SPECIAL REPORT ON MONEY MANAGEMENT

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International Institute of Trading **Mastery, Inc.**
519 Keisler Dr., Ste 204,
Cary, NC 27511
(919) 852.3994
(9 19) 852-3942
Internet http://www.iitm.com

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Perhaps the greatest secret to top trading and investing success is appropriate money management. I call it a "secret" because few people seem to understand it, including many people who've written books on the topic. Some people call it risk control, others call it diversification, and still others call it how to "wisely" invest your money. However, the money management that is the key to top trading and investing simply refers to the algorithm that tells you "how much" with respect to any particular position in the market.

There are many psychological biases that keep people from practicing sound money management. In addition, there are also practical considerations, such as not understanding money management or not having sufficient funds to practice sound money management.

I've written this special report to give you an overall understanding of the topic and show you various models of money management. Enjoy the journey its potentially the most profitable journey you will ever take. The material is quite complex, despite an attempt to make it simple. However, you'll find it well worth your while to go through all the examples until you have mastered it

Van K. Tharp, Ph.D.

Van K. Tharp, Ph.D.
COURSE UPDATE
YOUR PERFORMANCE TRADING EDGE

Special Report on Money Management - Part I

John was a little shellshocked over what had happened in the market over the last three days — he'd lost 70% of his account value. He was shaken, but still convinced that he could make the money back! After all, he had been up almost 200% before the market withered him down, He still had $4,500 left in his account. What advice would you give John?

Your advice should be, "get out of the market immediately. You don't have enough money to trade speculatively." However, the average person is usually trying to make a big killing in the market, thinking that he or she can turn a $5,000 to $10,000 account into a million dollars in less than a year. While this sort of feat is possible, the chances of ruin for anyone who attempts it is almost certain.

Ralph Vince did an experiment with forty Ph.D.s. He ruled out doctorates with a background in statistics or trading. All others were qualified. The forty doctorates were given a computer game to trade. They started with $10,000 and were given a 100 trials in a game in

which they would win 60% of the time. When they won, they won the amount of money they risked in that trial. When they lost, they lost the amount of money they risked for that trial.

This is a much better game than you'll ever find in Las Vegas. Yet guess how many of the Ph.D's had made money at the end of 100 trials? When the results were tabulated, only two of them made money. The other 38 lost money. Imagine that! 95% of **them lost money playing a game in which the odds of winning were better than any game in Las Vegas.** Why? The reason they lost was their adoption of the gambler's fallacy and the resulting poor money management.

Lets say you started the game risking $1,000. In fact, you do that three times in a row and you lose all three times — a distinct possibility in this game. Now you are down to $7,000 and you think, "I've had three losses in a row, so I'm really due to win now." That's the gambler's fallacy because your chances of winning are still just 60%. Anyway, you decide to bet $3,000 because you are so sure you will win. However, you again lose and now you only have $4,000. Your chances of making money in the game are slim now, because you must make 150% just to break even. Although the chances of four consecutive losses are slim — .0256 — it still is quite likely to occur in a 100 trial game.

Here's another way they could have gone broke. Lets say they started out betting $2,500. They have three losses in a row and are now down to $2,500. They now must make 300% just to get back to even and they probably won't be able do that before they go broke.

In either case, the failure to profit in this easy game occurred because the person risked too much money. The excessive risk occurred for psychological reasons — greed, the failure to understand the odds, and, in some cases, even the desire to fail. However,

mathematically their *losses occurred because they were risking too much money.*

What typically happens is that the average person comes into most speculative markets with too little money. An account under $50,000 is small, but the average account is only $5,000 to $10,000. As a result, these people are practicing poor money management just because their account is too small. Their mathematical odds of failure are very high just because of their account size.

Drawdowns	Gain to Recovery
5 Percent	5.3% Gain
10 Percent	11.1% Gain
15 Percent	17.6% Gain
20 Percent	25% Gain
25 Percent	33% Gain
30 Percent	42.9% Gain
40 Percent	66.7% Gain
50 Percent	100% Gain
60 Percent	150% Gain
75 Percent	300% Gain
90 Percent	900% Gain

Table **1 • Recovery after Drawdowns**

Look at Table 1. Notice how much your account has to recover from various sized drawdowns in order to get back to even. For example, losses as large as 20% don't require that much of a corresponding gain to get back to even. But a 40% drawdown requires a 66.7% gain to breakeven and a 50% drawdown requires a 100% gain. Losses beyond 50% require huge, improbable gains in order to get back to even. As a result, when you risk too much and lose, your chances of a full recovery are very slim.

Managing Other People's Money

In the futures industry, when an account goes down in value, it's called a drawdown. Suppose you open an account for $50,000 on August 15th. For a month and a half, the account goes straight up. On September 30th, it closes at a high of $80,000 for a gain of 60%. At this point, you may still be in all of the same trading positions. But as a professional, your account is "marked to the market" at the end of the month and statements go out to your clients indicating what their respective accounts are worth.

Now, let's say that your positions start to go down in value around the 6th of October. You close them out around the 14th of October and your account is now worth about $60,000. Let's say, for the sake of discussion, that your account at the end of October is worth $60,000. Essentially, you've had a peak-to-trough drawdown (peak = $80,000, trough = $60,000) of $20,000 or 25%. This may have occurred despite the fact that all of your trades were winners. It doesn't really matter as far as clients are concerned. They still believe that you just lost $20,000 (or 25%) of their money.

Let's say that you now make some losing trades. Winners and losers, in fact, come and go so that by August 30th of the following year, the account is now worth $52,000. It has never gone above $80,000, the previous peak. Thus, you now have a peak-to-trough drawdown of $28,000 — or 35%. As far as the industry is concerned, you have an annual rate of return of 4% (i.e., the account is only up by $2,000) and you are labeled as having a 35% peak-to-trough drawdown. And the ironic thing is that most of the drawdown occurred at a time in which you didn't have a losing trade — you just managed to give back some of your profits. Nevertheless, you are still

considered to be a terrible money manager. Money managers typically have to wear the label of the worst "peak-to-trough" drawdown that they produce for their clients for the rest of their lives.

Think about it from the clients viewpoint — you watched $28,000 of your money disappear, To you its a ***real loss. You*** could have asked for your money on the first of October and been $28,000 richer.

Trading performance, as a result, is best measured by one's reward-to-risk ratio. The reward is usually the compounded annual rate of return, In our example, it was 4% for the first year. The risk is considered to be the peak-to-trough drawdown which in our example was 35%. Thus, this traders reward-to-risk ratio was 4/35 or 0.114 — a terrible ratio.

Typically, you want to see ratios of 2 or better in a money manager. For example, if you had put $50,000 in the account and watched it rise to $58,000, you would have an annual rate of return of 16%. Let's say that when your account reached 553,000, it had drawdown to $52,000 and then went straight up to $58,000. That means that your peak-to-trough drawdown was only 0.0189 (i.e., $1,000 drawdown divided by the peak equity of $53,000). Thus, the reward-to-risk ratio would have been a very respectable 8.5. People would flock to give you money with that kind of ratio.

Let's take another viewpoint and assume that the $50,000 account is your own. How would you feel about your performance in the two scenarios? In the first scenario you made $2,000 and gave back 528,000. In the second scenario, you made $7,000 and only gave back $1,000.

Lets say that you are not interested in 16% gains. You want 40-50% gains. In the first scenario you had a 60% gain in a month and a half. You think you can do that several times at year. And you're

willing to take the chance of giving all or most of it back in order to to that. You wouldn't make a very good money manager, but you might be able to grow your own account at the fastest possible rate of return if you could "stomach" the drawdowns.

Both winning scenarios, plus numerous losing scenarios, are possible using the same trading system. You could aim for the highest reward-to-risk ratio. You could aim for the highest return. Or you could be very wild, like the Ph.D.'s in the Ralph Vince game and lose much of your money by risking too much on any given trade.

Interestingly enough, a research study (Brinson, Singer, and Beebower, 1991) has shown that money management (called asset allocation in this case) explained 91.5% of the returns earned by 82 large pension plans over a ten year period. The study also showed that investment decisions by the plan sponsors pertaining to both the selection of investments and their timing, accounted for less than 10% of the returns. *The obvious conclusion is that money management is a critical factor in trading and invesfment decision making.*

You now understand the importance of money management. Lets now look at various money management models, so that you can see how *money* management works. Many of the examples given are in the futures market. However, the models apply equally well to any investment. When the example says *contract* or *unit* or 100 *shares,* the meaning, for all practical purposes, is the same.

