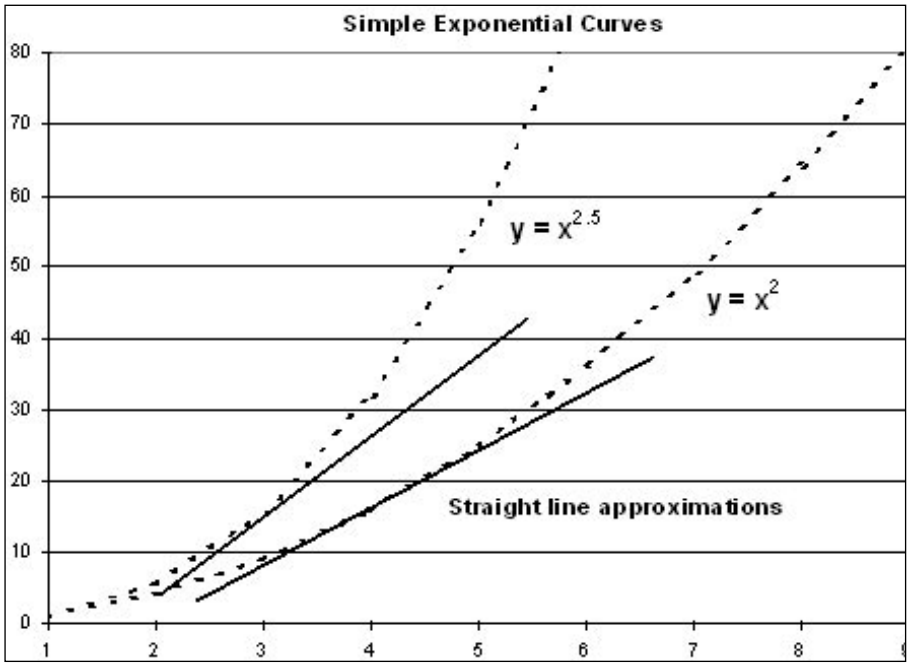


Figure 1

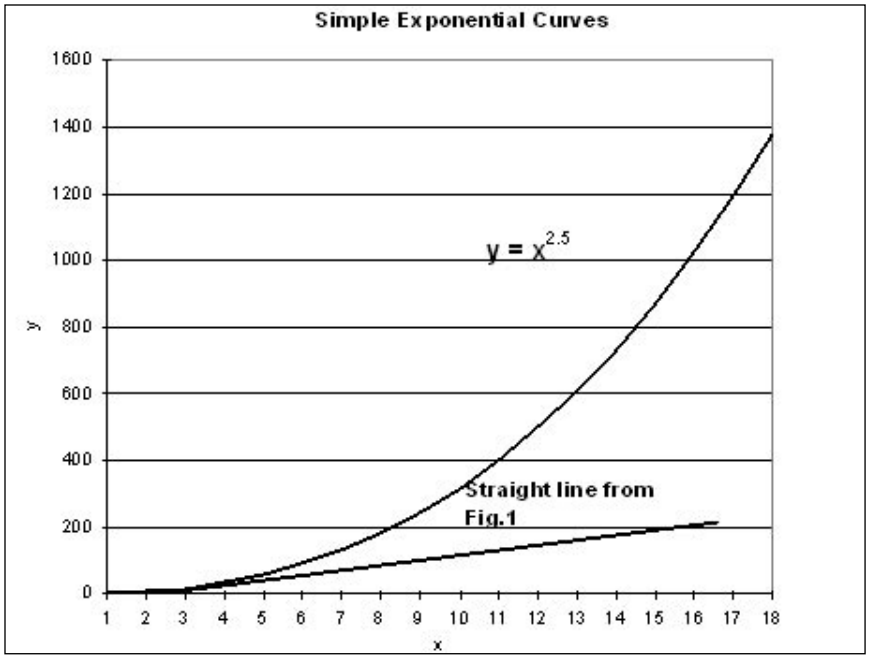


Figure 2

Detailed and elaborate mental rehearsals of the trading performance/response of your system is the best way to prepare you for the exponential results that will be a part of its nature in real trading. Once the system is in production, keeping a trading diary to record all of your thoughts about the system and the markets it trades will reveal all of the times when you are trapped in your thoughts of what has happened most recently. This leads us directly into the next topic, which is a very common emotional trap for most people.

Overwhelming Desire for the Current Trade to Win!

This is perhaps the most common psychological issue people have with trend following trading. Most superior trend following systems have a winning trade percentage below 50 percent (usually in the 35 to 45 percent range). In addition, a good system can capture winning trades that are many times in size compared to the losing trades. These two properties of trend following trading/investing cause one to fall into the trap of assigning far more importance to the current trade than is appropriate. How?

If a trader has not developed a detailed insight into how the trend following system works over both short and long periods of time, the losing periods extract a serious mental toll. Invariably, the losing trades were profitable during a portion of the time after entry and then gave up that open profit to result in a loss. After a number of these losing trades and some small winning trades, the unprepared trader projects this recent experience in a linear fashion out into the future. Now when a ***big*** trade arrives (the one that will create an exponentially growing profit to a large level compared to the recent past), the mental self-conditioning of the trader encourages early profit taking so "*those big gains won't be given back.*" Usually these thoughts are attached to some outside reference such as a market making new all-time highs (exit in belief that the trend will crash), some predetermined market reference point for which the trader is "sure" the market will not go through (target the exit for this point), or when account equity gets just above a previous peak equity level (exit now that you are back even or even a little ahead).

In the recent IITM Systems Seminar, the marble game had winning percentage of 27%, but it included some big winning marbles (20:1 and 30:1) along with the smaller winners. After a string of four reasonable size winning marbles in a row, the majority of the room seemed convinced that the next trade ***could not*** be a winning trade since the probabilities were greatly against a string of five winners in a 27% system. Of course every marble drawn out of the bag (they are replaced after being pulled) is totally independent of the previous marble drawn. However, many could not restrain themselves from their bias of wanting the next trade to be a winner (especially now that their internal psychological biases told them to expect a losing trade). This prompted the majority of the groups to trade the next draw against the positive expectancy. Guess the result yet?

A 20:1 marble was drawn resulting in even a moderate 2% bet causing a 40% loss of equity! The fifth winner in a row, which many were convinced was basically impossible, was drawn. At that point the message of always betting with the positive expectancy was driven home to most of the participants, but a few continued to bet against the expectancy only to get hit with another 20:1 loss and a 30:1 loss later in the game. One trader, who manages money, said that he could not get his group to understand the difference between "probability" and "expectancy." He said it was more important, based on his experience, to trade probability. As a result, his group gave him a separate allocation of money to trade. He was continually hit with 20:1 and 30:1 marbles against him.

In actual trend following trading, the desire for the current trade to "work out" is usually strongest during the losing periods. The more emotionally attached a trader is to the profits and losses of trading, the greater this desire. The more you ride emotional highs during winning trades and new equity highs, the more you will be caught up in the losing trades and drawdowns resulting in an increasing desire for a winning trade. Ironically, you reach the point where you violate your system's rules and take profits early just before the point in a growing trade where it really takes off.

Figure 3 depicts a system entry into a market that our fictitious trader, Bucky, has just taken after a series of losing trades in a number of markets including this one. Just like the previous ten trades, Bucky is ready to quickly cut losses short (following the adage he has always heard) should this trade work out to be yet another failure. He has been violating his system rules and saving a good bit of equity during this recent losing period. In Figure 4, the trade is exited as it falls back below Bucky's entry point. Bucky is happy that he did not stick to that system again even though he took 75% of the loss the system would have allowed. In fact, he is considering modifying his system given what has happened in the past

Figure 3

Figure 4

three months. In Figure 5, Bucky is stunned by the big move the market has now made in the direction of his system trade. He is a good bit upset at now having exited the trade prematurely, but now the trade is way out of his planned risk parameters, so he resolves to wait until the next day and try to buy it on a pullback. He realizes that his system is working great—if only he would follow it! All of the sudden, he has now become a believer in his system.

