

**Van Tharp's
Definitive Guide to
Position SizingSM**

**How to Evaluate Your System and Use
Position SizingSM to Meet Your Objectives**

**by
Van K. Tharp, Ph.D.**

Copyright © 2008 by The International Institute of Trading Mastery, Inc.

All rights reserved.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission. For information:

*International Institute of Trading Mastery, Inc.
102A Commonwealth Ct., Cary, NC 27511
(919) 466-0043—
Internet: <http://www.iitm.com>*

This publication is designed to provide accurate and authoritative information in regard to the subject matter covered. It is sold with the understanding that the publisher is not engaged in rendering legal, accounting, or other professional service. If legal advice or other expert assistance is required, the services of a competent professional person should be sought.

Printed in the United States of America

The following phrases are a trademark of the International Institute of Trading Mastery: "System Quality Number," "SQN," and "Position Sizing." These trademarks are denoted by the character "SM" meaning service mark.

This book is dedicated to Melita Hunt, the CEO of the International Institute of Trading Mastery. This book would not be possible without Melita's inspiration. Melita, you will always be in my heart.

Contents

Preface	xiii
---------	------

Acknowledgments	xvii
-----------------	------

PART I

THE GOLDEN RULES OF TRADING AND HOW TO EVALUATE THE QUALITY OF YOUR TRADING SYSTEM

Introduction to System Evaluation	3
<u>Chapter 1</u>	
The Golden Rules of Trading	5
<u>Chapter 2</u>	
Risk (R) and R-Multiples	11
Understanding R-Multiples	12
Using Your Total Risk to Keep Track of Your R-Multiples	14
What If You Don't Know Your Initial Risk?	16
More Thoughts about Expectancy	18
What about the Variability?	19
So What's the Downside?	21
<u>Chapter 3</u>	
Evaluating the Quality of Your Trading System	23
Rating Your System	30
One Problem with System Quality Number SM and How to Overcome It	32
Statistical Assumptions in Using This Material	33
Improving Your System Quality Number SM (SQN SM)	35
What's Important in Getting High SQNs SM ?	38

Chapter 4

What Can I Expect in the Future?	41
Question 1: Is My Sample Representative?	41
Question 2: Is My System Valid?	43
Question 3: What Can I Expect from My System in the Future?	44
Question 4: What Kinds of Markets Will My System Work In?	49
Question 5: What If I Have Multiple Correlated Trades?	54
Summary: What Do I Know about My System at This Point?	55
How Will I Trade Differently with This Information?	56

Chapter 5

Are You Doomed to Failure?	57
Judgmental Shortcuts	57
Bias 1: Locus of Control—The Lotto Bias	58
Bias 2: The Need to Be Right	60
Bias 3: Percent Gain	64
Bias 4: Lots of Input Says the Same Thing	66
Bias 5: Authority	67
Bias 6: Prediction and Understanding	68
Bias 7: Wanting Lots of Facts	71
Other Biases That Influence Being Right	72
Bias 8: The Law of Small Numbers	72
Bias 9: Once We Think We've Got It, It's Hard to Get Rid of It	74
Bias 10: Representation	74
Conclusion	76

PART II

UNDERSTANDING THE BASICS OF POSITION SIZINGSM

Introduction to Position SizingSM Basics	79
<u>Chapter 6</u>	
The Most Important Factor (Besides You) in Your Trading	81
Understanding Low-Risk Ideas	82
Psychological Biases Against Proper Position Sizing	86
The Need to Be Right Bias in Position Sizing	86
The Gambler's Fallacy	86
Streaks Cause Us to Doubt Probabilities and Change Our Risk	87
Not Enough Money or Too Much Greed	91
<u>Chapter 7</u>	
CPR for Traders and Investors	93
The Importance of Position Sizing	93
The Three Components of Position Sizing	94
The CPR Model for Position Sizing	95
More Basics: Equity Models	97
<u>Chapter 8</u>	
Core Position SizingSM Models	99
The System Used	99
Model 1: Units per Fixed Amount of Money	99
Model 2: Equal Units/Equal Leverage Model	102
Model 3: Percent Margin	104
Model 4: Percent Volatility	105
Model 5: Percent Risk	107

More Examples	110
Chapter 9	
More Position SizingSM Models	113
Model 6: Group Control	113
Model 7: Portfolio Heat	114
Model 8: Long versus Short Positions	116
Model 9: Equity Crossover Position Sizing	117
Position Sizing Under Unusual Circumstances	118
Model 10: Asset Allocation to Determine Position Sizing	118
Model 11: Position Sizing for Portfolio Managers	120
Model 12: Position Sizing for Professional Traders Who Don't Know How Much Equity They Have	121
Chapter 10	
Comparing the Impact of Various Models	123
The Models Compared	123
PART III	
USING POSITION SIZINGSM TO MEET YOUR OBJECTIVES	
Introduction to Using Position SizingSM to Meeting Your Objectives	133
Chapter 11	
Meeting Your Objectives	135
Objectives Re-examined	138
A Look at Optimal Bet Size	139
Expectancy, Win Rate, and Position Sizing	142
Conclusion	147

<u>Chapter 12</u>	
Position SizingSM Methods to Meet Your Target Profit Objective	149
Model 13: Using Your Optimal Target Risk Percentage	150
Model 14: Market's Money Methods	151
Model 15: Scaling In Techniques	156
<u>Chapter 13</u>	
Using Fixed Ratio Position Sizing (FRPS) to Meet Your Profit Target	161
Fixed Ratio Position Sizing Explored	161
Assumptions Necessary to Simulate FRPS	163
Position Sizing Evaluation	165
The Models Compared	170
How to Improve Your Performance with FRPS	171
Evaluation of Results	175
Conclusion	182
Model 16: Using Fixed Ratio Position Sizing	183
Checklist to Trade FRPS	183
Advantages and Disadvantages of FRPS	185
<u>Chapter 14</u>	
Position SizingSM Methods to Help You Avoid Ruin	187
Using Position Sizing to Limit Your Downside Potential	188
Model 17: Using Your System Quality Number SM to Determine How to Limit Risk	188
Model 18: Two-tier Position Sizing	191
Model 19: Multiple Tier Approach	193
Model 20: Using the Maximum R-Drawdown	193

Model 21: Scaling Out to Smooth Equity Curves	194
Model 22: Basso-Schwager Asset Allocation Technique Applied to Systems	197
Conclusion	198