Money Management Defined

In my opinion, money management is the most significant part of any trading system. Many professionals, and most amateurs, do not understand how important it is. In fact, I recently attended a seminar for stock brokers that detailed a particular method of investing that they could use to help their clients. While the seminar as a whole was terrific, the topic of money management, as I've defined it here, was not even covered. One speaker did talk about money management, but I could not fit what he was talking about into this discussion at all. At the end of his talk, I asked him, "What do you mean by money management?" His response was, "That's a very good question. I think it's how one makes trading decisions."

Since money management is the difference between poor performance and great performance — the difference between going broke and being a successful professional — it's important that I define it right now. Please take note.

> **Money management is that portion of your trading system that tells you "how many" or "how much." How many units of your investment should you put on at a given time? How much risk should you be willing to take? Aside from your personal psychological issues, this is the most critical concept you need to tackle as a trader or investor.**

The concept is critical because the question of "how much" determines your loss potential and your profit potential. In addition, you need to spread your opportunity around into a number of different

investments or products. Equalizing your exposure over the various trades or investments in your portfolio gives each one an equal chance of making you money.

I was intrigued when I read Jack Schwager's ***Market Wizards*** in which he interviews some of the world's top traders and investors. Practically all of them talked about the importance of money management. Here are a few sample quotes:

> *"Risk management is the most important thing to be well understood. Undertrade, undertrade, undertrade is my second piece of advice. Whatever you think your position ought to be, cut it at least in half"* — Bruce Kovner

> *"Never risk more than 1% of your total equity in any one trade. By risking I %, I am indifferent to any individual trade. Keeping your risk small and constant is absolutely critical."* — Larry Hite

> *"You have to minimize your losses and try to preserve capital for those very few instances where you can make a lot in a very short period of time. What you can't afford to do is throw away your capital on suboptimal trades."* — Richard Dennis

Professional gamblers play low expectancy, or even negative expectancy, games. They simply use skill and/or knowledge to get a slight edge. These people understand very clearly that money management is the key to their success. Money management for gamblers tends to fall into two types of systems — martingale and anti-martingale systems.

Martingale systems increase winnings during a losing streak. For example, suppose you were playing red and black at the roulette wheel. Here you are paid a dollar for every dollar you risk, but your

odds of winning are less than 50% *on* each trial. However, with the martingale system you think you have a chance of making money through money management. The assumption is that after a string of losses you will eventually win. And the assumption is true — you will win eventually. Consequently, you start with a bet of one dollar and double the bet after every loss. When the ball falls on the color you bet, you will make a dollar frbm the entire sequence of wagers.

The logic is sound. Eventually, you will win and make a dollar. But two factors work against you when you use a martingale system. First, long losing streaks are possible, especially since the odds are less than 50% in your favor. For example, one is likely to have a streak of 10 losses in a row in a 1,000 trials. In fact, a streak of 15 or 16 losses in a row is quite probable. By the time you have reached **ten in a** *row,* you would be betting $2,048 in order to come out a dollar ahead. If you lose on the eleventh throw, you would have lost $4,095. Your reward-to-risk ratio is now 1 to 4095.

Second, the casinos place betting limits. At a table where the minimum bet was a dollar, they would never allow you to bet much over $50 or $100. As a result, martingale betting systems, where you risk more when you lose, just do not work.

Antimartingale systems, where you increase your risk when you **win, do work.** Smart gamblers know to increase their bets, within certain limits, when they are winning. And the same is true for trading or investing. Money management systems that work call for you to increase your position size when you make money. That holds for gambling and for trading and for investing.

The purpose of money management is to tell you how many units (shares or contracts) you are going to put on, given the size of your account. **For example, a money management decision might be that you don't have enough money to put on any positions**

because the risk is too big. It allows you to determine your reward and risk characteristics by determining how many units you risk on a given trade and in each trade in a portfolio. It also helps you equalize your trade exposure in the elements in your portfolio.

Some people believe that they are "managing their money" by having a "money management stop." Such a stop would be one in which you get out of your position when you lose a predetermined amount of money — say $1000. However, *this kind of stop does not tell you "'how much" or 'how many," so it really has nothing to do with money management.* Controlling risk by determining the amount of loss if you are stopped out is not the same as controlling risk through a money management model that determines the size of your position.

There are numerous money management strategies that you can use. In the remainder of this update, you'll learn different money management strategies that work well. Some are probably much more suited to your style of trading or investing than others. Some work best with stock accounts, while others are designed for a futures account. **All of them are anti-martingale strategies in that your position size goes up as your account size grows.**

The material is somewhat complex. However, I've avoided the use of difficult mathematical expressions and given clear examples of each strategy. As a result, you simply need to read the material carefully and go over it until you understand it.

Money Management Models

All of the models you'll learn about in this report relate to the amount of equity in your account. These models can suddenly become much more complicated when you realize that there are three methods of determining equity. Each method can have a different impact upon your exposure in the market and on your returns. These methods include the core equity method, the total equity method, and the reduced total equity method.

The **Core Equity Method** is simple. When you open a new position, you simply determine how much you would allocate to that position according to your money management method. Thus, if you had four open positions, your core equity would be your starting equity less the amount allocated for each of the open positions.

Let's assume you start with an account of $50,000 and you allocate 10% per trade. You open a position with $5,000 money management allocation, using one of the methods described below. You now have a core equity of $45,000. You open another position with a $4,500 money management allocation, so you have a core equity of $40,500. You open a third position with an allocation of $4,050, so that your core equity is now $36,450. Thus, you have a core equity position of $36,450 plus three open positions. **In other words, the core equity method subtracts the initial allocation of each position and then makes adjustments when you close that position out.** New positions are always allocated as a function of your current core equity.

The **Total Equity Method** is also very simple. The value of your account equity is determined by the amount of cash in your account

plus the value of any open positions. For example, suppose you have $40,000 in cash plus one open position with a value of $15,000, one open position worth $7,000, and a third open position that has a loss of $2,000. **Your total equity is the sum of the value of your cash plus the value all of your open positions.** Thus, your total equity is **$60,000.**

The **Reduced Total Equity Method** is a combination of the two methods above. It is like the core equity method in that the exposure allocated when you open a position is subtracted from the starting equity. However, it is different in that you also add back in any profit or reduced risk that you would receive when you move a stop in your favor. Thus, **your reduced total equity is your core equity plus the profit of any open positions that are locked in with a stop or the reduction in risk that occurs when you raise your stop.** (Note: This is sometimes called the Reduced Core Equity Method. However, that title doesn't make any sense to me, so I've renamed it to one that does.)

Here's how that works. Suppose you have a $50,000 account. You open a position with a $5,000 money management allocation. Thus, your core equity (and reduced total equity) is now $45,000. Now suppose the underlying commodity moves up in value and you have a trailing stop. Today, you only have $3,000 in risk locked because of your new stop. As a result, your reduced total equity today is $50,000 less your new risk exposure, or $47,000.

The next day, the value drops by $1,000. Your reduced total equity is still $47,000 since the risk to which you are exposed if you get stopped out is still $47,000. It only changes when your stop changes to reduce your risk, lock in more profit, or close out a position.

You now buy a second position, with a $4,000 money management allocation. The value of the first position moves up and you now lock in $11,000 worth of profit by moving up your stop. Your reduced total equity is now $50,000 minus the initial allocation of your second position ($4,000) plus the locked in profit of $11,000 on the first position. The resulting new value is $57,000.

The models below all size positions according to your equity. Thus, each model of calculating equity will lead to different position sizing calculations. Generally, I'll refer to the total equity method of calculating equity unless otherwise stated in the discussions of each of the models that follow.

Model 1 — Units per Fixed Amount of Money

Basically, this method tells you "how much" by determining that you will trade one unit for every X dollars you have in your account. For example, you might trade one contract per $50,000 of your total equity.

When you started trading or investing, you probably never heard about money management. If you knew something about it, your knowledge probably came from some book by an author who didn't understand it either. Most books that discuss money management are about diversification or about optimizing the gain from your trading. Books on systems development or technical analysis don't even begin to discuss money management adequately. As a result, most *traders* and *investors* have no *place to go to learn what is probably the most important aspect of their craft*.

Thus, armed with your ignorance, you open an account with $20,000 and decide to trade one contract of everything in which you get a signal to trade (an investor might just trade 100 shares). Later, if you're fortunate and your account moves to $40,000, you decide to move up to two contracts (or 200 shares) of everything. As a result, most traders who do practice some form of money management use this model. It is simple. It tells you "how much" in a straight-forward way.