Figure 6 shows the next few days in the trade. Now it's gone way past Bucky's risk parameters and did not pullback as he expected. At this point, this trade has in fact already become Bucky's biggest trade in the last six months. Bucky is so upset over exiting this trade early at a small loss that he decides to forget about it, to force it out of his mind. He resolves to trade his system correctly in the future! Figure 7 shows the remaining history of the system's trade in this market. Bucky gave up a 30:1 trade that his system captured since he was unprepared to accept his system as designed. In his quest to make this trade a winner (of any size) or less of a loser, he sacrificed capturing a once in a decade trading opportunity in this market.

The best solution for resolving this issue is to develop a great level of understanding of how your method works and how you must let go of the outcome to the markets. Through these processes, if you have developed detailed mental rehearsals of how your method has worked, you can fully prepare yourself for future trading. As long as the method is performing within the guidelines of your preparation, your mission is to execute its orders without error. If you cannot get comfortable with the method's performance, and it's a successful method, you probably have underlying conflicts that you need to resolve (as discussed in the Peak Performance Course Volume **3** and the Peak Performance Trading Seminar). Next we will take a look at some positive, useful beliefs to adopt for trend following trading.

Entry Into a Position Is the Least Important Part of a System

Adopting this belief will allow one to become detached from considering the entry into a market worthy of some great level of importance. The goal in the design of a system is not to maximize the winning trade percentage, but to maximize