PART IV

MISCELLANEOUS POSITION SIZINGSM INFORMATION

Introduction to Miscellaneous Position SizingSM Information	203
<u>Chapter 15</u>	
Position SizingSM Strategies to Avoid!	205
Martingale Position Sizing Models	205
Model 23: When Probability Is Out of Line, Increase Your Position Sizing	206
Model 24: One Up, Back One	208
Model 25: One Up, Back One, Version 2	208
Model 26: Regression toward the Mean Position Sizing	211
Other Dangerous Models to Avoid	212
Model 27: Intuitive Position Sizing	212
Model 28: Joe Ross Method	213
Model 29: Percent Risk Based Upon Winning Percentage	214
Model 30: Kelly Criterion	214
Model 31: Optimal f	215
Conclusion	218
<u>Chapter 16</u>	
Putting It All Together: An Interview with Chris Anderson	221

Chapter 17	
Position SizingSM Software Examined	235
My Experiences with Position Sizing Software	235
Software to Keep Track of Your Trades	237
Simulation Software	244
Position Sizing Software	247
System Specific Software with Position Sizing Capabilities	248
Multi-Purpose Software that Includes Position Sizing	250
High-End Software	260
Conclusion	263
Chapter 18	
Some of Your Questions Answered	265
Category 1: Miscellaneous Questions	265
Category 2: Expectancy versus Position Sizing	269
Category 3: I Don't Understand One of the Models	271
Category 4: Position Sizing and Risk of Ruin	275
Category 5: Account Size and Liquidity	277
Category 6: Multiple Accounts	282
Category 7: How Do I Position Size? What Do You Think of My Method?	283
Category 8: What Do You Think of This Form of Position Sizing?	288
Category 9: Math Questions	290
Chapter 19	
Self-Evaluation	291
Appendix I	299
Appendix II	361
Glossary	363
Index	375

Preface

Perhaps the greatest secret to top trading and investing success is appropriate money management or what we now call **position sizing**. I call it a “secret” because few people seem to understand it, including people who’ve written books on the topic. Some people call it risk control; others call it diversification. Money managers call it managing other people’s money and still others call it how to “wisely” invest or spend 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. And because the topic of money management is so conflicting, I’ve elected to call it position sizing throughout this book.

I’ve written this book to give you an overall understanding of the topic and show you various models of position sizing. Enjoy the journey; it’s potentially the most profitable journey you will ever take as a trader. The material is quite complex, despite my 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.

One of the fundamental concepts that you will learn in this book is that position sizing is the key to meeting your objectives as a trader. Most people assume that there is just one objective to trading—their own—and thus their view is biased by their objective. **As a result, they never realize that the purpose of position sizing is to meet your objectives.**

The purpose of position sizing is to meet your objectives.

There are many other key concepts that stem from this primary one.

- There are probably an infinite number of objectives that you could have and thus, an infinite number of ways for you to use position sizing.
- It is important for you to define your objectives before you develop a system and before you develop your position sizing routine.
- Although your system has very little to do with meeting your objectives, we have developed a method to quantify the quality of your system, which we call the System Quality NumberSM or SQNSM for short.
- **We’ve discovered that the higher your System Quality NumberSM, the easier it is to use position sizing to meet your objectives.**
- You might even think of position sizing as a separate system, overlaid upon your primary system, which is designed to meet your objectives.

These key ideas are the foundation that you need to understand to make position sizing useful to you.

This book is one of the most important books you could ever read if you want to be a professional investor or trader. The material in this book provides the foundation for everything you do as a trader or investor. Only your personal psychological work is more important because you are the source of your trading success. In fact, there are many psychological biases that keep people from practicing sound position sizing. In addition, there are also practical considerations, such as not understanding position sizing or not having sufficient funds to practice sound position sizing.

The higher your System Quality NumberSM, the easier it is to use position sizing to meet your objectives.

Let's look at the facts. The entry price to being an investor or trader is fairly low. All you have to do is have enough money to open an account. Your brokerage company doesn't care whether you understand expectancy. Your brokerage company doesn't care whether you know your objectives. Your brokerage company doesn't care whether or not you understand that position sizing is the key to meeting your objectives. And your brokerage company certainly doesn't care that you must have your personal psychology together in order for any of this to matter. They simply don't care.

Your brokerage company cares about three things: 1) that you have enough money to open an account, 2) that you don't do things that might cause you to lose many times the value of your account so that you get your broker into trouble, and 3) that you generate a lot of commissions through your trading. That's it. You can make every mistake described in this book and it's still okay with your brokerage for you to open an account.

This is not true of most professions. You cannot become an engineer without understanding calculus. And if you make too many mistakes, you can never be an engineer. You cannot do brain surgery without going through medical school, doing an internship, and then going through residency. You cannot hold a research job without a basic understanding of statistics. You cannot practice law without attending law school and passing a rigorous bar examination. To get a doctorate in finance, economics, or business, you must pass many exams. But the material you must study is almost the antithesis of what it takes to be successful in the markets. You even have to pass exams to become a broker, but there is absolutely nothing in that exam that tests your knowledge of material related to trading success—NOTHING.

To be a trader or investor, you don't have to know anything about what it takes to be "safe" as an investor and you certainly don't have to know what it takes to be profitable as an investor. All you need is enough money to open an account and to sign a statement that you understand the risks involved. In fact, your brokerage company, when they make you sign that statement, probably doesn't understand the fundamental basis behind that risk, which is the material in this book. Furthermore, most people who open a brokerage account lose money.

Here's the bottom line: if you want to safely master the art of trading or investing, you must thoroughly understand all of the material in this book. If it seems too complex, it

doesn't matter—it's still core material you must master. It is necessary if you want to be successful as a trader. In fact, Chapter 19 contains a mini-test on the topics contained in this book. Answering all of the questions correctly doesn't necessarily mean that you will apply this material because that means that you have mastered yourself as well, but it at least means that you have enough understanding to have a reasonable chance of success.

I've divided this book into four primary sections. The first section is on understanding the golden rules of trading and how to evaluate the quality of your system. The second section is on position sizing basics, including an introduction to basic position sizing models. The third section is on how to use position sizing to meet your objectives. And the last section is on miscellaneous topics related to position sizing, including what not to do, software, and information on putting it all together. This book contains the most important technical information that you will ever be exposed to as an investor/trader and probably the least understood. However, you must master this material if you want to meet your objectives as a trader/investor.