The one unit per fixed amount of money has one advantage in that you never reject a trade because it is too risky. Let me give you an example of a recent experience of two CTAs I know. One trades one contract per $50,000 in equity, while the other limits his risk to 3% of equity and won't open a position in which his exposure is more than

that. Recently, each was presented with an opportunity to trade the Japanese Yen contract. The person trading one contract, no matter what, took the trade. The subsequent move in the Yen was tremendous, so this person was able to produce the biggest monthly gain that his firm had ever experienced in their history — a monthly 20% gain.

On the other hand, the other trader couldn't take the trade, even though his account size was $100,000, because the risk involved if the trade went against him exceeded his 3% limit. The second trader didn't have a profitable month.

Of course, this also works in reverse. The first trader could have taken a large loss if the Yen trade had gone against him which the other trader would have avoided.

In presenting the results of all these systems, I've elected to use a single trading system, trading the same commodities over the same time period. The system is a 55-day channel breakout system. In other words, it enters the market on a stop order if the market makes a new 55-day high (long) or 55-day low (short). The stop, for both the initial risk and profit taking, is a 21-day trailing stop on the other side of the market.

To illustrate, if you go long and the market hits a 21-day low, you exit. If you are short and the market makes a new 21-day high, you exit, This stop is recalculated each day, and it is always moved in your favor so as to reduce risk or increase your profits. Such breakout systems produce above average profits when traded with sufficient *money.*

This system was tested with a million dollars *in* start-up equity with a basket of 10 commodities in the years 1981 through 1991. Whenever data are presented in this report, it is based upon this same

55/21-day **breakout system tested over the same commodities over the same years. The only difference between the tables is the money management model used. Table 2 shows the results with this system using the first money management model.**

1 contract per $X in equity	Profits	Rejected Trades	Annual % Gain	Margin Calls	Maximum Drawdown
$100,000)	$5034,533	0	18.20%	0	36.86%
890,000	56,207208	0	20.20%	0	40.23%
$80,000	$7.,725,361	0	22.30%	0	43.93%
$70,000	$10,078,968	0	25.00%	0	48.60%
$60,000)	$13,539,570	0	28.20%	0	54.19%
$50,000	$19,309,155	0	32.30%	0	61.04%
$40,000	$27,475,302	0	36.50%	0	69.65%
$30,000	$30,919,632	0	38.00%	0	80.52%
$20,000	($1,685,271)	402	0%	1	112.00%

Table 2:
55/21 Day Breakout System with 1 contract per $X in equity
(Starting Equity is One Million Dollars)

Notice that the system breaks down at one contract per $20,000 in equity. At $30,000, you'd have to endure an 80% drawdown and you'd have to have at least $70,000 if you wanted to avoid a 50% drawdown.

To really evaluate this money management method, you'll have to compare it with the tables developed from the other models (see Tables 3 and 5).

Despite its advantage of allowing you to always take a position, I believe that the one unit per fixed dollars type of money management is limited, because 1) all investments are not alike and 2) it does not allow you increase your exposure very rapidly with small amounts of money. In fact, with a small account, the "units per fixed amount model" amounts to minimal money management. Lets explore both of these reasons.

All contracts are not alike. Suppose you are a futures trader and you decide you are going to be trading up to twenty different commodities with your $50,000. Your basic money management strategy is to trade one contract of anything in that portfolio that gives you a signal. Lets say you get a signal for both bonds and corn. Thus, your money management says you can buy one corn contract and one bond contract.

With T-bonds futures at $112 as of August 1995, you are controlling $112,000 worth of product. In addition, the daily range (i.e., the volatility) is about 0.775 so if the market moved three times that amount in one direction, you would make or lose $2,325. In contrast, with the corn contract you are controlling about $15,000 worth of product. If it moved three daily ranges with you or against you, your gain or loss would be about $550. Thus, what happens with your portfolio will depend about 80% on what bonds do and only about 20% on what corn does.

One might argue that corn has been much more volatile and expensive in the past. That could happen again. But you need to diversify your opportunity according to what's happening in the market right now. Right now, based on the data presented, corn has about 20% of the impact on your account that bonds would have.

Cannot increase exposure rapidly. The purpose of an antimaringale strategy is to increase your exposure when you are winning. When you are trading one contract per $50,000 and you only have $50,000, you will have to double your equity before you can increase your contract size. As a result, this is not a very efficient way to increase exposure during a winning streak. In fact, for a 550,000 account it almost amounts to no money management.

Part of the solution would be to require a minimum account size of a million dollars. If you did that, your account would only have to

increase by 5% before you moved from 20 contracts (1 per $50,000) to 21 contracts.

One reason to have money management is to have equal opportunity and equal exposure across all of the elements in one's portfolio. You want an equal opportunity to make money from each element of your portfolio. In addition, you also want to spread your risk equally among the elements of your portfolio.

Having equal opportunity and exposure to risk, of course, makes the assumption that each trade is equally likely to be profitable when you enter into it. You might have some way to determine that some trades are going to be more profitable than others. If so, then you would want a money management plan that gives you more units on the higher-probability-of-success trades — perhaps a discretionary money-management plan. However, for the rest of this update, we're going to assume that all trades in a portfolio have an equal opportunity of success from the start. That's why you selected them.

The "units per fixed amount of money" model, in my opinion, doesn't give you equal opportunity or exposure. But there are a number of methods whereby you can equalize the elements of your portfolio. These include equating 1) the total value of each element of the portfolio; 2) the margin of each element in the portfolio; 3) the amount of volatility of each element in the portfolio; and 4) the amount of risk (i.e., how much you'd would lose when you got out of a position in order to preserve capital) of each element in the portfolio.

Model 2 — Equal Units /Equal Leverage Model

The **Equal Units Model** is typically used with stocks or other instruments which are not leveraged. The model says that you determine "how much" by dividing your capital up into five or ten equal units. Each unit would then dictate how much product you could buy. For example, with our $50,000 capital, we might have five units of $10,000 each.

Thus, you'd buy $10,000 worth of investment "A", $10,000 worth of investment "B", $10,000 worth of investment "C" and so forth. You might end up buying 100 shares of a $100 stock, 200 shares of a $50 stock, 500 shares of a $20 stock, 1000 shares of a $10 stock, and 1429 shares of a $7 stock. Part of the money management in this strategy would be to determine how much of your portfolio you might allocate to cash at any given time.

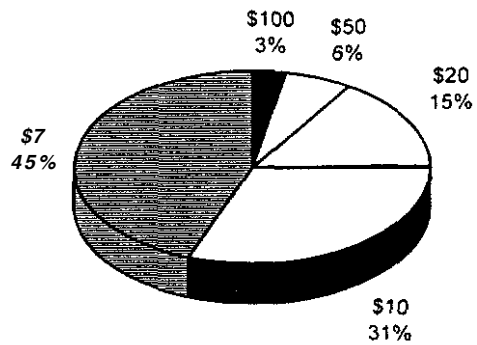

Chart 1: Distribution of Funds as Shares
(each unit represents $10,000)

Chart 1 simply illustrates the number of shares, as a percentage of total shares, for each of the five $10,000 units.

Notice that there is some inconvenience in this procedure. For example, the price of the stock may not necessarily divide evenly into $10,000 — much less into 100 share units.

In futures, the equal units model might be used to determine how much **value** you are willing to control with each contract. For example, with the $50,000 account you might decide that you are willing to control up to $250,000 worth of product. And lets say you arbitrarily decide to divide that into five units of $50,000 of each.

A bond contract is currently worth about $112,000. You couldn't buy any bonds, using this money management criterion, because you'd be controlling more product than you can handle with one unit.

Corn is traded in units of 5,000 bushels. A corn contract, with corn at $3 per bushel, is valued at about $15,000. Thus, your $50,000 would allow you to buy 3 units of corn or $45,000 worth.

Gold is traded in 100 ounce contracts in New York, which at a price of $390 per ounce, gives a single contract a value of $39,000. Thus, you could trade one gold contract with this model.

The **Equal Units Approach** allows you to give each investment or futures an approximate equal weighting in your portfolio. It also has the advantage in that you **can** see exactly how much leverage you are carrying. For example, if you are carrying 5 positions in your $50,000 account, each worth about $50,000, you would know that you had about $250,000 worth of product. In addition, you would know that you had about 5-to-1 leverage, since your $50,000 was controlling $250,000.

When you use this approach you must make a decision about how much total leverage you are willing to carry before you divide it into units. It's such valuable information, so I would recommend all traders

keep track of the total product value they are controlling and their leverage. This information can be a real eye opener.

The equal units approach still has the disadvantage in that it would only allow you to increase “how much” very slowly as you make money. In most cases with a small account, equity would again have to double to increase your exposure by one unit. Again, this practically amounts to “no” money management for the small account.