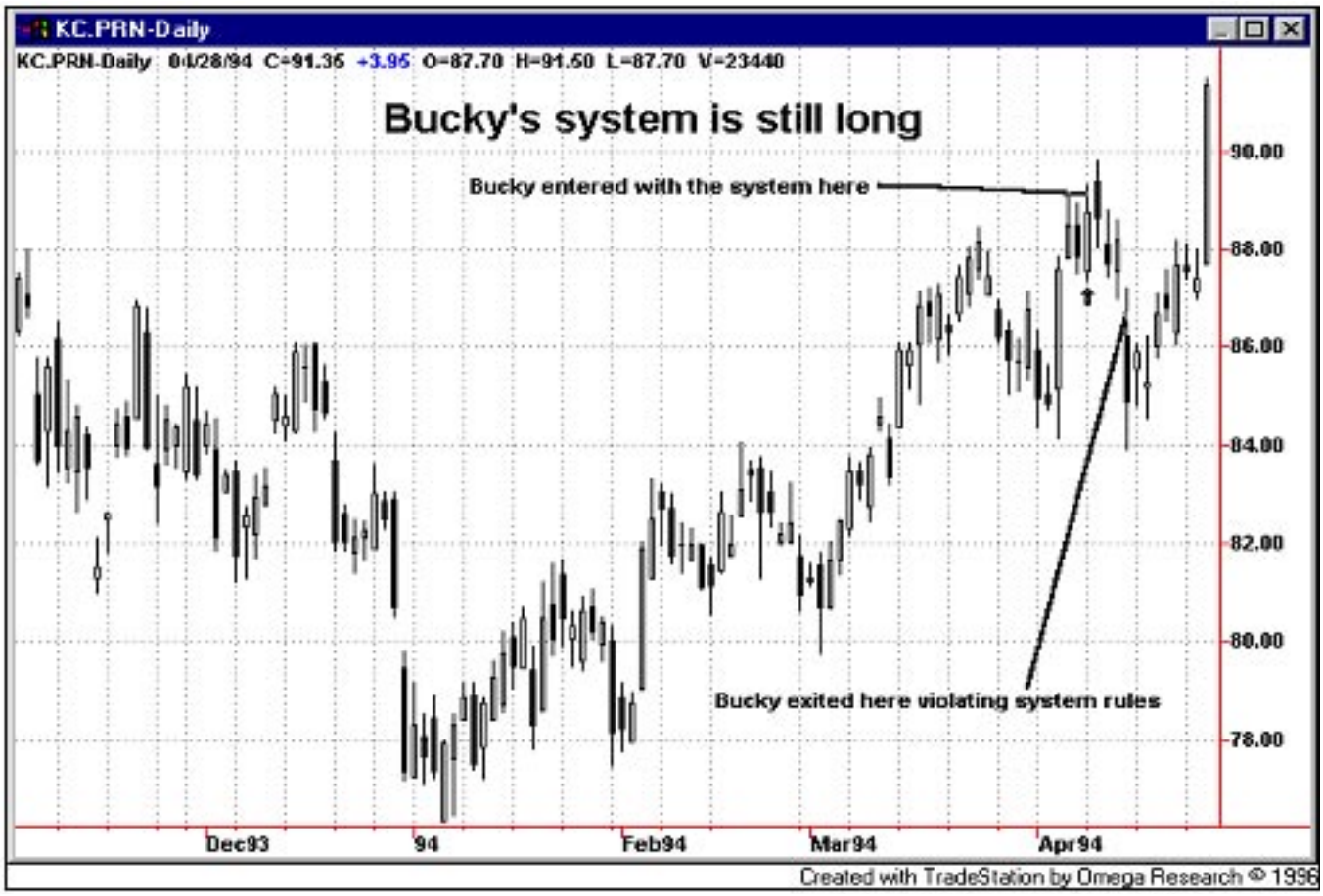


Figure 5

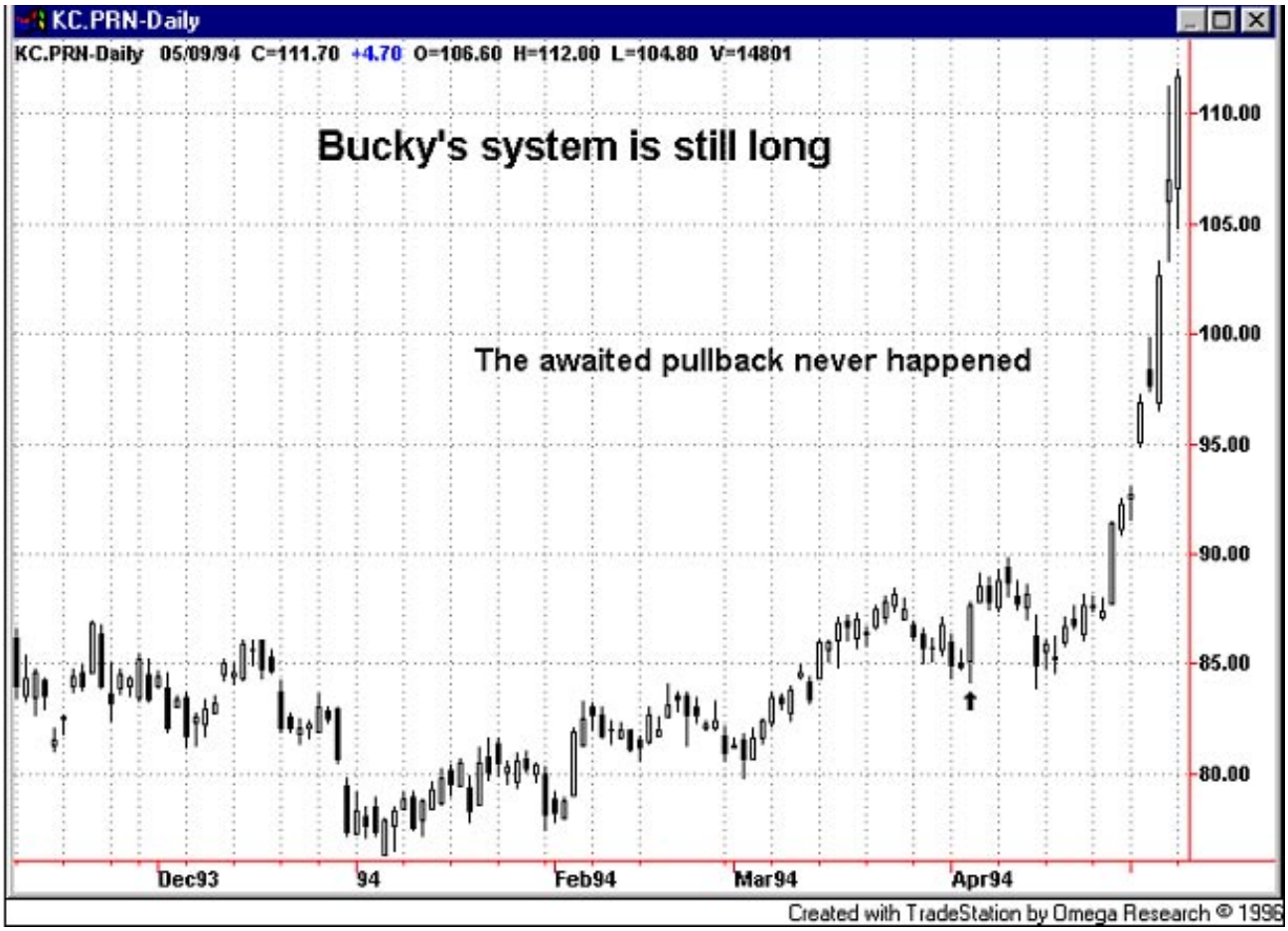


Figure 6

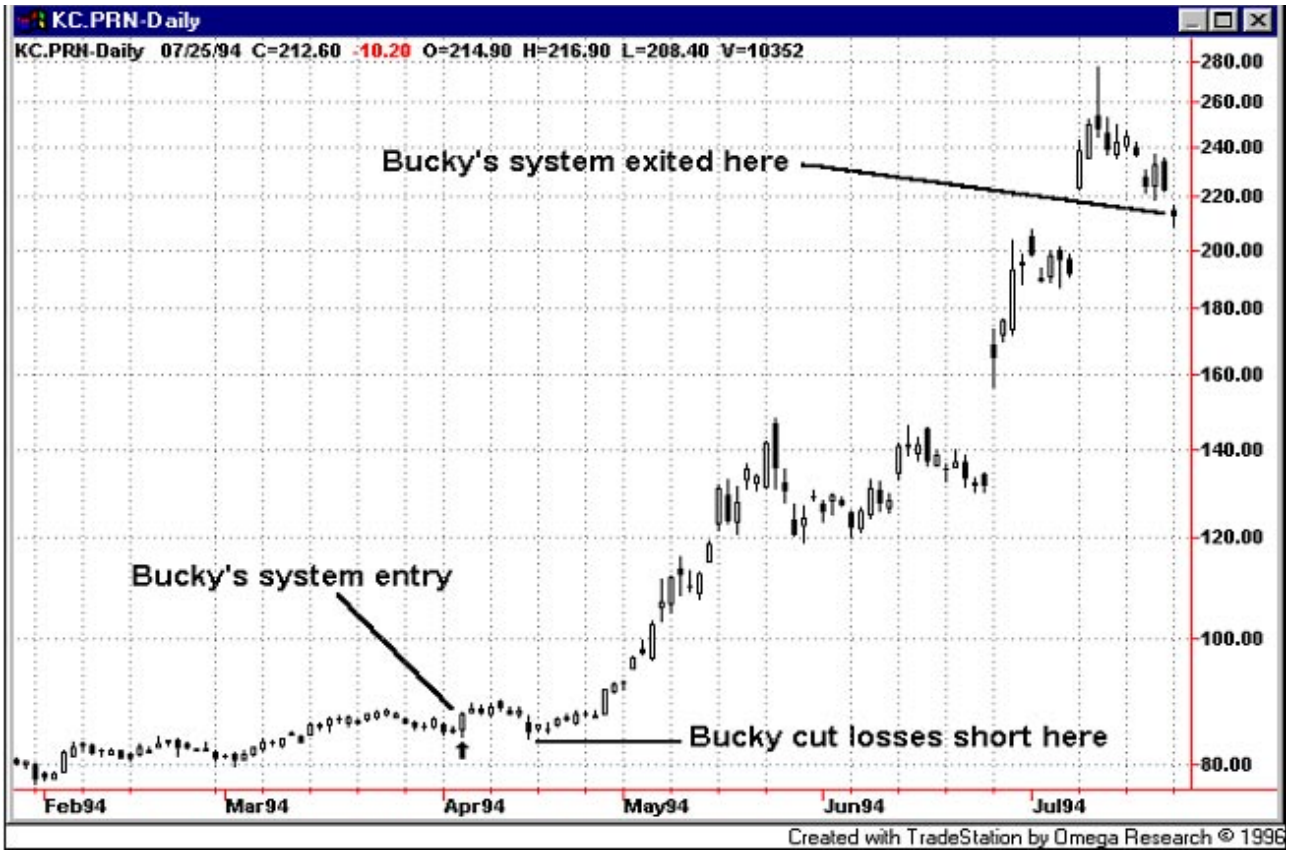


Figure 7

the system expectancy. Of course you want to try for the highest winning percentage possible, but not at the expense of a worthwhile overall expectancy. Most entry methods of good systems are only slightly better than 50 percent correct after 20 days (or time periods) in the market when evaluated without an exit condition. In addition, trend following methods capture most of their profits after a significant number of days in the market. Attaching too much importance to market entry can easily create a pattern of behavior that violates the system rules. Why? Since the losing trades are more probable than the winning trades, you can cut the losses shorter by violating the system rules. During losing periods, it's easy to feel as if you are helping things along by behaving this way. This behavior builds upon itself until you believe that you now "understand" how to manage your entries to reduce losses. However, this pattern of behavior results in a massive instability eventually.

Inevitably, you will cut yet another loss short, just as you have been doing for the past three months when the winning trade, that big marble, arrives. You have just spent three months operating in a 1:1 win/loss realm of your system keeping losses to less than the initial risk. Now your system presents a 15:1 winner. Your system is about to go logarithmic, and you are stuck in a linear pattern of expectations and behavior. This leads nicely into the next belief to adopt for trend following.

Don't Ever Miss a Trade

Unless you have the ability to see into the future (in which case you would not need much of a system), this is a very useful belief to adopt: ***I cannot ever miss a trade***. The situation just described has a trader violating the system rules for a period of time and improving the results. Eventually, the big winning trade will come along and also be exited early, just like the last 20 trades. What the trader thought was yet another small loss evolving turns out to be a 30:1 reward/risk winning trend that lasts for three months. For example, the trade is exited with a small loss, and the next day it opens up way in favor of the system position.

In most cases, the best action is to reenter at the market; however, the risk/reward profile of the trade has now changed. Perhaps you exited at a loss equal to only 0.2 times your initial risk. The market has now gapped ahead 3 times your initial risk on the open as the big trend gets underway, so the distance to your exit (and therefore risk) has expanded greatly. Through your linear conditioning during the previous losing period you now have managed to lose the opportunity to make up for those losses, and more, now that your system has entered into an exponential period of performance.