Here's what you need to do to get started. First, have an open mind. Second, make sure that you understand everything you read. If you have questions about what some particular word means, go to the glossary of this book and look it up. We also have a glossary at our web site, www.iitm.com. Third, be sure you can do all of the exercises in this book when they come up. If you have problems, keep working until you have mastered the exercises. Fourth, you must develop a plan to put all of this material together. And finally, you must master yourself so that you can apply this material without making significant mistakes.

Acknowledgements

So many people contributed to the content of this book and although I cannot recognize each of you individually, to all of you, let me just say thank you. Some of you may have just asked a question that stimulated me to think in a certain way. Some of you may have made a suggestion that started me in a new direction.

However, certain people deserve a special acknowledgment because their contributions were enormous.

Before the publication of *Trade Your Way to Financial Freedom*, “how much” was referred to as money management and very few people knew what it really meant or the implications of this very important variable. So I’d initially like to thank all of those who were insightful enough to see how important the “how much” question was to trading success. And, of course, this variable is now called position sizing throughout this book.

First, I’d like to acknowledge Ed Seykota who first taught me the importance of position sizing, saying that success was 60% psychology, 30% position sizing, and 10% systems. Ed was also the person who taught me the value of using the market’s money.

Second, I’d also like to acknowledge the contributions of Tom Basso. Tom echoed Ed’s formula in which position sizing and personal psychology were 90% of success. He taught me that position sizing could be used to produce slow, steady results as well as rapid, volatile profits. Tom also taught me the importance of the scaling out models of position sizing.

Although I was interviewed as a candidate for the “Turtles” back in 1982, I’m not sure if I ever met William Eckhardt during the screening process. Nevertheless, I later learned so much from his great ideas about scaling in that I think he deserves a very special mention here. I hope we can meet some day.

Bob Spear, the developer of *Trading Recipes*, was also very helpful in allowing me to better understand position sizing. We did several workshops together involving his software and that’s where I first realized how easily you could “curve fit” certain position sizing routines to give optimum results. That experience taught me to favor simulation over backtesting.

Next I’d like to acknowledge John Humphreys who developed the *Athena Money Management* software. John developed *Athena* to do every position sizing routine that was in my original *Special Report on Money Management*. Because John had to translate complex routines into a format that a machine could understand, his programming solidified a lot of interesting ideas in my head into a mathematical formula. For example, one such concept was that of “open risk.” Together in developing that software, he and I generated many new ideas about position sizing that can be found in this book.

Mahesh Johari was a math professor who first taught me that the optimal bet size that would give the largest average return was always one that would come closest to producing bankruptcy. That's explained and illustrated later in this book. Mahesh also built a primitive optimal bet size calculator in Excel based on the lognormal distribution that would calculate the potential results of various risk percentages.

In the mid-1990s, Frank Gallucci taught a class that was originally about how to use Excel to support your trading by developing routines in Excel to do various position sizing simulations. However, few people were interested in that topic and it was transformed into a position sizing workshop. Frank helped me understand that there were limitless possibilities for mathematically expressing the market's money. Frank also modified the first optimal bet size calculator developed by Mahesh Johari so that it was a useful tool.

Next, I'd like to acknowledge Ryan Jones, the developer of fixed ratio position sizing. His concepts in *The Trading Game* always provoked me and stimulated my thinking to ask "Could it work?" And in working with Chris Anderson (see below) to determine if it could work, many new ideas came up for consideration.

My friend Ron Ishibashi also helped immensely by developing the idea of CPR for traders discussed later in this book. This amounts to a simple formula for calculating position sizing that anyone who undertakes the business of trading should be able to understand.

I'd like to acknowledge the contributions of Chris Anderson who turned fixed ratio position sizing into a method that could be useful to everyone, and an excellent addition to this book, simply by making some reasonable assumptions. Furthermore, Chris then developed a simulator that I use personally to help me understand both position sizing and expectancy much better.

Ralph Vince has always been a giant name in the field of money management. Although he tended to stress large position sizing methods that would make one age prematurely, his contribution in helping people understand the importance of position sizing is still immense.

Since this book was self-published, the duties normally assigned to the publishing house fell into the lap of my staff members. Cathy Hasty, Melita Hunt, Becky McKay, Jillian Ellis and Revathi Ramaswami—you have my deepest gratitude for making this book possible.

In particular, I'd like to thank Becky McKay for her work in proofing and editing, working on the glossary and index, and for being the all-round jack-of-all-trades for this book. Thanks, Becky.

I'd also like to thank Cathy Hasty for spending many hours helping with the layout of the book and the graphics. Thanks, Cathy. And finally, I'd like to thank Melita Hunt for running my office so that I have the time to do things like complete this book. Melita, this book would not be possible without you.

A number of people reviewed the last draft of the manuscript. Those people included Louis Crowder, John Dupuis, Frank Eaves, Roman Franko, Rick Freeman, RJ Hixson, Ron Ishibashi, David Meyer, Ed Pomicter, Sara Rich, Joe Staib, Jay Street, Maxey Von Seton, CJ Wang, and Jim Weigel, and Siaka Yusuf.

And lastly, I'd like to thank all the people out there who gave me information about the various software packages available. I mentioned your names in the individual reviews, but I also wanted to take this opportunity to thank you for your assistance.

Thank you all for your incredible contributions, as well as all of you who contributed in a small way that I've not mentioned directly.

Van K. Tharp, Ph.D.

Part I:

The Golden Rules of Trading and How to Evaluate the Quality of Your Trading System

Introduction to System Evaluation

One of the fundamentals that every trader/investor must know is how to evaluate the effectiveness of your trading methodology. Part I of this book does just that.

In Chapter 1, we will explore the Golden Rules of Trading—core trading fundamentals that you must follow if you are to survive and prosper in today's market. Then, in Chapter 2, we will move on to understanding risk and how to properly think about all of your trades in terms of reward-to-risk ratios (or R-multiples as we call them). Understanding both of these chapters is critical to surviving in the markets long term.

Chapter 3 covers how to monitor the quality of your system. We'll look at a number of significant ways that you might evaluate your system. In fact, we'll even give you a chance to see how well you can discriminate between various trading systems to determine which one is the best with the criteria you currently have. You might be surprised at the results. And finally you'll learn a method that will help you distinguish a quality trading system from a so-so system. And when you have a quality system, you'll find that it is easy to lay a position sizing system over it to help you meet your trading objectives.