Model 3 -Percent of Margin

The third model one might use for money management is to control your size according to the margin requirements of the underlying assets. Here, margin refers to the amount of money that the exchange (or your broker) requires that you put up in order to purchase one investment unit. If you have less money in your account than the margin requirements, you'll need to add more money.

The margin on buying most stock is 50%. Thus, you would have to have $25,000 in your account to purchase $50,000 worth of stock. In contrast, the margin ***on one*** S&P futures contract is currently $11,250. Thus, you could purchase one S&P contract, controlling stock worth approximately $290,000 at today's (December 1995) price, with only $11,250 in your account. This would give you leverage of almost 25-to-1.

Since leverage can be so high with futures, you might want to control it by limiting your margin to a percentage of your equity. Here's how that would work. You might decide to limit your trades to 5% of margin. In a $50,000 account this would mean that the margin of your first purchase could be no more than $2,500.

The margin of your second purchase would depend on the equity model you were using. Lets say you have one open position worth $2,500 and $47,500 in cash. With the total equity model, your next purchase could also have a margin of $2,500 — 5% of the total. However, with the core equity model or the reduced total equity model, you could only acquire margin in the second position of $2,375 — 5% of $47.500.

Lets look at a few examples of additions using the Total Equity Model. Currently, the margin on corn is $675. When you divided $675 into your 5% level of $2,500, you get 3.7 contracts. Thus, you could buy 3 contracts. The margin on silver is currently $2500 so your 5% requirement would allow you to buy one contract. However, the margin on bonds is currently $2,700 so you couldn't buy a bond contract until you had increased your equity.

You might also limit the total margin of your account to some value such as 30%. If you did that, the margin on your total open positions could never total over $15,000 (i.e., 30% of your $50,000). If you wished to purchase a new position that would increase your total margin over that value, you could not do it.

Method three is the first method that allows the smaller account to begin to increase its exposure as it makes money. It gives you strong control over your account and some control over the probability of margin calls.

However, margin amounts can change daily for each contract, so you will have to keep track of them. In addition, the margin values are arbitrarily set by the exchanges and the brokerage houses. They tend to relate to both the volatility and the leverage in a particular contract, but the amount set is still quite arbitrary. As a result, the margin method of money management doesn't necessarily give you equal exposure across all positions.

Model 4 — Percent Volatility

Volatility refers to the amount of daily price movement of the underlying instrument over an arbitrary period of time. It's a direct measurement of the price change that you are likely to be exposed to — for or against you — in any given position. If you equate the volatility of each position that you take, by making it a fixed percentage of your equity, then you are basically equalizing the possible market fluctuations of each portfolio element to which you are exposing yourself in the immediate future.

Volatility, in most cases, simply is the difference between the high and the low of the day. If IBM varies between 115 and 117½, then its volatility is 2.5 points, However, using an average true range takes into account any gap openings. Thus, if IBM closed at 113 yesterday, but varied between 115 and 117% today, you'd need to add in the 2 points in the gap opening to determine the true range. Thus, today's true range is between 113 and 117% or 4% points.

Here's how a percent volatility calculation might work for money management. Supposed that you have $50,000 in your account and you want to buy gold. Let's say that gold is at $400 per ounce and during the last ten days the daily range is $3.00. We will use a 4-day simple moving average of the average true range as our measure of volatility. How many gold contracts can we buy?

Since the daily range is 53.00 and a point is worth $100 (since the contract is for 100 ounces), that gives the daily volatility a value of $300 per gold contract. Let's say that we are going to allow volatility to be a maximum of 2% of our equity. Two percent of $50,000 is $1,000. If we divide our $300 per contract fluctuation into our allowable limit of

$1,000, we get 3.3 contracts. Thus, our money management, based on volatility, would allow us to purchase 3 contracts.

Lets do one more example, using a total equity model. Gold is now $405 per ounce, so the value of our open position has increased our equity by $500 per contract or $1,500. Thus our total equity is now $51,500. We now want to buy a bond contract, Lately, bonds have been fluctuating by about 0.75 points per day. Thus, the dollar value of the daily fluctuation is $750 (0.75 times $1,000 per point). Our money management says to limit our risk to 2% of equity, and 2% of $51,500 is $1,030. The daily $750 fluctuation in bonds, divided into $1,030 works out to be 1.37, allowing us to buy one bond contract.

Notice that the daily fluctuation from bonds ($750) is about two and a half times the daily fluctuation in gold ($300). As a result, we've ended up with three gold contracts compared with only one bond contract. Thus, we can expect about the same amount of price fluctuation, in the short term at least, from both positions.

If you use volatility in your money management, you might also want to limit the total amount of volatility to which your portfolio is exposed at any one time. Five to ten percent is a reasonable number. Suppose, for example, that your exposure were 10%. Thus, you could have five positions, since your individual position limit is 2%. If all of your positions went against you at once in a single day, and you stayed in the market, it would mean that you could lose as much as ten percent of the value of your portfolio in a single day.

How would you feel if your $50,000 portfolio went down to $45,000 in a single day? If that's too much then 2% and 10% are probably too big for you.

you make money and conserve profits. It includes concepts like percent risk, group risk, making daily or hourly adjustments, optimal f, and playing the market's money. I would suggest that you study Part I until you really understand it before you move onto Part II.

Reference Notes for Part 1:

1. Brinson, Singer, and Beebower. Determinants *of Portfolio Performance II: An Update,* **Financial Analysts Journal, 47,** May-June, 1991, p 4049.

Special Report on Money Management - Part II

Money Management - Part II is a continuation of the money management series. Money management is that part of your trading system that tells you "how much" when you open a position in the market. Part I discussed three equity models: total equity, core equity, and reduced total equity. It also discussed four money management models: 1) the one unit per so much equity; 2) the leverage model; 3) the percent margin model; and 4) the percent volatility model. The four models can be combined with each of the equity models to produce 12 different money management models — even more if you combine them or add creative money management.

In Part II you'll learn five more money management models, giving you many additional ideas that could have a great impact on your bottom line profits. You'll also learn how to design a system using these models to fit your particular objectives. In addition, we'll also explore creative money management, so you can get some idea where you really need to focus your attention in system development.

Model 5 — Percent Risk

When you enter a position, it is essential to know that point at which you would get out in order to preserve your capital. This is your "risk." It's your worst case loss — except for slippage and a runaway market going against you.

One of the most common money management systems involves controlling position size as a function of this risk. Let's look at an example of how this money management model works. Suppose you want to buy gold at $380 per ounce. Your system suggests that if gold drops as low as $370, you need to get out. Thus, your worst case risk per gold contract is 10 points times $100/point or $1.000.

You have a $50,000 account. You want to limit your total risk on your gold position to 25% of that equity or $1,250. If you divide your $1,000 risk per contract into your total allowable risk of $1,250, you get 1.25 contracts. Thus, your money management using model 5 will only allow you to purchase one contract.

Suppose that you get a signal to sell short corn the same day. Gold is still at $380 an ounce, so your account with the open position is still worth $50.000. You still have $1,250 in allowable risk for your corn position based upon the total equity model.

Lets say that corn is at $3.03, and you decide that your maximum acceptable risk would be to allow corn to move against you by 5 cents to $3.08. Your 5 cents of allowable risk (times 5,000 bushels per contract) translates into a risk of $250 per contract. If you divide $250 into $1,250, you get 5 contracts. Thus, you can sell short 5 corn contracts within your money management paradigm.

In these examples, we've used a total equity model to calculate our risk, where total equity refers to the cash value of the account plus the value of all open positions. In contrast, lets see what would happen if we used a core equity calculation of risk. In the core equity model, the risk involved in open positions is subtracted from the cash value when those positions are opened and only the remaining cash value is used in subsequent calculations.

First, we purchased a gold contract and our total risk exposure in that contract was $1,000. In the core equity model, our new core equity is $1,000 less. Thus, we only have $49,000 left on which to base the risk for our next position in corn. Since our money management allows us to risk 2.5% of this core equity, we can risk $1225.

We now want to sell short corn with a risk of $250 per contract. If you divide $250 into $1,225 you get 4.9 contracts. Thus, the core equity model would only allow you to sell short 4 corn contracts. Notice that to be conservative and not exceed our parameters, we always round down to the nearest whole unit.

Lets say that your next purchase of corn isn't the same day. You get your signal six weeks into the future. You still have an open position in gold, but now gold is $490 per ounce. Thus, your open position is worth $11,000. As a result, your total equity is now $50,000, plus the value of the open position, or $61,000.

If you are using the total equity model, you can now risk 2.5% of $61,000. Therefore, you could now risk $1525. If the corn signal occurred with $250 risk per contract, your money management would now permit you to sell short 6.1 ($1525 divided by $250) contracts. In contrast, the core equity model would still be based upon $49,000 and would only allow you to sell short the same 4 contracts of corn.