Most methods always have a stop exit to limit losing trades, but few methods have a means to ensure that they do not miss a big trend. In the above example, the trader is likely disturbed by the expanding volatility and the violation of the system rules, which were developed with a lot of sound research. As the trade progresses for three months to enormous heights, the trader may increasingly become disabled by the lost opportunity. Losing an opportunity like this one, which comes around rarely, can result in total disruption to a trading plan. The best behavior to adopt at that point in time is to never miss a trade again—simply follow the system rules. Unfortunately, unless the trader has done a thorough psychological clearing, the pattern may yet repeat. Imagine another series of losing and small winning trades that seems to drag on forever. About the time the next big winner arrives, the trader will have been worn out by now digging a big hole of a drawdown (since the 15:1 trade was missed that the system captured), and will once again be trying to limit those small losses.

To prevent this type of common and destructive behavior, simply resolve not to break the system rules. Either the system is good enough to trade properly, or you should not trade it at all. Remember:

(1) Always take every trade as designed.

(2) **Review the results of how the system worked at the end of each trade and during the Periodic Review** as discussed in the Peak Performance Course.

(3) Resolve to follow the system rules to trade completion.

As long as the results for the trade remain within your expectations based on your trading business plan, resolve to follow the system rules exactly until your next scheduled Periodic Review—leading us into our next useful belief.

Follow Your System Rules and Leave the Outcome to the Market

That's your job during each and every trade. You may want to pretend that you have a boss who left you in charge of the office with explicit instructions to follow these rules or else. After the entry point, you must follow your well-researched system exit rules as designed. Your mission is to **let go of the outcome of the trade to the market**. Hopefully, you have done enough mental rehearsal with the historical performance of your system such that you are prepared for the wide range of

possibilities that may arise in any given trade. Again, your goal for each and every trade is to follow the system rules to the trade exit.

Only on very rare occasions, after a significant amount of experience, should you consider overriding your system rules. For example, during a worldwide dramatic event, such as the stock market crash in 1987, you may consider violating your rules to reduce risk in light of the great uncertainty. In *The New Market Wizards* by Jack Schwager, William Eckhardt gives the example of how he exited his short system position in Eurodollars right near the close due to an intuitive feel that given what had happened in the stock market, Euros should have been down 40 or 50 points instead of only 5 points. The Eurodollar market opened up around 300 points higher the next day as the Federal Reserve injected the financial markets with massive liquidity. This is simply an example of a very experienced trader responding to a strong intuition about a circumstance that no mechanical system could contain.

Situations like the above should be a rare occurrence in your system, and you should not attempt to modify the system to filter the anomaly out of the historical results. Adding a degree of freedom for an infrequent event or tailoring an existing degree of freedom will result in curve fitting the system to the specific historical event while reducing the future performance of your system.

Money Management—the Most Important Part of any System

Perhaps the most useful belief to have with regard to trend following trading is that **money management represents the most important part of any system or method**. It makes sense that the area of trading most overlooked by magazines and books that cater to the masses is the most important. In fact, most of these books and articles even refer to money management as a way to set the initial stops. Money management in our context is defined as the portion of any method that identifies the position size to be traded at the entry point and every point in the trade until the exit. You may have a decent system with a worthwhile expectation, but the level of performance you achieve will be a significant function of the money management algorithm you use.

Adopting this belief about money management methods will allow you to explore creative methods that make sense when applied to the underlying characteristics of your system.

There is no one method that is "best," but you can use money management as a very effective tool to achieve your objectives. When you fully understand how your method achieves its results (as we have discussed in the past three issues of *Market Mastery*), only then can you begin to explore the possibilities of creative money management strategies. The characteristics of the R-multiples, as discussed last time, and the winning percentage of the system will greatly influence what type of money management strategy and the level of risk to be employed. Of course the first place to start is to decide what the objectives are for the money management system you will use.

These objectives can range from moderate returns from a conservative algorithm to large returns using an aggressive algorithm employing such concepts as trading *"the market's money."* The range of potential strategies is great, but there are some common elements that any money management algorithm should employ.

Conclusion

Basically the difficulties related to trend following trading can be grouped under the heading of *Psychology*. As we discussed, the beliefs you have coupled with your *"map"* of the world will dictate what you can achieve in developing and implementing a trend following approach to the market. Hopefully some of this illuminates potential issues you have with respect to the markets and trading. Realizing that these "issues" are simply creations of your own mind is the first step to their resolution. Adopting useful beliefs related to trend following is the next step to achieving success following this approach to trading. We have pointed out a number of useful beliefs to hold. Step into these beliefs and see how you can expand your own map of the world. Allowing your own creativity to flourish within the context of supportive, useful beliefs is the best way to create your own unique system and approach to the markets.

Six Keys

to

Investment Success

by Van K. Tharp, Ph.D.

This is an attempt to review the basics of trading one more time. It's an important review because even some of my Super Traders have still expressed a lack of understanding of some of these principles. In fact, I'm often totally amazed when someone who has been exposed to the material at least a dozen times suddenly approaches me and repeats back something. That something might be a key principle that I've been teaching for years, but it is clear that they are just beginning to understand it.

Let's think about trading or investing in terms of the following six variables:

1. Reliability

Reliability or the percentage of time you make money. For example, do you make money on 60% of your investments and lose money on 40% of them? What percentage of the time do you make money? Most long-term traders are probably right 50% of the time or less, while most short-term traders are probably right in the neighborhood of 60%.

Most people strive for methods that will make them "right" most of the time. They consider the sole purpose of entry to be finding a signal to make them "right"—as if entry was totally responsible for making them money. However, as you will see in this article, there are at least five other factors that are important for your success.

2. Relative Size

The relative size of your profits compared to your losses when traded at the smallest possible level (i.e., one share of stock or one futures contract). Relative size could be expressed as an average—for example, the average gain is twice as big as the average loss. Relative size could also be expressed as a series of vectors which relate groups of trades. We've been attempting to help you understand this in our discussions of R-multiples. For example, if your initial risk is 1R, then you might find that your average risk is 0.5R. You might also find that your profits could be expressed as three 1R wins, seven 2R wins, four 5R wins, and one 18R win—in other words, a series of vectors.

The relative size of gains and losses would be the same if you lost $1 per share on losing trades and made $1 per share on winning trades. However, the relative size would be quite different if you make $10 per share on winning trades and only lost $1 per share on losing trades. What if you lost 80% of the time with $1 losses (i.e., 1R) and won 20% of the time with $10 gains (i.e., 10R)? Would that be an acceptable trading system? In ten average trades, you'd make $20 and lose $8. That's a $12 total profit.

3. Cost

Your cost in making an investment or trade. This is the destructive force on your account size with each trade due to execution costs, brokerage commissions, and taxes. How much time have you spent thinking about trade execution costs? For example, if you trade stocks through a full service broker and pay well over $100 to buy and again to sell 100 shares of stock, then you are paying so much that you have little chance of making a lot of money. The only solution is to hold on to it for a long time during great markets. But what happens if we stop having great markets? In today's trading atmosphere, that's quite possible. Yet today, you can trade 1,000 shares of a high priced stock through the internet for about $10. Doesn't that make a lot more sense?

What about slippage? Slippage is really the market maker's fee. It's the difference between the bid and asked prices when you buy something in the markets. What you pay for slippage is a function of how you trade. If you are a short-term trader, then you may want to be in and out quickly and get positive slippage. In contrast, if you are a long-term trader, then you want poor slippage—otherwise the market probably is not going in your favor.

Lastly, think about the cost of taxes on your trading. It's a real cost that most people don't consider. There are some investments for which taxes are not a major problem. For example, when you sell real estate and simply trade up for a more expensive piece of property, you don't pay taxes on the profits. When you have appreciating stock that you don't sell, you don't pay taxes on the unrealized profits. However, in most short-term trading in which you are in and out frequently your profits are heavily taxed. Futures traders are even taxed on their unrealized profits at the end of the year.