Chapter 4 covers the very important topic of how to think like a statistician so that you will be able to determine 1) what to expect from your system in the future and 2) how to know when your system is broken. Prediction of success is possible if you think of your system as a distribution of R-multiples with a mean (expectancy) and standard deviation. Doing so allows you to determine if you have a real edge in the market.

Chapter 5 covers the psychological biases that prevent most people from ever understanding or using any of this material. If you want to succeed, you must overcome these biases and make yourself efficient with respect to the market.

So let's get started with the Golden Rules of Trading/Investing.

Chapter 1

The Golden Rules of Trading

I bought my first stock when I was 16 years old in 1962. And, considering the knowledge I had about investing at the time, I did a fairly good job of researching the stock. First, I read an article in *Fortune Magazine* on the top growth stocks for the year 1961. The stock I picked was a small mobile home manufacturer, called Poloron, which had the highest growth in its earnings per share of any stock surveyed by *Fortune* during 1961. With that I thought I had done my homework. It was probably more homework than the average person does before he buys his first stock.

Anyway, the stock was selling for \$8 per share. I bought 100 shares with the \$800 I'd saved up, which was a lot of money in those days for a 16 year old. Within a year or so, the stock went as high as \$20 per share. In fact, I don't think I lost any money initially—the stock just did a steady climb. I was deliciously happy, and I'd more than doubled my money. Then it started to go down. I had no idea that you should sell falling stocks to preserve your profits, so eventually it went below my \$8 purchase price.

Now that I was losing money, what did I do? Did I re-evaluate the stock fundamentals? Was it still the top stock in terms of earning per share? Was it still increasing its earnings per share? I didn't look at any of that information.

Did I look to see if there was a better stock, based upon my initial screening criteria (and remember several years had now passed)? No, I didn't. I'd already selected my stock, so I didn't think I needed to do anything more. After all, isn't success all about selecting the right stock and holding it for the rest of your life? At least that's what I thought at the time.

Instead, I just assumed that the same criteria held and the stock was an even better buy now that it was valued at less than I paid for it. When it hit \$4 per share, it must have been twice as good as it was when I originally bought the stock at \$8, so I bought another hundred shares. And when it hit \$2 per share, it seemed like it was an even better buy, so I bought another hundred shares. I now had \$1,400 invested in this stock and I owned 300 shares. (When Warren Buffett was about that age, he bought a 40 acre farm for \$1,400—which he rented out! It was a much better buy.)

What do you think happened? Within another year or so Poloron went bankrupt. My \$1,400 went to zero. I have no idea where those shares are; I wish I did because I'd frame them. But that stock is now totally worthless. And when I ask people at my workshops, "How many of you have stock that is now worthless?" at least half of the people in the workshop are usually willing to raise their hands. That says something to me. A lot of companies end up going bankrupt!

So what was my mistake? Conventional wisdom would say that I picked the wrong stock. Just think about it. In the early 1960s, I invested \$1,400 in the stock market. If I had put that \$1400 in Microsoft when it was founded in 1975, that investment would be worth millions. If I had put that \$1,400 in Intel when it was founded in 1968 or even when it went public in 1978, that investment would be worth millions. Even an investment in the original Dow Jones Industrial stock, General Electric, in 1968 would be worth a small fortune today. I could have put \$1,400 into Berkshire Hathaway when it was founded in 1964 and today have over \$5 million from that one investment. So it would seem that my mistake was that I invested in the wrong stock.

That argument, in my opinion, is totally fallacious. For every stock I mentioned that would have made me millions, there are thousands of companies that, just like the one I invested in, no longer exist. So the first argument is that my chances of finding one of those great companies that would have made me millions were very, very small. If your criteria is picking the right stock, no matter how good your criteria are, you are still more likely to pick a stock that will eventually go bankrupt than you are of finding one that will make you a fortune.

Second, let's look at the stock I bought. It went from \$8 to \$20—that's a 150% gain—in about a year. That doesn't sound like I bought the wrong stock. Where did I go wrong?

- I didn't establish any initial risk parameters to say, "I'm wrong about this stock if it drops to this point." If you don't know how to do that, then a 25% drop is usually sufficient to say that something is wrong. Thus, my initial stop loss should have been about \$2 per share so that I would get out if the stock dropped to \$6 per share.
- Second, I had no way to take profits. I could have said, "If this stock doubles, I'll get out." I could have established a 25% trailing stop. That means that whenever the stock makes a new high, a 25% drop from that point becomes my exit. Table 1-1 shows my stock at various points and how a 25% trailing stop would have worked.

Notice, as shown in the table, that as the price gets higher, my trailing stop gets higher. And as the price goes down, my stop doesn't change. Thus, when the price goes to \$20 and then back down to \$15, I'm out. I have a profit of \$7 per share. Since my initial investment was \$8, I have a profit of 87.5%. However, since my initial risk would have been only \$2, my \$7 profit is actually 3.5 times my initial risk. I like to call this a 3.5R profit, where R stands for my initial risk.

Because I didn't have a stop, my initial risk was \$8 per share. That means that at the high price of \$20 per share, I only had a profit that was 1.5 times my initial risk.

**Table 1-1: A 25% Trailing Stop
on a Stock Going from \$8 to
\$20**

Stock Price	Trailing Stop
\$8	\$6.00
\$10	\$7.50
\$12	\$9.00
\$14	\$10.50
\$16	\$12.00
\$18	\$13.50
\$20	\$15.00
\$18	\$15.00
\$16	\$15.00
\$14	Out at \$15.00

- Third, I had no understanding of position sizing. I risked too much! I had \$800 and I risked all of it on one stock. Now, if I had kept a 25% trailing stop, I would have only risked 25% of it or \$200 on that stock. But as you'll learn later in this guide, risking 25% on one stock is still way too high. Incidentally, today's solution to the problem would have been to buy 4 shares—then my risk would have only been \$8 (i.e., \$2 per share risk times 4 shares is \$8) or 1% of my \$800. However, that wasn't an option in 1962, when it cost \$65 in commissions to buy the 100 shares and another \$65 to sell it. And if I wanted to buy 4 shares—it might have cost me more than \$65 because there would have been an extra cost to buy an odd lot.
- Fourth, I added to a losing position. You should never add to a losing position, but that's what I did.
- Fifth, I had no plan, no rules and no discipline.