Obviously, of the three equity models, the core equity model is the most conservative. Reduced total equity ranks in the middle, and the total equity model is the most risky model.

How does the percent risk money management compare with the percent volatility money management discussed in the last issue? Table 4 shows the 55/21-day breakout system (used as an illustration in Tables 2 and 3) with a money management algorithm based upon risk as a percentage of equity. The starting equity is again $1,000,000.

% Risk	Net Profits	Rejected Trades	Gain per Year	Margin Calls	Maximum Drawdown	Ratio
0.10%	$327	410	0.00%	0	0.36%	0
0.25%	$80,685	219	0.70%	0	2.47%	0.28
0.50%	$400.262	42	3.20%	0	6.50%	0.49
0.75%	$672,717	10	4.90%	0	10.20%	0.48
1.00%	$1,107,906	4	7.20%	0	13.20%	0.54
1.75%	$2,776,044	1	13.10%	0	22.00%	0.6
2.50%	$5.621.132	0	19.20%	0	29.10%	0.66
5.00%	$31.620.857	0	38.30%	0	46.70%	0.82
7.50%	$116.500.000	0	55.70%	0	62.20%	0.91
10.00%	$304,300,000	0	70.20%	1	72.70%	0.97
15.00%	$894,100,000	0	88.10%	2	87.30%	1.01
20.00%	$1,119,000,000	0	92.10%	21	84.40%	1.09
25%	$1,212,000,000	0	93.50%	47	83.38%	1.12
30.00%	$1,188,000,000	0	93.10%	58	95.00%	0.98
35.00%	($2,816,898)	206	0.00%	70	104.40%	0

Table 4: 22:21 Breakout System with Risk Money Management

If you compare Table 4 with Table 3 from Money Management Part I, you'll notice the striking difference in the percentages at which the system breaks down. These differences are the result of the size of the number (i.e., the current 21-day extreme against you versus the 20-day volatility) that you must take into consideration before using the

equity percentages to size positions. Thus, a 5% risk based upon a stop of the 21 day extreme appears to be equivalent to about 1% of equity with the 20 day average true range. **These numbers, upon which the percentages are based, are critical.** They must be considered before you determine the percentages you plan to use to size your positions.

Notice that the best reward-to-risk ratio occurs at about 25%, but you would have to tolerate an 84% drawdown in order to achieve it. In addition, margin calls (which are set at current rates and not historicatlv accurate) start entering the picture at 10% risk.

If you traded this system with $1,000,000 and used a 1% risk, your bet sizes would be equivalent to trading the $100,000 account with 10% risk. Thus, Table 4 suggests that you probably should not trade this system unless you had at least $100,000 and then you probably should not risk more than about ½% per trade. And at ½%, your returns with the system would be very poor.' Essentially, you should now understand why you need at least a million dollars to trade this system.

Just how much risk should you accept per position with risk money management? **Your overall risk using risk money management depends upon the size of the stops you've set to preserve your capital and the expectancy of the system you are trading. For** example, most long-term trend followers use trailing stops that are fairly large, several times the average daily range of prices. In addition, most trend followers are usually using a model that makes money 4050% of the time and has a reward-to-risk ratio of 2.0 to 2.5. If your system does not fall into these ranges, then you need to determine your own money management percentages.

With the above criteria (and precautions) in mind, if you are trading other people's money, you probably should risk less than 1% per

position. If you are trading your own money, your risk depends upon your own comfort level. Anything under 3% is probably fine. If you are risking over 3%, you are a "gunslinger" and had better understand the risk you are taking for the reward you seek.

If you trade a system that sets very small stops, then you need to adopt much smaller risk levels. For example, if your stops are less than the daily range of prices, then you probably need guidelines that are about half (or less) of what we present here. On the other hand, if you have high expectancies in your system (your reliability is above 50% and your reward-to-risk ratio is 3 or better), then you can probably risk a higher percentage of your equity fairly safely. People who use very tight stops might want to consider using a volatility model to size their positions.

Most equity traders don't consider this sort of model at all. Instead, they tend to think more in terms of the equal-units model. But let's look at how "risk money management" would work with stocks.

Let's say you want to purchase IBM and you have a $50,000 account. IBM's price is about $111 per share. You decide that you would get out of this position at $107, or a drop of $4 per share. Your money management routine tells you to limit your risk to 2.5% or $1250. When you divide 4 into 1250 you come up with 312.5 shares.

If you bought 312 shares at $111, it would cost you $34,632 — over half of the value in your account. You could only do that two times without exceeding the marginable value of your account. This gives you a better notion of what a 2.5% risk really means. In fact, if your stop was only a $1 drop to $110, you could purchase 1250 shares based upon the model. But that 1250 shares would cost you $138,750 — which you couldn't do even by fully margining your account. Nevertheless, you are still limiting your risk to 2.5%. The

risk calculations, of course, were all based upon the starting risk — the difference between your purchase price and your initial stop loss.

Model 6 — Periodic Money Management Adjustments

Consider monitoring your money management on a periodic basic — weekly, daily, or even hourly — to maintain a fairly constant exposure. Think about the potential here. You could monitor each position and make sure that your exposure was always 1% or less. This means that, except in runaway markets, your biggest risk would always be about 1%.

Your exposure could be monitored using any of the money management models given or any of the equity models suggested. However, I would suggest that you consider monitoring both ongoing risk and ongoing volatility with a total equity calculation.

Here's how daily monitoring for risk and volatility might work. Lets suppose you have a $200,000 account and you have open positions in gold and corn. Your money management says you will keep your initial risk to 2% of equity and your ongoing risk at 3% of equity. You've purchased four long gold contracts at $400 per ounce with a stop at $390, so you now have open risk of $1,000 (i.e., 10 points times $100 per point) per contract, or $4.000.

The next day at the close you monitor your open risk. Lets say gold has jumped to $440 overnight. Your gold stop is now $410. The $40 increase in gold has increased your equity by $16,000 (i.e., 4 contracts times 40 points times $100/point). Thus, your total equity is worth $216,000. Your open risk for gold is now at $30 (i.e., $440 less $410) per contract. The total value of that open risk is $3000 (i.e., 30 times $100 per point) per contract or $12,000.

You have decided to monitor your open risk on a dailv basis and keep it at 3% of total equity. Doing so still allows you to follow your trading model. More importantly, it reduces the chances of any large declines in equity occurring in a short period of time. Since 3% of $216,000 is $6,480, you can now only afford to keep two gold contracts. You must sell off the remaining two contracts.

Some of you might say, "why not raise your stop so that you could keep the four gold contracts?" *Remember, money management is a separate part of your system that tells* you *how much.* If you altered your stop, you wouldn't be following your trading system which now says that your stop should be at $410 — your exit and your money management would start to merge. By selling two contracts, you are simply' reducing your risk in order to keep your total risk within acceptable limits on a daily basis according to your money management guidelines. You still have the opportunity to profit if gold keeps moving in your favor and you won't be giving back as much of your profits should gold suddenly decline. Thus, you are making a *money management* decision to maintain a constant risk in your portfolio.

Let's see how the same adjustments might occur with volatility. Suppose you have a $200,000 account and you decide to buy corn at $3.00. Your model says that you will buy enough corn so that the daily volatility of corn was only 1% of your total equity. In addition, you will never allow the daily volatility to go beyond 2% and you elect to monitor daily volatility each Monday.

Assume that the daily volatility was 8 cents when you purchased it. This translates into a price range of $400 per day (i.e., 5,000 bushels x 8 cents/bushel = $400). You decided not to allow volatility to exceed 1% of your $200,000 equity or $2,000 when you purchased the corn, so you bought five contracts.

Suppose corn jumps to $4.00 over the next month so that your five corn contracts have given you a profit of $25,000. The daily volatility of corn is now 20 cents. Since your total equity is now $225,000, you can now allow your daily equity to fluctuate by 2% of that amount or $4500. However, corn volatility is now $1000 per contract. You have five contracts, giving you a total volatility of $5,000. As a result, you must sell one corn contract according to the criteria of your periodic volatility money management model.

Generally, when something begins to increase in price dramatically the volatility will also go up dramatically. If you are in such a move, you might find that you have a $100,000 starting account that's now worth $500,000. In addition, because of the large increase in the daily price volatility, you might find that your account changes value by as much as $100,000 each day. By keeping a volatility adjustment as part of your money management, you protect your open profits and prevent such large daily fluctuations in your account.