4. Opportunity

How often you get the opportunity to trade? Now imagine holding the first three variables constant. These variables constitute what we have been calling expectancy. However, their combined effect now depends upon how often you trade. The results will be much different if you make 100 trades each day compared with 100 trades each year.

A low expectancy system that is traded many times each day can be much better than a high expectancy system that only generates a few trades each year. The reason is simple. Given enough trades and a positive expectancy, you will make money. Given a few trades and a positive expectancy, even one that is high, you might not make money.

5. Capital

The size of your trading/investing capital. The effect of the first four variables upon your account depends significantly upon the size of your account. Even the cost of trading will have a significant effect on a $1,000 account. For example, if it costs $100 to trade, then you would take a 10% hit on each trade before you'd make a profit. You'd have to average more than 10% profit per trade just to cover the cost of trading. However, the impact of the same $100 in costs becomes much less significant if you have a million dollar account.

The average trading account in the market is way too small for what the average trader is trying to accomplish. The risk involved, as a percentage of equity, is probably way too large. And when this risk is large enough, you are almost guaranteed to lose money.

6. Position Sizing

Your position sizing model. This variable refers to how many units you trade at one time (i.e., one share of stock versus 10,000 shares of stock). Obviously, the amount you win or lose per share is multiplied by the number of shares traded. So this variable can have a dramatic effect on performance.

I used to call this last variable money management. Many of you have probably read the report I've written about money management. You probably also know about the Athena software that is being developed to help people control money management. However, money management is a very confusing term. I looked it up in the internet and the only people who used it the way I was using it were the professional gamblers. Money management to other people seems to mean controlling your personal spending, giving money to others for them to manage, risk control, making the maximum gain, plus 1,000 other definitions. Thus, *to avoid confusion, I've elected to call this variable position sizing.* How big a position should you take for any one trade?

Would you want to focus on just one of those six variables? Or do you think that all six of them are important? When I ask the question in that manner, you probably agree that all six variables are important.

However, if you were to devote all of your energy into focusing on just one of those variables, which one would it be? Perhaps you think this question is a little naïve, since all of them are important. Nevertheless, there is a reason behind this question, so write your answer in the space below:

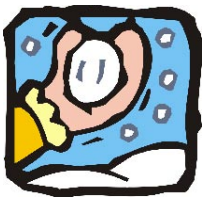
_____

_____

The reason I asked you to focus on one item is because most traders and investors often only focus on one of the six items in their day-to-day activity. Their focus tends to be on the need to be right. People are obsessed with it to the exclusion of all else. Yet if all six components are important to success, you can begin to understand how naïve it can be to just focus on being right.

The first three variables are part of what I call expectancy. Variable four stands on its own. The last two variables are part of position sizing.

The Snow Fight Metaphor



To illustrate the importance of all six variables, let me guide you through a metaphor that might give you a different perspective from one of just thinking about money and systems. Imagine that you are hiding behind a large wall of snow. Someone is throwing snowballs at your wall and your objective is to keep your wall as large as possible for maximum protection.

Thus, the metaphor immediately indicates that the size of the wall is a very significant variable. If the wall is too small, you couldn't avoid getting hit. Imagine standing behind a wall that is one inch tall, two inches wide, and six inches long? Would that wall give you much protection?

On the other hand, if the wall is massive, then you are probably not going to get hit. For example, imagine standing behind a wall that is six feet thick, 30 feet high, and 100 feet long. Would you feel safe? Probably so! Variable five, the size of your initial equity, is a little like the size of the wall. In fact, you

might consider your starting capital to be a wall of money that protects you. The more money you have, assuming the other variables stay the same, the more protection you will have.

Now imagine that the person throwing snowballs at you has two different kinds of snowballs—white snowballs and black snowballs. White snowballs are a little like winning trades. They simply stick to the wall of snow and increase its size. Now imagine the impact of having a lot of white snowballs thrown at you. They would simply build up the wall. It would get bigger and bigger and you would have more protection.

Imagine that black snowballs dissolve snow and make a hole in the wall equivalent to their size. You might think of black snowballs as being "anti-snow." Thus, if a lot of black snowballs were thrown at the wall, the wall would soon disappear or at least have a lot of holes in it. Thus, black snowballs are a lot like losing trades—they chip away at your wall of security.

Variable one, how often you are right, is a little like focusing on the percentage of white snowballs. You would naturally want all the snowballs coming to your wall to be white and add to your wall. It's probably easy for you to see how people, who don't focus on the big picture, might devote all of their attention into making as many snowballs as possible be white.

But let's consider the relative size of the two kinds of snowballs. How big are the white and black snowballs relative to each other? For example, imagine that the white snowballs are the size of golf balls, while the black snowballs are like six-foot diameter boulders. If that were the case, it would probably only take one black snowball to break down the wall—even if white snowballs were being thrown at the wall all day. On the other hand, if the white snowball were the size of a six-foot boulder, then one snowball each day would probably build up the wall enough to protect you from a continual bombardment of black snowballs the size of golf balls. The relative size of the two kinds of snowballs is equivalent to variable two in our model—the relative size of profits and losses. Hopefully, by visualizing the snow fight metaphor you can understand the importance of variable two.

Variable three, the cost of trades, is a little like assuming that each snowball has a slight destructive effect on the wall—regardless of whether it is white or black. Each white snowball has a slight destructive effect on the wall, hopefully less than its effect in building up the wall. Similarly each black snowball, destroys a little of the wall just by hitting it and this simply adds to the normal destructive effect of black snow upon the wall.

Clearly, the size of this general destructive force could have an overall impact on the outcome of the snowball fight. For example, imagine that the destructive effect of a snowball was equal to fifty percent of its size. This would be very difficult to overcome and even white snowballs could be dangerous. Now imagine that each snowball, no matter what its size, destroyed a cubic centimeter of snow. This would be easy to overcome. Are you beginning to understand the impact of cost?

Let's assume that our snowballs only come at the wall one at a time. After one hundred snowballs have hit the wall, the condition of your wall will depend upon the relative volume of white and black snow hitting the wall. In our model, you can measure the effectiveness of the snowball fight by the condition of the wall. If the wall is growing, it means that the total volume of white snow hitting the wall is greater than the total volume of black snow hitting the wall. And the growing wall is like growing profits. You'll feel more secure as it gets bigger. If the wall is shrinking, then it means that relatively more black, than white, snow is hitting the wall. Eventually, your wall will lose all of its protection and you will no longer be able to play the game.

The relative volume of white versus black snow hitting the wall is essentially the "snow fight" equivalent of expectancy. If relatively more black snow arrives, then the wall will shrink. If relatively more white snow arrives and if the destructive factor of the snowballs is not too great, then the wall will grow. The relative volume of white versus black snow depends both upon the percentage of white and black snowballs and upon the relative size of the two kinds of snowballs. However, the bottom line is the net amount of white or black snow impacting upon the wall.

In the real world of investing or trading, expectancy tells you the net profit or loss that you can expect over a large number of single unit[1] trades. If the total amount of money in the losing trades is greater than the total amount of money in the winning trades, then you are a net loser and have a negative expectancy. If the total amount of money in the winning trades is greater than the total amount of money in the losing trades, then you are a net winner and have a positive expectancy.

Notice that, in the expectancy model, you could have 99 losing trades, each costing you a dollar. Thus, you would be down $99. However, if

1 One share of stock or one futures contract would be a single unit.

you had one winning trade of $500, then you would have a net payoff of $401 ($500 less $99)—despite the fact that only one of your trades was a winner and 99% of your trades were losers. Let's also say that your cost of trading is $1 per trade or $100 per hundred trades. Thus, after 100 trades you would now have a net profit of $301. Are you beginning to understand why expectancy is made up of all of the first three variables? And just as the effect on the wall was the result of the net volume of black versus white snow, the effect on your equity is the result of the net profits minus the net losses.