Those are all huge mistakes and I didn't understand any of them at the time. But you will understand them when you've finished this book. And understanding them is the key to making sure that you don't make the same mistakes.

As a result of my many years of studying the best traders and investors in the world, I believe that there are certain "Golden Rules of Trading" that you must follow. I've listed the ten most important ones. These rules form the foundation of everything else that follows in this book.

The Golden Rules of Trading

1. **Never open a position in the market without knowing your initial risk.** Initial risk is the point at which you will get out of the position to preserve your capital. This point is your initial stop loss and it establishes your initial risk (which we'll call R for short). In my first investment if I had said, "Get out if the stock drops to \$6 per share," I would have been following the first rule. My initial risk, or R, would have been \$2 per share.
2. **Define your profit and loss in your trades as some multiple of your initial risk.** We call these R-multiples. If your risk is \$100 and you make \$200, you have a 2R gain. If your risk is \$100 and you lose \$150, then you have a 1.5R loss. It's a pretty simple concept. In other words, you must start thinking in terms of risk and reward. In my first investment, had I followed the 25% trailing stop rule, I would have had a profit of 3.5R or a profit that was 350% bigger than my initial risk.
3. **Limit your losses to 1R or less.** If you set an initial stop level and then change your mind when it goes down (i.e., because you don't want to take a loss), then you are in real trouble. This is what produces 4R losses or larger and those can turn a great system into a losing system very easily.
4. **Make sure that your profits, on average, are bigger than 1R.** Let's say you have one 10R profit and nine 1R losses. If you add those up you have 10R in profit and 9R in losses—a total gain of 1R. Thus, even though you lost money on 90% of your trades, you still made money overall because your average gain was huge. That's the power of having an average gain that is much bigger than 1R. And if you were to let your risk represent 1% of your equity, then that 1R gain would mean you had a profit of 1%. You'll learn more about this as we get into position sizing.

What typically has been known as the golden rule of trading is a summary of these first four rules: ***Cut your losses short and let your profits run.*** What we're talking about here is doing your best to make sure your losses are 1R or less and that your profits are much bigger (if possible) than 1R. Incidentally, the Nobel Prize for economics in 2002 was awarded to psychologist Daniel Kahneman, and economist Amos Tversky for their development of "Prospect Theory." While the topic sounds a bit complex, what Kahneman and Tversky actually showed, in my opinion, is that people have a natural bias to cut profits short and let their losses run—which is the opposite of the Golden Rule.

5. **Understand your trading system in terms of the mean (the average R) and the standard deviation (variability in the results) of your R-multiples.** Your system, when you trade it, will generate a number of trades. The results of those trades can be expressed as a multiple of your initial risk, or a set of R-multiples. You should know the characteristics of that distribution for any system that you plan to trade. And most people never know this.

If you spend some time and calculate the mean and standard deviation of your R-multiples, you'll know a lot about your system. The mean R-multiple is the **expectancy** of your system. In other words, *expectancy tells you what to expect from your system in terms of R-multiples over many trades*. If your expectancy is 0.33R, then you know that after 20 trades you'll probably be up by about 6R to 7R ($0.33R \times 20$ trades). And that's valuable information to know.

The *standard deviation of R tells you the variability of your system*. It tells you how much your results are likely to vary after any given sample of 20 trades. A small standard deviation suggests that the results from each sample will be similar, whereas a large standard deviation suggests that the result from each sample could be quite different.

Let's say your expectancy is 0.33R, but your standard deviation is 3R. What this means is that even though your average gain after 20 trades should total about 6.6R, you only have about a 65%¹ chance of being profitable after 20 trades because of the huge variability. Part I of this book is all about expectancy. Understanding the mean and standard deviation of your R-multiple distribution is very important to telling you how to trade the system you adopt.

6. **Design some core objectives for your trading.** Those objectives must be stated in terms of what you'd like to make as a goal for your trading and/or what you would call ruin for your system—the point at which you'd stop trading. When you have those two things, then you have a chance to meet your objectives and you can also calculate the optimum position sizing to meet your objectives. We'll be covering this topic later in this book.
7. **Practice proper position sizing in order to meet your objectives.** In a lecture to his students at a 1991 retreat in Hawaii, Ed Seykota said that the most important question you could ever ask yourself as a trader, once you know the expectancy of your system, is "*How much should I invest?*" Position sizing will be covered extensively in other parts of this book. Here are some of the key rules involving position sizing:
 - Invest a percentage of your equity so that you invest more as you win and less as you lose.
 - You might start out with a percentage of your equity that has a very low probability of reaching your ruin point and then switch to another percentage of your equity when you have enough money to make sure that you don't reach ruin. Models for doing this will be discussed extensively later.
8. **Calculate your System Quality NumberSM to give you some idea of how to position size your system in order to meet your objectives.** Generally, the better the System Quality NumberSM, the easier it is to use position sizing to meet your objectives. In addition, I'd also recommend that you simulate trading your system at least 100 times. In version 4.0 of *The Secrets of the MastersTM Trading Game*

you can plug in the R-multiples of your system and then live through trade after trade, with each one selected randomly. Do 50 or 100 such simulations and you'll really begin to understand how your system will perform and why it has the System Quality NumberSM that it has.

9. **Know the big picture (what factors are influencing the market); have a way to measure these factors; and have a business plan that helps you capitalize on these factors.** You then need three or four systems that meet rules 1 through 8.
10. **Follow the ten tasks of trading and master yourself.** This rule is the key that makes everything else work. The ten tasks of trading are the core of my *Peak Performance Course for Traders and Investors*.²

NOTES

¹ Sixty five percent was determined by running a simulation of 5000 sets of 20 trades with this R-multiple distribution.

Chapter 2

Risk(R) and R-Multiples

Let's look at the first golden rule in much more detail to be sure that you understand it. That rule, if you remember it, is to always have an exit point when you enter a position. The purpose of that exit point is to help you preserve your trading/investing capital. And that exit point defines your initial risk in a trade.

Wall Street defines the **risk** in a trade by its potential volatility: how much you can expect your account (or that position) to fluctuate.¹ However, that's not the definition of risk that we'll use here. Here **risk** is defined as **how much** you'll lose per unit of your investment (i.e., share of stock or number of futures contracts) if you are wrong about the position. I call this initial Risk (R or 1R). And the good news is that you can control this form of risk.