I've shown examples of periodic monitoring of your money management for the risk and volatility models. However, you can do periodic monitoring with all of the models mentioned. You can even do a combination of them, such as monitoring risk and volatility simultaneously. Are you beginning to see the possibilities?

Model 7 -Group Control

One of the most important factors in risk control is having a diversified portfolio. Trading a number of items generally spreads your risk around, provided that price changes in those items have a low-correlation.

Here's how Group Control works. Suppose you are trading a system that makes money in 5 of 12 trades. The average winning trade is about 2.5 times the size of the average losing trade. In addition, the system only generates about one trade per month per investment vehicle. **If you only traded one instrument you would have about one trade each month. This means your chances of having a winning month are only about 41.7%. You** could easily have six months of losses and become discouraged.

Suppose that you trade 10 different instruments that are all independent of each other. Each one of them, let's say, is likely to generate a trade each month. Table 5 (on the next page) shows 1) the number of losing trades out of 10 you might have, 2) the chances of that happening, and 3) the amount of money you'd make or lose on that combination assuming an equal unit risk on each trade and a 2.5-to-l reward-to-risk ratio.

Notice that you would need to have less than three winning trades out of ten in order not to make money. The chances of that occurring on a given month (in which you have 10 trades) is the sum of the first three probabilities or 14.2%. Thus, with 10 independent markets, you only have a 14% chance of having a losing month.

Number of Winning Trades	Probability	Amount won / Lost
None	0.0046	Minus 10 units
One	0.0326	Minus 7.5 units
TWO	0.1047	Minus 3 units
Three	0.1995	Plus 0.5 units
Four	0.2494	Plus 4 units
Five	0.2172	Plus 7.5 units
Six	0.1272	Plus 11 units
Seven	0.0519	Plus 14.5 units
Eight	0.0139	Plus 18 units
Nine	0.0022	Plus 21.5 units
Ten	0.0002	Plus 25 units

Table 5: Possible Results with 10 Independent Units

When you try to put this plan into effect, however, you run into the difficulty that most trades are not independent. Stocks tend to go up and down together. During bull markets, there are tendencies for certain groups of stocks to move together. For example, much of the stock market move in 1995 was due to technology stocks. When the move was over, technology stocks tended to fall as a group — and, as early as 1996, many of them already have.

Commodities also tend to have groupings that are highly correlated. Grains, metals, meats, stock indices, currencies, energies, etc. might each tend to move as a group in the same direction at the same time.

Thus, your goal through money management is to minimize the number of highly correlated positions in your portfolio at any given time. You could do this by preselecting a limited number of vehicles in which to invest or trade. This is the portfolio selection part of system design.

However, you can also accomplish this diversification by having a money management algorithm limiting your total group exposure by using one of the methods presented so far. For example, you could limit the amount of leverage in any one group. You also could limit the amount of risk, volatility, leverage, margin, or total number of units of exposure that you have in any one group. This has the advantage of limiting your group exposure, while avoiding the possibility of missing a good opportunity because it is not part of the portfolio which you have preselected to trade.

Suppose your overall money management algorithm is to limit the new risk on any given position to 1% of equity. Your model calls for you to trade any liquid commodity that tends to fit your trading model. When you do that, however, you might find yourself with a portfolio of US bonds, 10 year notes, t-bills, eurodollars, munibonds, German Bunds, etc. That wouldn't be prudent, because your entire portfolio would be controlled by interest rate fluctuations. As a result, you decide to limit your total group risk to 3%. Based upon your initial risk allocation, the most you could have is three 1% positions in any one commodity grouping.

Note that your group money management model could be based upon any of the first five models presented — the one unit per so much equity model, the leverage model, the margin model, the volatility model, or the risk model.

Model 8 — Portfolio Heat

It's also important to limit the total risk to which your portfolio is exposed. This value has been called portfolio heat by Ed Seykota and Dave Druz[2]. Most great traders would argue that 20-25% is probably a maximum level for your portfolio heat. However, portfolio heat should also depend upon how good your system is. For example, a 60% system with average gains that are 4 times the size of average losses could have a much greater portfolio heat than a 50% system with a 2-to-1 gain-to-loss ratio

A good rule of thumb for determining your portfolio heat is to calculate the Kelly criterion for your system (see page 50). The Kelly criterion gives you a good approximation for the maximum risk possible for your system. Eighty percent of that value is probably a good number to pick for your total portfolio risk. However, if 80% of the Kelly criterion for your system is still above 25%. you could be flirting with danger.

Once you have a number in mind for your portfolio heat, work backwards to determine the individual risk on any given position. How many positions are you likely to have on at any given time? Take your maximum number of positions and divide that into the number you've just calculated for your portfolio. That's probably a good estimate for the maximum amount of risk you should assume for a single position. However, these guidelines also make the assumption that you are going for maximum gains in your portfolio.

Portfolio heat was a term coined for the total risk of your portfolio. However, you could apply any of the first five models, or a combination

of them, to your total portfolio. Notice how money management is getting more complex and more sophisticated as we add more models.

Model 9 — Long versus Short Positions

Several famous traders have distinguished between long and short positions in considering group risk and portfolio heat. They believe that they somewhat counteract each other, so that one long position and one short position — each at your desired market money management level -would just need to be counted as one unit. In other words, a 1% risk in a long corn position and a 1% risk in a short bond position might be grouped together as one 1% unit of risk. This puts an interesting twist to many of the money management models already presented.

Equating different long and short positions, of course, can only be used with those models which equate your exposure. Thus, it would not be applied to Model 1, but you could apply it with Models 2 through 5.

Using Money Management to Meet Your Trading Objectives

Given the models and ideas in money management presented in this special report, it is now possible for you to design a system to meet your objectives — such as trading a high-reward-to-risk ratio system for managing other people's money or getting a very high rate of return trading your own money. You just have to know what you want to accomplish and then focus on that. You also need to realize that money management is the area of your system that will have the greatest impact on the bottom line — your profits, your drawdowns, and your reward-to-risk ratio.

Designing a High Reward-Risk System for Managing Money

The first part of your system design should focus on building the highest possible expectancy into your system, where expectancy is defined by the following formula:

Expectancy = (Probability of Winning * Average Win) Minus (Probability of Losing * Average Loss)

The main variables in developing a high expectancy system are to find: 1) an entry technique that will give you the highest possible percentage of winning trades; 2) an initial stop loss that will preserve your capital; and 3) an exit (or multiple exits) that will capture as much money as possible from the market. Once you've developed the highest possible expectancy, I would suggest that you take the following steps in order to develop the best reward-to-risk ratio using money management.

1) In a given period of time, the more trades you have with the same expectancy, the less likely it will be that you will have a loss. Consider developing a high expectancy system that generates lots of trades during the minimum time period in which you must be profitable. One trade might only have a 30-40% chance of being profitable. But 50 such trades with a high expectancy over a similar time period are highly likely (i.e., 75% or better) to be profitable — especially if the trades are non-correlated.

2) Examine the concept behind your idea and determine if there is a money management model presented that logically fits

the system you've developed. For example, if you use very tight stops, then a percent risk model would be very dangerous unless you use very low risk (Le., 0.1% risk). Consequently, a model such as percent volatility might fit you better.

3) Determine what fits best? Test your system with all of the models presented, using different percentages of equity and different equity models. Determine which model and what percentage gives you the best reward-to-risk ratio.

4) Consider using daily money management adjustments. This means limiting the maximum exposure of your total system and any given positions. For example, what if you calculated your risk per position hourly and never let it go beyond 2%? It would, tend to smooth out both your equity fluctuations and your peace of mind — knowing it was always 2%.

5) Think about using multiple trading systems with different money management models. Perhaps the most sophisticated method of keeping a high reward-to-risk ratio is to employ several non-correlated trading systems. Each system should have its own money management parameters, depending upon what you are trying to do with that system. When using multiple systems in this manner, you should be able to generate a lot of high-expectancy trades that are non-correlated. As a result, you should have profitable trading months as long as you have markets in which at least one of your systems can make money.

6) Use some creative money management to make your system unique. The models presented have all given been linear. If your portfolio goes up, you risk more. If your portfolio goes down, you risk less. Consider using creative money management. I'll show you examples of creative money management in the next section, but creative money management mostly depends upon your creativity If

you put as much effort into creative money management as most people put into figuring out how to enter the market, your trading methodology should be superb.

How to Produce Maximum Profits

Before starting this section, I would like to caution readers that the techniques suggested are quite dangerous unless you fee/ vary confident about your discipline and your own psychological make up. If you use some of the techniques suggested and forget about your discipline, then your capital could disappear very quickly.

These techniques are also very deadly if you are inadequately capitalized. But for some of YOU with especially small accounts, (i.e., under $50,000), who insist on going for high rates of return, following the discipline in these techniques may be the onlv hope YOU have to keep you from sure ruin.