Now let's continue our snow fight metaphor just a little further. Variable four is essentially the frequency at which snowballs are thrown. Let's say that the cumulative effect of 100 snowballs (white and black) is to add about 10 cubic inches of snow to the wall. Obviously, if a snowball is thrown once each minute, the impact will be 60 times greater than if a snowball is thrown once each hour. Thus, the rate at which snowballs are thrown will have a major impact on the status of the wall.[2]

The frequency of your trades will have a similar effect in the rate of change of your equity. If you make $500 net after 100 trades, then the amount of time it takes you to make those 100 trades will determine the growth of your account. If it takes you a year to make 100 trades, then your account will only grow by $500 per year. If you make 100 trades each day, then your account will grow by $10,000 per month (assuming 20 trading days per month) or $120,000 per year.

Which method would you want to trade: one that makes $500 per year or one that makes $120,000 per year?

The answer is obvious, but the methods could be exactly alike (i.e., in that both have the same expectancy). The only difference is the frequency of trading.

Based upon our discussion of the snow fight metaphor, which of the six variables do you think are most important now? Why? What is the basis of your conclusion? Hopefully, at this time you can see how important variables one through four are. These are the basis for expectancy and they determine the effectiveness of your trading system.

Variables 5 and 6—the money management or position sizing variables—are the most important factors in your overall profitability. You should already understand how important the size of the wall (variable 5) is in playing the game. If the wall is too small, then a few black snowballs could destroy it. It must be big for protection.

Let's look at variable six, the variable that tells you how much. Up to this point we've just assumed that our snowballs arrive at the wall one at a time. But imagine the impact of having snowballs arriving in large numbers at the same time. First, imagine the impact on the wall of one black snowball the size of a golf ball hitting the wall. It would make a single, golf-ball sized dent in the wall. Now, imagine 10,000 of them hitting the wall simultaneously. It totally changes the impact of your thinking, doesn't it?

The metaphor of 10,000 snowballs simply illustrates the importance of position sizing—that part of your system that tells you how much. We've been talking about one unit of size up to now—one snowball or one share of stock. 10,000 black snowballs the size of golf balls could totally demolish your wall unless the wall is massive.

Similarly, you might have a trading method that only loses a dollar per share of stock when it loses. However, when you purchase your stock in units of 10,000, your loss suddenly become enormous. It's now $10,000! Again, notice the importance of position sizing. If your equity is a million dollars, then a $10,000 loss is only one percent. But if your equity is just $20,000, then a $10,000 loss is 50%.

Does this model now make sense to you? I'd appreciate your feedback and any suggestions you might have to improve it.

2 This would seem to imply that if the cost of trading is factored in, it's better to trade more frequently than less frequently. While this assumption is true, it doesn't take into effect the psychological wear and tear that comes from frequent trading.

Reviewing the Basic Principle of Successful Trading: Positive Expectancy

by Chuck Branscomb

At the heart of all trading is the simplest of all concepts: the bottom-line results must show a positive mathematical expectancy in order for the method to be profitable. In this issue we will begin to explore again the details and some useful beliefs surrounding the concept of mathematical expectancy and other basic trading principles. Many readers have expressed frustration regarding their understanding of expectancy as it applies to them. Their frustrations have ranged from simply not understanding the basic concept to eliciting strong emotional responses related to their personal trading. Perhaps a personal story will prove useful. This will provide a look at my emotional experience just as I was first becoming involved in trading.

I recall first reading about the "expected return" of a trading method around 10 years ago in a book entitled, *The Futures Game*.[1] At that time I was just becoming interested in trading. I was attempting to apply all of my engineering skills to the world of trading since it was clear how "easy" this would be! I had a strong emotional block to thinking much about having significant numbers of losing trades (no need to pay attention to something that won't happen that much, right?). I also had an unresourceful reaction thinking about the potential size of my winning trade; I had the naïve trader's assumption that the winning trades would "all be big"—whatever "big" meant. I had been conditioned, by all of the smoke and mirrors advertising in this industry, into thinking that trading was easy. Therefore, I did not want to spend a lot of time trying to figure out all of this "expectation" stuff. I wanted to get on with trading to make great profits!

Functioning within this limited and naïve frame of reference, it was easy to fall prey to those emotions described above. I was not interested in trying to thoroughly test out my plans. I was caught up in trying to achieve "successful" trading. However, something in the back of my mind clicked when I read this material about expected returns. My engineer part knew that it was a very important aspect of trading, but I was at a loss to find much more information on how to answer all of my questions.

If you are in the beginning stages of looking into the subject of trading, recognize any tendency you may have to neglect fully learning the building blocks of profitable trading. It takes a significant amount of time and effort. Moreover, the payoff is typically far slower in coming than one would like—especially if you have fallen prey to the easy money infomercials, magazine adds and direct mail solicitations. In that case, realize that it may be difficult to actually find the building blocks of successful trading. All of the "easy money" advertising, most of which is fraudulent, tends to create the belief within us that it will not take much effort to make a dramatic amount of money. Most people require a very low level of "proof" that a method is either useful or not useful to them. Some selected best-case examples can easily fool many people into believing in a worthless trading method. Conversely, some selected worst-case examples can easily fool many into believing that a valid, positive expectancy method is totally worthless! If you do not fully understand your trading methodology, and if you have not mentally rehearsed all of the possible outcomes to develop your response, then it is very easy to fall into emotional traps when both the best case and worst case trades come along.

The Two Intrinsic Principles of Trading

Throughout the past two years of *Market Mastery*, we have provided a useful paradigm through which a system can be designed and tested. This paradigm contains two basic principles that have to be met for any trading to be successful. These basic principles include (1) a positive mathematical expectancy, and (2) sufficient opportunity (number of trades) to meet your objectives. A third principle that we have continually discussed is risk-based position sizing algorithms. Although this principle is not as fundamental as the other two, its use is highly conducive to obtaining consistent success in trading. To fully appreciate the basic utility of any of the above principles, consider trading with a method that uses the inverse of each.

Let's assume that we are trading a negative expectancy method. This means that over time we will continually lose money trading this method (our expected losses exceed our expected gains over time). No contest here—having a positive expectancy is clearly a mandatory requirement for trading. However, consider the possibility that you

1 The Futures Game – *Who Wins? Who Loses? Why*? Richard J. Teweles, Frank J. Jones. New York: McGraw-Hill Book Company, 1987.

may unknowingly trade a negative expectancy method for a significant amount of time prior to learning its true worth (systems with high percentage of winning trades but low average win/loss ratios generally fall into this category).

The second principle, opportunity, determines how often a trading opportunity occurs. We may have a great method, but if only one opportunity appears per year, we do not have much chance to achieve any trading objective over a reasonable amount of time. On the other end of the scale in opportunity is having too much—it is easy to fall prey to designing an intra-day system that trades too often to be successfully implemented in real time.

The third principle, risk-based position sizing, determines how each trade opportunity is implemented with respect to the amount of funds available. This principle allows for a consistent method of sizing the trading position with respect to the amount of equity in the account. It also relates the position size to the amount of market risk the trading system entry signal indicates. This principle is extremely useful in trading; however, it is not as critical[2] as the first two above. However, employing a risk-based position sizing algorithm will ensure that you never take on risk that is outside the objectives of your trading plan while also maintaining a consistent approach to sizing trading positions. With these guiding principles as our background, let's take a look at the subject of **expectancy** in more detail.

Mathematical Expectancy

Perhaps one of the reasons that most people have ignored the concept of expectation is that it continuously varies through time—just like all of the other parameters related to trading. Expectancy is simply the mean R-multiple of your trading system.