Let's look at some examples:

Example 1: You buy a stock at \$50 and decide to sell it if it drops to \$40. What's your initial risk?

The initial risk is \$10 per share. So in this case, 1R is equal to \$10. If you buy 100 shares, then your total risk is \$1,000 (i.e., $\$10 \times 100$). But let's call R our risk per unit.

Example 2: You buy the same stock at \$50, but decide that you are wrong about the trade if it drops to \$48. At \$48 you'll get out. What's your initial risk?

In the second example, your initial risk is \$2 per share, so 1R is equal to \$2. Notice that each time you buy a \$50 stock, but in the two cases you are simply selecting different initial risks or R values.

Example 3: You buy a stock for \$24 and you decide to keep a 25% trailing stop. That means you'll sell if it drops 25% from the entry price or from any subsequent higher closing price the stock makes. What's your initial risk? What's 1R for you?

In the third example, you'd sell the stock if it drops 25% to \$18. Thus, your initial risk is \$6/share and 1R is equal to \$6.

Example 4: You have a soybean contract at \$5.20 per bushel. You decide to sell if it drops 10 cents. What's your initial risk per contract given that one contract is 5,000 bushels? What's 1R for you?

In this case, you multiply 5,000 by your loss per bushel of 10 cents. Your initial risk is \$500, so 1R is \$500 per contract.

Example 5: You want to do a foreign exchange trade with a \$10,000 account, buying the dollar against the euro. Let's say that \$100 USD is equal to 77 Euros. The minimum unit you must invest is \$10,000. You are going to sell if your investment drops by \$1,000. What's your risk? What's 1R for you?

I made this example sound complex, but it isn't. If your minimum investment is \$10,000 and you'd sell if it dropped \$1,000 to \$9,000, then your initial risk is \$1,000, and 1R is \$1,000.

Are you beginning to understand? R represents your initial risk per unit. It's not your total risk in the position because you might have multiple units—it's simply the initial risk per share of stock or per futures contract or per minimum investment unit.

Understanding R-multiples

All of your profits and losses should be related to your initial risk. You want your losses to be 1R or less. That means if you say you'll get out of a stock when it drops from \$50 to \$40, then you actually get out when it drops to \$40. If you get out when it drops to \$30, then your loss is much bigger than 1R. It's twice what you were planning to lose, or a 2R loss. And you want to avoid that possibility at all costs.

Ideally, you want your profits to be much bigger than 1R. For example, you buy a stock at \$8 and plan to get out if it drops to \$6, so that your initial 1R loss is \$2 per share. The stock climbs and you sell at \$28 for a profit of \$20 per share. Since this is 10 times what you risked, we call it a 10R profit.

Let's look at some more examples to make sure that you understand. The answers will be given at the end of the exercises.

1. You buy a stock at \$40 and plan to exit if it drops to \$38. But it then gaps down six points at the open the next day. You get out as soon as you can at \$31. Your \$9 per share loss is what multiple of your initial risk? This example, by the way, is a good illustration of how your losses can be greater than the planned maximum of 1R.
2. You buy a stock at \$40 and plan to exit if it drops 10% to \$36. You eventually sell when the stock rises to \$80 per share. What's your profit as an R-multiple?
3. You buy a stock at \$40 with a planned exit at \$36. You sell it at \$45, what's your profit as an R-multiple?
4. You buy a stock at \$60 and plan to get out if it drops to \$55. However, when it goes that low, you don't sell. Instead, you just stop looking at it and hope it will go back up. It

doesn't. It becomes part of the headline business news involving corporate scandal and eventually the stock becomes worthless. What's your loss as an R-multiple? By the way, this perfectly describes the situation with Enron, WorldCom, or any number of other companies that have gone bankrupt over the years. There were plenty of signs to get out of those stocks before any corporate scandal broke out.

5. You buy a stock at \$50 and plan to sell it if it drops to \$49. The stock takes off and jumps \$20 in three weeks where you sell it at \$70. What is your profit as an R-multiple?
6. You buy a stock at \$50 with a 25% trailing stop. The stock goes as high as \$64 and then drops 25% where you get out at \$48. What is your loss as an R-multiple?
7. You buy a stock option at \$3. You determine that if the option drops by 50%, you'll get out. However, you get lucky and the underlying stock goes up \$10 and your option goes up in value to \$12 where you sell. What is your profit as an R-multiple?
8. You buy a stock option for \$4.50. You decide that you'll sell the option if it drops to \$3 or less. However, the stock gaps down overnight and you find yourself with an option that's only worth \$1.50. You decide to hang on, hoping the stock will come back. It doesn't. Instead, the option expires worthless. What's your loss as an R-multiple?
9. You buy a futures contract for wheat at \$3 per bushel. You decide that you'll sell if wheat drops to \$2.90 per bushel. Instead, wheat goes up to \$4.50 per bushel. What is your profit as a multiple of your initial risk? Incidentally, a wheat contract is 5,000 bushels, but you don't need to know that to answer this question. Why?
10. You decide to buy a stock when it breaks out of a trading range at \$40.35. You'll sell it if it moves back into the trading range at \$40 or you'll keep a 10% trailing stop on it as it becomes profitable. The stock moves to \$57.20 and then you get stopped out at \$51.48. What's your profit as an R-multiple?

Answers: Be sure you understand these answers before moving ahead in this workbook. In each case, I indicate 1R. I then divide the profit or loss by 1R to determine the R-multiple. It's that simple.

1. 1R is \$2. Your loss per share is \$9, so you have a 4.5R loss.
2. 1R is \$4. Your profit per share is \$40, so you have a 10R profit.
3. 1R is \$4. Your profit per share is \$5, so you have a 1.25R profit.
4. 1R is \$5. Your loss per share is \$60, so you have a 12R loss. You never want to let this happen.
5. 1R is \$1. Your profit per share is \$20, so you have a 20R profit. You want this to happen all the time.
6. 1R is \$12.50. Your loss per share is \$2, so you have a 0.16R loss. This is the sort of loss you want. Some people might argue that you've allowed a profit to turn into a loss. However, the key is you have followed your rules.
7. 1R is \$1.50 or half the value of the option. Your profit is \$9, which is a 6R profit.
8. 1R is \$1.50. Your total loss is \$4.50, so you have a 3R loss.
9. 1R is 10 cents. Your total profit is \$1.50, so you have a 15R gain. Notice that it was simple to determine your R-multiple from a single bushel of wheat because you just needed the ratio.
10. 1R is 35 cents. Your profit is \$11.13 (i.e., \$51.48 less your cost of \$40.35 = \$11.13). If you divide \$11.13 by 35 cents, you get a profit of 31.8R. Again, this is the kind of profit you want. Notice that your profit was only about 26% of the initial cost of the stock, but your result is a huge R-multiple because your 1R value was so small.