If your goal is to only trade proprietary money and you can tolerate large fluctuations in your account value, then you may want to build a trading system designed to give you the maximum rate of return. Many books have been written about how to maximize profits. Ironically, *the key to maximum profits is simple money management.* You must balance how much you are willing to make with how much you are willing to lose and be sure your losses never put you so far into the hole that you cannot successfully return.

Technique 1 -Get Best Reward-to-Risk Ratio and then Leverage Yourself

Let's say you've developed several systems that together give you an average return of 20% per year with a maximum drawdown of about 4%. If you can achieve that, then you've got a reward-to-risk ratio of 5 to 1. That kind of record is **outstanding and few other traders can duplicate it.** As a result, the best way for you to produce maximum profits is to simply leverage yourself. For example, if you traded $100,000 as if it were $500,000 in that system, then you'd probably have an annual return of 100% with a maximum drawdown of about 20%. This is much better than simply going for a system that produces the highest rate of return.

Technique 2 -Optimal f and the Kelly Criterion

Ralph Vince has suggested that if "you are not trading for optimal profits, then you belong on a psychiatrist's couch rather than in the markets" [3] Yet, trading for optimal profits also means trading with large drawdowns. For most people, such drawdowns are totally unacceptable. They probably would stop trading at the bottom of the drawdown as a net loser and have no chance of letting the system work. Nevertheless, its possible to make large rates of return by simply adding "optimal" money management to your trading system.

Ralph Vince's solution to optimal money management is to risk an "optimal fixed fraction" or "f" of one's largest "historical drawdown." In Vince's word's:

> "For any given independent trial situation, which you have an edge (i.e., a positive mathematical expectation), there exists an optimal fixed fraction (f) between 0 and 1 as a divisor of your biggest loss to bet on each and every event to maximize your winnings. Most people think that the optimal fixed fraction is the percentage of your total stake to bet. This is absolutely false. Optimal f is the divisor of our biggest loss, the result of which we divide by our total stake to know how many bets to make or contracts to have on." *Portfolio Money Management, p.* 80. [4]

I have two problems with optimal "f" as a guide for optimal gains'. First, since it is based upon one's largest historical loss, it makes the assumption that you have already had your worst loss. It's much

more useful for the average trader to assume that one's worst loss has never occurred.

Second, the calculations require an iterative mathematical procedure that is quite complex. Vince is a man who has had no college education, but has studied mathematics extensively. This unusual combination has made him very difficult to read, even for someone schooled in mathematics. For example, he'll introduce a rather vague term, like Terminal Wealth Relative, and then simply refer to it as TWR throughout the rest of the book.

Thus, Vince's formula for optimal f amounts to using a computer (and perhaps Vince's own software) to test all possible values between 0.01 and 1.00 increments of Terminal Wealth Relative or TWR. His exact formula is:

$$TRW = \sum^{n} (1 + (-trade^{i}) / (biggestloss))$$

For the reasons suggested, I much prefer the Kelly Criterion for estimating maximum bet size. Vince says that the Kelly Criterion should not apply to trading — it only applies to *win-loss* type data. However, you can use your past trading (or historical testing) to determine the information you need.

Basically, you need your winning percentage (which we'll call W) and you need the average size of your winning trades divided by the average size of your losing trades (which we'll call R). Thus, the Kelly criterion can be calculated as follows:

$$\text{Kelly \%} = W - [(1 - W)/R]$$

Let's look at how the Kelly Criterion might work. Suppose you have a system that has a winning percentage of 0.5. Your system also has average profits that are twice as large as the size of your average

loss. Thus, W = 0.5 and R = 2. Using these numbers results in the following.

$$\text{Kelly \%} = 0.5 - [(1 - 0.5)/2]$$

$$= 0.5 - [0.5/2]$$

$$= 0.5 - 0.25$$

$$= 0.25$$

Thus, the percentage of equity bet that would provide a maximum rate of return is 25%.

However, if you have a system that is right 50% of the time, you can easily be wrong 10 or even 20 times in a row during a large number of trials. Thus, you could never risk 25% of your remaining equity — unless you like the kind of drawdowns show in Table 4 at the 2530% level.

The Kelly Criterion can still be useful for people wanting to go for optimal rates of return. Simply take about 80% of the Kelly Criterion — in this case 80% of 25% is equal to 20%. Figure out how many trades you are likely to have on at one time and then divide your 80%-Kelly value by that number of trades. For example, if you are likely to have on as many as 10 trades at one time, then your optimal risk size would probably be about 2% using this system.

Technique 3 -Playing the "Market's Money"

Perhaps the best way to go for top returns is to distinguish between your starting equity and the market's money. You can't do this with other people's money, because they typically get upset-even when you give back open profits.

Suppose your objective is to achieve a maximum income by some future date. You're willing to do whatever it takes to increase that income as long as you don't lose your starting equity. On that assumption, you can design a special system that risks very little of your starting equity and instead risks the markets money at an optimal level.

As an example, suppose you start January 1st with $100,000. Your objective is to make as much money as you can by December 31st while risking as little as possible of your starting equity. Here's one way you might do it:

You might begin by risking only 1% of your starting equity, but be willing to use an optimal level (or near optimal level) with the market's money. Let's say that you've determined that your system is optimal risking 20%. However, you've determined that you might have as many as five positions in the market at any one time (and this is the maximum you will have). Consequently, you are willing to risk up to 4% per position at an optimal level.

The real advantage of this system is that, as soon as you move into profits, your ability to make profits goes up dramatically — but so does your risk. Let's say that your first position is in crude oil. You initially risk 1% of your $100,000 or $1.000. By the time, your second

trade comes along, you have $3,000 in open profits. You can now risk $1,000 of your original equity plus 4% of your open profits or $120. Thus, you can assume $1,120 worth of risk on your second trade under this model.

Imagine you've been doing really well with this model. By March, you've accumulated $25,000 in new profits. At this point, you are now risking $1,000 (1% of your starting equity) plus 4% of your $25,000 in new profits or another $1,000. Your risk (Le., your ability to profit) has now doubled even though your equity has only gone up by 25%.

Of course, trading doesn't necessarily bless you by starting out with big profits. You might begin with a losing streak. If you want to be careful about protecting your starting equity, you may want to cut back your risk if you go into a drawdown in your starting equity. For example, you may decide that if you lose 5% of your starting equity (i.e., and get down to 595,000) you'll cut your risk down to 0.9%. If you drop another 5% down to $90,000, you'll cut your trading risk down to 0.8%. Since your trading risk drops down dramatically as you move into your equity, you are not likely to lose much of your starting equity."

Technique 4 -Creative Money Management with the Market's Money

Another equally profitable money management routine allowing you to build your capital quickly amounts to playing the market's money through pyramid money management and stop adjustment. For example, suppose you have a $100,000 account and you want to make your money grow as rapidly as possible, You are using a 3 times volatility stop as I did in the random entry trading system (reference Course Update #23a). You've also decided that your system is optimal risking 24% of equity at a time, using a reduced total equity model. You plan to have as many as six open positions at one time, so you are willing to risk up to 4% per position — but not all at once. You'll build up to a position as big as 4% as your profits increase. Your initial risk will only be 2%.

Let's see how such a money management system might work. You buy corn at $3.025. The ten day average true range (which we'll call "V") is 3.5 cents. Therefore, a 3 times volatility stop is 10.5 cents (i.e., at $2.92) which amounts to a total risk of $525. You can risk 2% of your $100,000, which amounts to 3 contracts (rounded down to the nearest contract).

Your pyramiding scheme is to add one contract every time your profit increases by one daily volatility or V (i.e., which is currently 3.5 cents). When this occurs, (i.e., corn moves to $3.06) you risk another 2% with a 3 times V stop at $2.955. However, your stop on the original position moves up by 3.5 cents to $2.955. Thus, you now have six contracts all with stops at $2,955. However, notice that vour total exposure of your oriainal equity is now onlv 3% (actually less due to rounding) because YOU raised vour initial stop

Let's say that your daily volatility now increases to 4 cents. Thus, a new stop would now be 12 cents or $600. Corn moves up to $3.10, so you can now risk another 2%. (Actually, you could have done so at 53.095 — when the price had increase by the old V-value of 3.5 cents.) Your reduced total equity is now $97,000 and 2% of that is 51,940. As a result, you can still purchase 3 contracts at $3.10 — with a stop at $2.98. You also get to raise your stop on both of your other units by their respective V-values. Therefore you now have six contracts with stops at $2.99 and three contracts with a stop at $2.98.