Notice that the expectancy contains no variable related to the frequency of trades. As we have pointed out before, the ***expectunity*** is actually what is most important (*expectunity is a word I created to describe this concept*). Recall that expectunity is the product of the expectancy times the opportunity. If two methods have the same expectancy, but one trades 10 times as often as the other, then the later method will generate far greater profits. Realize also that one method may be preferable to another even though it has a lower expectation (simply because it trades more often). The frequency of trades must always be measured as well as the expectancy.[3]

Risk-based Expectancy

Expectancy should be based on the risk taken in each trade. In order to base expectation on risk, we have to make an assumption about how we will size the trading positions. If we assume that all trades will be sized as a function of account equity and the system's entry risk, then we can view expectancy in this different, and perhaps more useful, manner. To accomplish this process, we have to use the concept of R-multiples.

Assume that we have a method that generated 10 trades with the following R-multiples: -1, -0.5, 2, 5, 1, -1, -1, -1, 4, 1. We would then calculate the expectancy over these ten trades by summing up all of the R-multiples and then dividing by the total number of trades. This gives us a value of 0.85. Notice that the units of expectancy are now in terms of R-multiples, so this value represents 0.85R as our expected value for each trade for this set of trades. The expectancy is positive and large in this example—it means that our expected return on each trade is 0.85 times our risk per trade. If we are risking 1.5% of equity per trade, then we can expect to return 1.275% per trade (1.5% * 0.85).

Note also in the above example how dependent the expectancy is on the number of marbles drawn from the bag. If we had only drawn the first two marbles, we would have calculated a negative expectancy. Let's contrast this to the "marbles" from a typical trend following system. Here we can usually limit our maximum initial loss to an R-multiple of –1.0. However, the maximum possible gain is large. If the market trend (as our system defines it) continues, then we could end up with an R-multiple of 20:1 or more. If we consider each and every trade as simply a marble being drawn from a bag, it is easy to see that the calculated value of the expectancy will continually vary over time. After a substantial number of trades (100+), the changes in the expected value will be smaller since any one trade has less effect on the calculated value. However, that does not mean that there will not be lengthy periods where the expectancy will be negative!

Every trading methodology has a negative expectation over given time periods. For example, simply measure the expectation of a method beginning with the time that the last equity peak occurred. For a period of time from the equity peak to past the drawdown trough, the calculated expectancy will be negative. For robust trend following models on large portfolios of assets, this time period can even last for a year or more!

2 Proper position sizing is essential to good performance. It is simply not as critical as the other two variables.
3 We are assuming here that the cost of trading, which goes up with each opportunity, is figured into the expectancy (i.e., subtracted from each gain and added to each loss).

Marble Game Example

Now let's look at an example of how expectancy varies over time using a marble game as an example. This marble bag has 100 total marbles that differ only in their color. The payoff ratios based on the initial risk for the marbles are as follows:

Number	Payoff Ratio
70	-1:1
10	1:1
7	5:1
5	10:1
5	20:1
3	30:1

Using the above formula, we can quickly calculate the true expectancy of this marble bag. That value is 2.15. This is an incredible expectancy since it means that each marble is "worth" 2.15 times the amount bet over many trials. You can imagine the difficulties in predicting what "many" means. If the first marble drawn is a 30:1 payoff, then its easy to fall into the trap of assuming that the marble bag is worth far more than it is. Conversely, if the first five marbles drawn are all minus 1 payoffs, then it's also perhaps even easier to think that this marble bag is worthless. In fact, this is usually what happens to the typical player of this game—they fall prey to their emotions and bet *against* the expected value of the bag. After all, this is a game where you only "*get to be right*" 30% of the time, so it is easy for most people to be drawn to the probability of being right as opposed to increasing their equity. Note that this bias is even more prevalent in actual trading with real money on the line.

Let's look at some results achieved with one string of 50 trades from this marble bag. For this trial, I drew one marble out, obtained its payoff, and then replaced it in the bag. The bag was well shaken between each successive draw. Figure 1 shows a graph of the expectancy as a function of the marble number. Notice how early on the expectancy varied greatly. As more and more marbles are drawn, the expectancy value tends to approach the calculated value. At the end of the fifty trials, the expectancy was 2.26 versus the calculated value of 2.15!

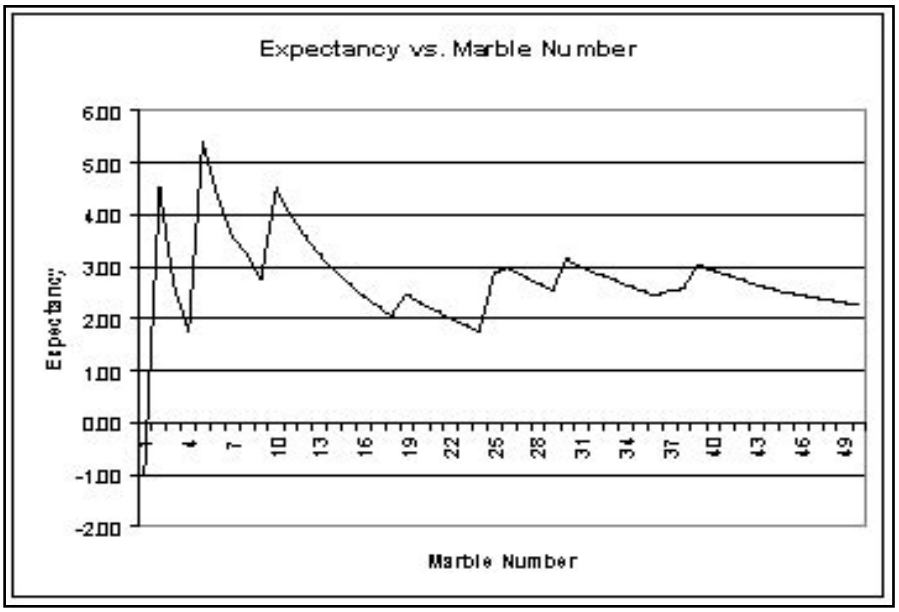


Figure one

During the fifty trials there were three lengthy runs of losers: two runs of six losses in a row and one run of eight losses in a row. The eight loss streak started at trade number 11. Let's take a look at what the expectancy looks like if we started trading at trade number 11. Remember that each and every marble draw is independent of what has happened in the past. Our marble drawing could have just as easily started at trade number 11.

Figure 2 shows a graph of the expectancy starting at trade number 11. Ten additional marbles (trades) were pulled from the marble bag so that we have the same number of trades as in Figure 1. Notice that for the first 10 trades, the expectancy is -1.0. Also notice that as more trades are drawn, the expectancy recovers and approaches the calculated value for the marble bag. At the end of fifty trades starting at the original marble number 11, the expectancy was 1.78, which is approaching 2.15. If we had continued to draw many more marbles from the bag, the expectancy value would slowly approach the calculated value.

Take the time to consider the vastly different impression one could obtain from these two results. Other than the starting point, there is absolutely no difference between the two trials. The same system with 80% of the trades in common generated the results shown in Figures 1 and 2.