Using Your Total Risk to Keep Track of Your R-Multiples

It can get quite complex to keep track of the risk per unit and the profit or loss per unit. In addition, there are also transaction costs involved that won't get figured into your profit or loss per share. As a result, an easier way to determine the R-multiple distribution of your trades is to use the total initial risk and the total profit or loss (after costs) to determine your R-multiples.

Let's say that you have a \$100,000 account and you want to keep your total risk per position to about 1% of your account value or \$1,000. Here's what a sample of trades might look like.

1. You buy a stock at \$40 and plan to exit if it drops to \$38. You buy 500 shares, which at a risk of \$2 per share gives you a total risk of \$1,000. However, the stock goes to \$37 and then gaps down five points at the open the next day. You get out as soon as you can at \$31. Your total loss is \$9 per share times 500 shares or \$4,500. You also had a transaction cost of \$24, making your total loss \$4,524.

Your initial total risk is \$1,000. Your total loss was \$4,500, so you had a 4.5R loss. Wasn't this the same answer you got for the first example above? It should have been. However, your total loss, including transaction costs, was \$4,524. Thus, your actual R-multiple loss was 4.524R. Notice how the only difference between using total risk and risk per share is that with total risk you can include all of your costs in the R-multiple, which makes it a little more accurate.

By the way, you could also use the total cost to determine 1R. However, this step makes your calculations even more complex and your results would be slightly different. As a result, I recommend that you simply subtract your total costs from your profit or add it to your losses, as I did in the above example. You'll find that it is much simpler and you've still included the total cost in your R-multiples.

And while we're at it, let's say something about rounding. Let's say your total equity is \$100,000. You actually want to risk 1% of that or \$1,000. You determine that your risk is going to be \$11 per share. If you divide \$11 into \$1,000, then you get 90.909 shares. You cannot buy that much, so you'd probably end up buying 90 shares. However, if you multiply 90 times \$11, your initial risk is really \$990—not \$1,000. You also have transaction costs in there. Are they part of your risk? And when you are figuring out your R-multiple, do you divide by your intended risk (which was \$1,000 and is simple) or the actual risk of \$990? Look at our example above in which the R-multiple was 4.524 with the transaction costs added. Are the last two decimal points that significant? Probably not, so why not just round to the nearest single decimal point?

Let's do one more example:

2. You buy a stock at \$40 and plan to exit if it drops 10% to \$36. Since you want to keep your total risk to \$1,000, you only buy 250 shares. Notice that 250 shares times \$4 risk per share equals \$1,000 in total risk. Now, you eventually sell when the stock rises to \$80 per share. What is your total profit for your 250 shares? If your transaction cost is \$35, then what's your profit as an R-multiple?

This problem is again like the second example above, only now we are using total risk. Your total risk is \$1,000, so you can call 1R a thousand dollars. Your 250 shares of stock cost \$10,000 and you sold it for \$20,000, less your transaction costs of \$35. Thus, your profit is \$10,000 less \$35 or \$9,965. Since your initial risk is \$1,000, your profit as an R-multiple is 9.965R. In the per share example, we got 10R; the only difference was the transaction costs. Again, why not just round to 10R?

Table 2-1 shows the typical monthly transactions of a trader. You see the stock, the initial risk, and the profit or loss (including transaction costs). Your job is to fill in the R-multiple. I'll make it easy on you. All you have to do is divide the total profit or loss (including transaction costs) by the initial risk to get the R-multiple for that column. Remember that the initial risk usually isn't a simple round number like \$1,000. Notice that this trader didn't hold his total risk constant at \$1,000 for every trade, so you'll have to take that into account.

Table 2-1: Determining R-multiples from Total Risk

Transaction	Total Risk	Profit or Loss Including costs	R-multiple
400 CSCO at \$23	\$1,000	\$2,317	
80 IBM at \$80	\$1,000	-\$813	
300 VLO at \$50	\$1,000	\$3,413	
400 HRB at \$51	\$1,000	-\$1,531	
500 IRF at \$13	\$1,000	\$3,890	
400 ISIL at \$16	\$1,000	-\$776	
600 LSI at \$5.35	\$1,000	\$4,561	
500 MYL at \$17.50	\$500	-\$567	
400 ORI at \$31	\$800	-\$2,314	
300 SRA at \$40.77	\$600	\$1,571	
	Total	\$9,751	
	Average	\$975.10	

Table 2-2 shows the answers rounded to two decimal places. Are those the answers you got?

Table 2-2: Determining R-multiples from Total Risk

Transaction	Total Risk	Profit or Loss Including costs	R-multiple
400 CSCO at \$23	\$1,000	\$2,317	2.32R
80 IBM at \$80	\$1,000	-\$813	-0.81R
300 VLO at \$50	\$1,000	\$3,413	3.41R
400 HRB at \$51	\$1,000	-\$1,531	-1.53R
500 IRF at \$13	\$1,000	\$3,890	3.89R
400 ISIL at \$16	\$1,000	-\$776	-0.78R
600 LSI at \$5.35	\$1,000	\$4,561	4.56R
500 MYL at \$17.50	\$500	-\$567	-1.13R
400 ORI at \$31	\$800	-\$2,314	-2.89R
300 SRA at \$40.77	\$600	\$1,571	2.62R
Total	\$8,900	\$9,751	9.66R
Average	\$890	\$975.10	0.966R

Notice that it wasn't that hard to calculate your R-multiples. The only problem came when the total initial risk varied and you had to divide by a different number. Table 2-2 shows total and average profits and R-multiples. The total profit is \$9,751 and your total R is 9.66R. These values are very similar because the total initial risk was the same (\$1,000) for all but three trades.

What If You Don't Know Your Initial Risk?