You might be saying, "How can you do that? Your risk is over the 3% limit with the reduced total equity model." No, it isn't because you raised your other stops enough so that your exposure is still about 3% of your reduced total equity.

Contracts	Current Stop	Remaining Risk in Original Equity	Total Risk to Original Equity
3 at $3.025	$2.99	3.5 cents	10.5 cents = $525
3 at $3.06	$2.99	7 cents	21 cents = $1,050
3 at $3.10	$2.98	12 cents	36 cents = $1,800

Table 6

Table 6 summarizes your current position. Notice that your total risk to your original $100,000 is now $3,375 (or 3.375%).

Let's say that volatility stays at 4 cants and corn now goes to $3.14. Its time to risk another two percent. Your reduced total equity is now $96,525. You can risk 2% of that or $1932.50. Your 12 cent stop is a 5600 risk, so you can again purchase another 3 contracts. You 'must also raise your stops on the existing contracts. The stop on the first six contracts raises to 53.025 (i.e., it was raised 3.5 cents, the original V). The stop on the last three contracts raises to 53.02.

Consider where you are with respect to the reduced total equity model in terms of risk, You now have risked 2% four times, but have you exceeded your 4% limit?

Contracts	Current Stop	Remaining Risk in Original Equity	Total Risk to Original Equity
3 at $3.025	$3.03	0	
3 at $3.06	$3.03	3.5 cents	10.5 cents = $550
3 at $3.10	$3.02	8 cents	24 cents = $1,200
3 at $3.14	$3.02	12 cents	36 cents = $1,800

Table 7

The total risk to your original equity is now only $3,550 or 3.55% — still under our 4% limit. So let's say corn starts to really get volatile now and V goes to 6 cents. And you get a chance to buy more corn as it goes up to $3.20 (actually you could buy at $3.18, when it increased by the last value of V). But we'll say that you buy at $3.20.

Your total reduced equity is now $96,450 and 2% of that is $1,929. Your new stop, at 3 V, is now 18 cents or $900. Thus, you can now only purchase **two contracts,** but you also get to raise your other stops. Let's say that we make a decision to leave the breakeven stop alone, giving it plenty of room to move. However, you can now move the stop on the second 3 contracts purchased to breakeven; move the stop on the contracts purchased at $3.10 to $3.06; and move the stop on the contracts purchased at $3.14 to $3.06. Thus, the current risk picture is shown in Table 8.

Notice that by the reduced total equity model, your risk has changed very little. The risk to your original equity is now $3,600 or 3.6%.

Contracts	Current Stop	Remaining Risk in Original Equity	Total Risk to Original Equity
3 at $3.025	$3.03	0	0
3 at $3.06	$3.06	0	0
3 at $3.10	53.06	4 cent5	12 cents = $600
3 at 53.14	$3.06	8 cents	24 cents = 51,200
7 at $3.20	$3.02	18 cents	36 cents = $1,800

Table 8

Corn now goes to $3.26, and V remains at 6. As a result, you decide to add another 2% and raise your other stops by their previous V values. Again, you can only buy two more units and their stop is now 53.08. Your portfolio now looks like Table 9.

Contracts	current Stop	Remaining Risk in Original Equity	Total Risk to Original Equity
3 at 53.025	$3.025	0	0
3 at $3.06	$3.06	0	0
3 at 53.10	$3.10	0	0
3 at $3.14	53.10	4 cents	12 cents = 5600
2 at 53.20	53.08	12 cents	24 cents = $1,200
7 at $3.26	$3.08	1a cents	36 cents = $1.800

Table 9

Notice that your original exposure is still just 53600. If the market kept going up, you could continue to add contracts to your portfolio — even if you never raised any of your stops past breakeven — and you would still be unlikely to exceed your 4% risk ceiling per position. However. you do run the risk of a series of limit moves aaainst you. As a result, you must set a physical limit to the total number of times that you are willing to add 2% more risk **and increase your stops.**

Now let's say the market dropped the next **day** and gave you a sell signal (i.e., your sell signal is independent of your money management stops). You get out at 53.21. Basically, you'd make 55.5 cents on the first 3 contracts; **45 cents on the next three contracts, 33 cents on the**

next three contracts, 21 cents on the next three contracts, and 2 cents on the next 2 contracts. You'd lose 10 cents on the last two contracts. Your total profit is $7,325.

Initially, you only risked $1575 on what might have been a false signal, You only added risk as the signal proved itself. Had you invested the 4% initially, you would have purchased 7 contracts at a risk of $3,675. Those 7 contracts would have made you $6,475.

Some of you might be saying "... but you ended up with 16 contracts. It might have been disastrous if you'd had some limit moves against you." That's true. but my point was to show you creative money management. A method very similar to the one described has been used by a number of well-known traders to produce consistent and very large rates of return. Furthermore, you could offset the risk with options which would avoid the risk of a runaway market against you.[7]

There are any number of variables that you can vary in creative money management — your initial stop, your maximum risk per commodity, moving your stops in your favor, your equity model, your money management model, etc.. For example, you could even use the idea of increasing your "reduced total equity" by raising your stop to justify opening up positions in other commodities. This could really help the small trader who does not have a large enough account to trade using most of these models.

Conclusion

My point in writing this report is to get you to think about money management (especially, creative money management) instead of just creative entry techniques. Money management is the most important part of a trading system. Yet for psychological reasons most people avoid thinking about it entirely. *These money management variables will have much more of an impact on your bottom line profits (or losses, if misused) than the latest entry signal you've been studying.*

Reference Notes

1. This is basically a Turtle's System. The difference in the rate of return is basically a difference in the money management presented here versus the money management of the Turtles. For information about the Turtle systems contact Russell Sands at 305-895-2951. Mr. Sands currently says he trades 1 contract per $30,000 in his proprietary account and 1 contract per $100,000 in his fund. That suggests that either Mr. Sands doesn't understand the original Turtle money management (as presented in his manual) or he's given up on it.

2. Ed Seykota and Dave Druz. Determining Optimal Risk. *Technical Analysis of Stocks and Commodities* **, March 1993, p. 46-49.**

3. Ralph Vince *The New Money Management.* *New* **York: Wiley, 1995.**

4. Ralph Vince *Portfolio Money Management. New* York: Wiley, 1995.

5. Vince's assumption about utility functions, and much of his thinking rests on these assumptions, show a naive understanding of human psychology. For example, Vince doesn't understand that people are conservative when it comes to even a small profit and very risky when they have a loss.

6. I've known people who have produced return rates as high as 1,000% per year using this sort of money management, (using a system quite similar to the 55-21 day channel breakout that we've used as an example in some of the models presented.)

7. Options are another excellent form of controlling risk, but they are beyond the scope of this report.

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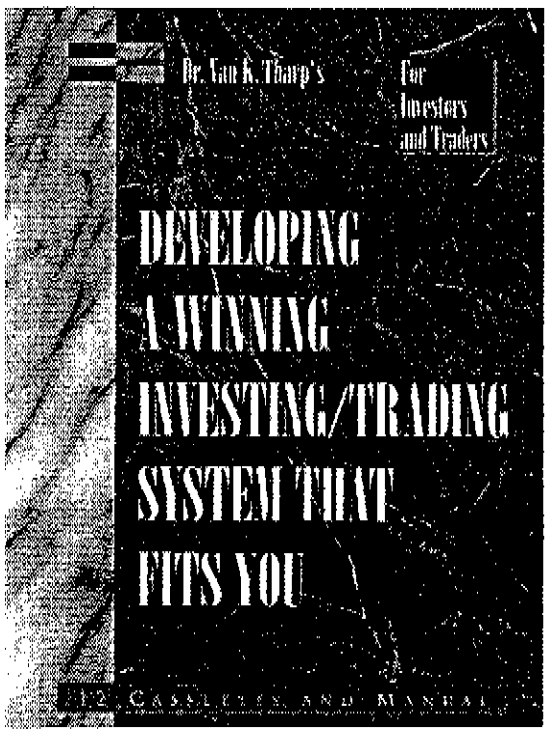

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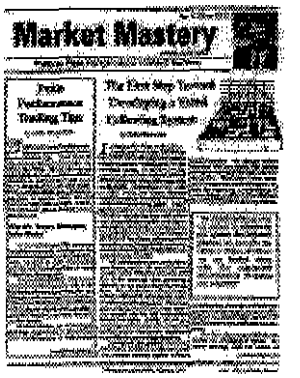

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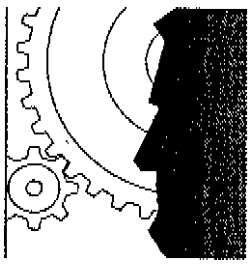

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