In real trading, a system and markets combination will generate a vast range of potential variations in expectancy over short time intervals. Robust systems tend to revert to a mean expectancy range over time or they actually show an uptrend in expectancy over time. Non-robust systems tend to have an expectancy trend *in the negative direction*, yet they are sometimes very easy and

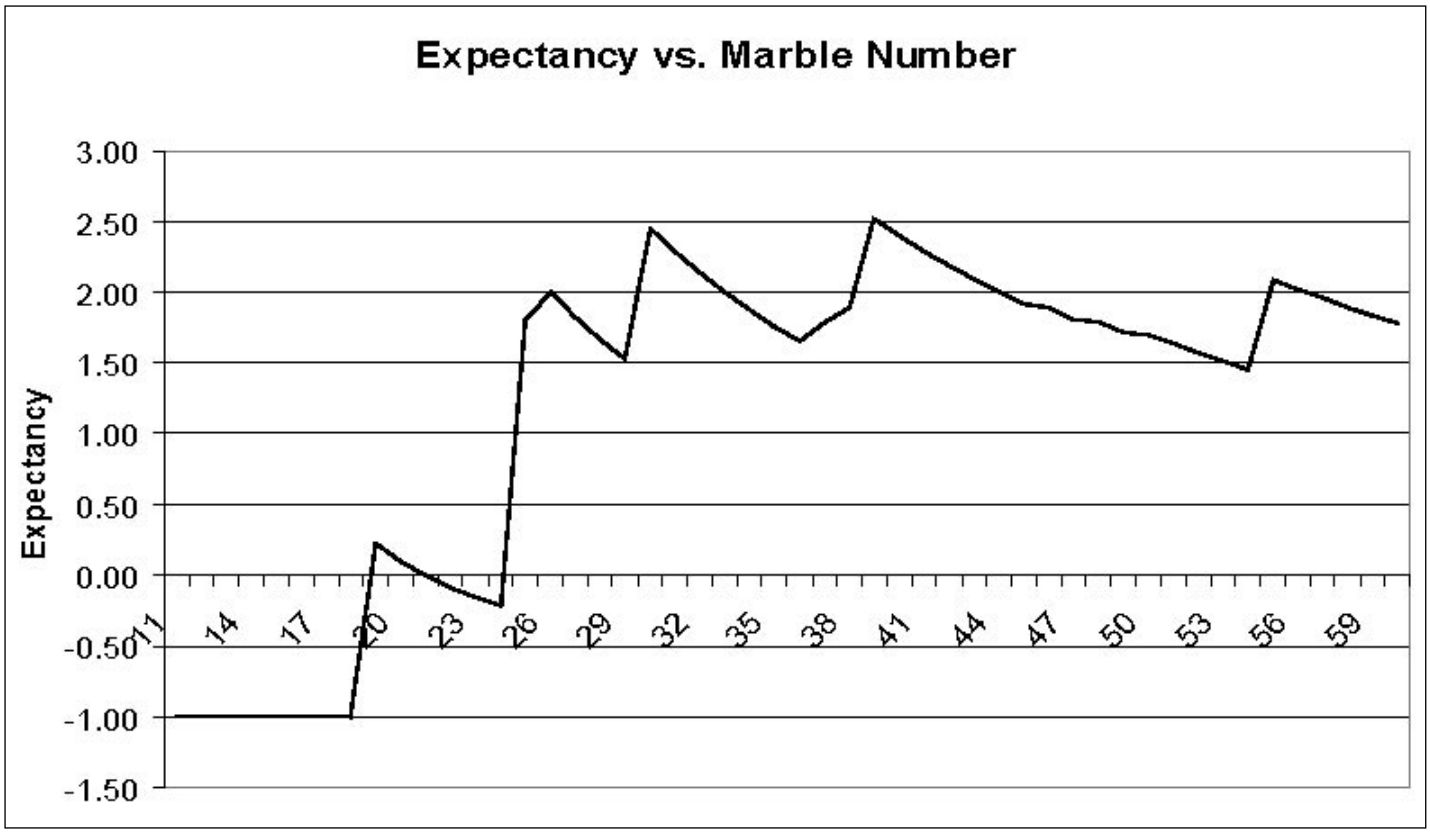


Figure 2

profitable to trade over short time periods.

I have a belief that the "easier" a system is to trade, the less robust that system is likely to be over the long haul. Consider how easy it would be to trade a system that wins 90% of the time. You would have long streaks of winning trades, and a streak of more than four losses in a row would hardly ever occur. You may trade a method like this for a significant amount of time prior to an unfortunate experience learning its true expectancy.

Consider a program designed to sell short options to collect the time premium. It is easy to design a method like this that can show perhaps 90% winning trades over a year or more of market action (particularly if you just consider one market). Of course all of the wins are relatively small compared to the potential for a large loss. However, the large loss occurs infrequently, so the method may lure one into a sense of success perhaps even to the point of really increasing the positions to take this "easy money out of the markets." Then the bomb hits—a huge market move occurs overnight when the short options cannot be hedged. Years of small profits and perhaps more disappear in a flash. Be wary of any highly profitable system with a high percentage (>70%) of winning trades. Chances are that one or more of the following is true: (1) the system was curve-fit to the data it was tested against; (2) the system has a negative expectancy over a realistic sample of market data for which it hasn't yet seen; or (3) post-dictive errors were made in the design of the system. (A post-dictive error occurs when a system accesses data for a future time period such as, "Buy the open today if the close today is greater than the open").

Real System Expectancy

When evaluating real trading systems, it quickly becomes clear that ***the biggest variable in the whole equation is the input data—the markets***. Consider the options system described above. Prior to the 1987 stock market crash, many traders had years of actual trading results using systems like that one on stock index options. Their volatility models had no history of the massive increase in implied volatility that was to occur. In fact, many of these models indicated *historic opportunities* to open large, new positions selling short index option volatility the Friday prior to the crash. On the following Monday, some traders not only lost on the trade, but they lost everything they ever made trading plus everything they were worth financially and more.

Tom Basso has always said that the more you understand your trading method the less testing you have to

do. This is actually a very profound statement that has great depth behind it. One major goal of a system should be to design the method such that the impact of any one trade is minimal even in the worst-case scenario. This type of system is easy to design as long as you can have some assurance of getting out of losing trades at, or reasonably close to, your initial exit. In the trend following system examples we have covered in the past two years, all of the initial exits were very wide—either three times the average true range or a 17-day opposite extreme. The larger the number of market points that make up 1R of risk, the less impact slippage through the intended exit has on your results. You need to develop a high degree of confidence that essentially all of your losing trades can be exited without a serious impact to the long-term results. The short options system described above could have incurred a loss that is 100 times or more its average win amount. These types of systems are the most prone to destroying your account and ability to trade as their negative expectancy nature is realized all at once. Traders who were selling short those index options on that Friday did not truly understand their methods—until that next Monday.

An additional factor to consider when pondering the topic of expectancy and markets is that the future will not contain what is in your historical data. This is where the fallacy of suggesting that 30 trades is somehow meaningful statistically, comes to light. In reality, the minimum number of trades to consider is likely in the hundreds prior to being able to roughly outline the future performance of a system.

William Eckhardt suggests in *The New Market Wizards*[4] that price changes probably have an infinite variance. This means that the average of price change over time continually grows in value. I have not found anything in my experience with trading system design and actual trading to contradict this assumption. Robust trading system returns reflect this property by capturing R-multiples that are greater than any that existed in the historical data. Since my trend following model went into live trading over three years ago, there have been numerous instances where the historical data for a given market have been exceeded. For example, the first two trades that it took in one market during 1995 generated bigger R-multiples than in the entire history for that market.

Wrap Up

We have discussed how the traditional definition of expectancy is limited by using averages and not being based on risk. By defining the ***expectancy*** as being the summation of all the R-multiples divided by the total number of trades, we now arrive at an expectation that is anchored in market risk. Furthermore, if we implement a %risk position-sizing algorithm on the system, we can then consistently apply the system to our account and the markets to realize the expectancy over the long term. We also discussed how the expectancy is a continually varying value that is a strong function of the action of the markets the system is trading. However, a robust, positive expectation model should show a mean reverting or growing expectancy over time.

4 The New Market Wizards. Jack Schwager. New York: Harper-Collins Publishers, Inc., 1992.