What if you don't know your initial risk? Perhaps your initial exit was variable and it wasn't possible to say exactly what it would be at the onset. Perhaps you didn't understand the first golden rule and you didn't have an exit. Anyway, for some reason, you have a set of trades and

you don't know your initial risk. You'd still like to get a rough idea of the R-multiple distribution of your system. What can you do?

I recommend that you use your average loss as 1R. Let's see how that works out in the last sample. Table 2-3 shows the five losses.

Table 2-3: Using Average Loss to Determine 1R	
Transaction	Profit or Loss Including costs
80 IBM at \$80	-\$813
400 HRB at \$51	-\$1,531
400 ISIL at \$16	-\$776
500 MYL at \$17.50	-\$567
400 ORI at \$31	-\$2,314
Total Loss	\$6,001
Average Loss	\$1,200.20

Notice that we're 20% over \$1,000 by using this estimation. Nevertheless, at least it gives us an idea of what 1R might be for this system. Now let's plug in \$1,200 as 1R into Table 2-2 and see how much it changes the results. These are show in Table 2-4.

Table 2-4: Determining R-multiples from Average Loss			
Transaction	Total Risk	Profit or Loss Including costs	R-multiple
400 CSCO at \$23	\$1,200	\$2,317	1.93R
80 IBM at \$80	\$1,200	-\$813	-0.68R
300 VLO at \$50	\$1,200	\$3,413	2.84R
400 HRB at \$51	\$1,200	-\$1,531	-1.28R
500 IRF at \$13	\$1,200	\$3,890	3.24R
400 ISIL at \$16	\$1,200	-\$776	-0.65R
600 LSI at \$5.35	\$1,200	\$4,561	3.80R
500 MYL at \$17.50	\$1,200	-\$567	-0.47R
400 ORI at \$31	\$1,200	-\$2,314	-1.93R
300 SRA at \$40.77	\$1,200	\$1,571	1.31R
	Total	\$9,751	8.11R
	Average	\$975.10	0.811R

However, when you use total risk in determining your R-multiples, there is an assumption that you are using the same factor to determine what your total risk will be (i.e., like 1% of your equity). When it varies, you are probably just as accurate to use the average loss to determine 1R.

More Thoughts About Expectancy

In my first edition of *Trade Your Way to Financial Freedom*, I gave a traditional definition of expectancy:

$$\text{Expectancy} = [(\text{Avg Profit}) \times (\text{Probability of Winning})] - [(\text{Avg Loss}) \times (\text{Probability of Losing})]$$

However, the formula is incorrect because expectancy really should be the average profit per dollar risked, whereas this formula simply gives you the average profit. If you are curious, look up expectancy on the Internet and notice how many times you'll see this incorrect definition, which, I suspect, was often copied from my book.

Instead, the formula must be corrected as follows:

$$\text{Expectancy} = \frac{[[(\text{Avg Profit}) \times (\text{Probability of Winning})] - [(\text{Avg Loss}) \times (\text{Probability of Losing})]]}{\text{Avg Risk Amount}}$$

This formula, of course, was corrected in the second edition of *Trade Your Way to Financial Freedom*. 

Let's look at how we might use the data in Table 2-1 to calculate expectancy in this manner. We already know that the average loss is \$1,200.20. Our system has five winners and five losers, so the probability of winning and losing are each 50%. Table 2-5 shows the winning trades from our sample.

Table 2-5: Calculating Our Average Gain	
Transaction	Profit Including Costs
400 CSCO at \$23	\$2,317
300 VLO at \$50	\$3,413
500 IRF at \$13	\$3,890
600 LSI at \$5.35	\$4,561
300 SRA at \$40.77	\$1,571
Total Profit	\$15,752
Average Profit	\$3,150.40

Thus, we know that the average win is \$3,150.40 and that the probability of winning is 50%. Thus, the first part of the formula is \$1,575.20.

We also know that the average loss is \$1,200.20 and that the probability of losing is 50%. Thus, the second part of the formula is \$600.10.

To determine the expectancy, we subtract \$600.10 from \$1,575.20 and we get \$975.10. The average risk is \$890, so the expectancy is \$975.10/\$890 = \$1.096. So what does that really tell us? It tells us that we can expect to make a little over a dollar per dollar risked with this system, over a large number of trades.

Let's take a look at Table 2-2 again. Do you see the number \$975.10 in that table? Of course you do, it's the average profit/loss of the system. Thus, *the traditional definition of expectancy actually refers to the average profit or loss of the system* and, as I already said, needs to be corrected by dividing it by the average risk per trade.

If you look at the R-multiple column in Table 2-2, you see that we can also express expectancy with respect to R. In fact, another definition of expectancy is the average R-value of the system. Thus, Table 2-2 shows that the expectancy of this system can either be expressed in terms of dollars gained per dollar risked or in terms of R.

Sometimes, when people do not know the initial risk for every trade, they use the average loss to reflect R. When we plugged that into the formula, the best we got was an estimate of expectancy (i.e., $0.811R$) and not as accurate as when you use the actual risk for every trade, which gives you $0.966R$.

Thus, of three possible formulas for expectancy you can get three different results for expectancy:

- Average profit/average amount risked = 1.096 (corrected *Trade Your Way* formula)
- Using the average loss as the average risk = 0.811 (use this if you don't know initial risk)
- Using the average R-multiple = 0.966 (preferred/most accurate formula)

Expectancy really refers to the mean (average) R-multiple of your system. Thus, if you have a choice, always calculate the average R-multiple for expectancy.

Notice that when we go through this exercise, expectancy becomes quite easy to understand. **The expectancy of your system is the average of the R-multiples (both positive and negative) of your system.** It tells you what you can expect in terms of R, on average, over many trades.

For our system in Table 2-2, expectancy was $0.966R$. Thus, we know that we will make nearly one times our risk on average over many, many trades. In fact, over 10 trades we can expect to make $9.66R$. Over 100 trades we could expect to make $96.6R$.

People often say that R-multiple information is useless because R varies from trade to trade. That's true, but what if you risked 1% of your equity (position sizing) on each trade? When you do so, this information is quite valuable because it tells us that if we were to risk 1% of our equity on every trade, we'd make an average of 0.966% per trade. Furthermore, after 100 trades, we'd probably be up 100% or more—actually more, since 1% would continue to get bigger as we continue making money. That is, when you have \$100,000, you'd be risking 1% of that or \$1,000. But when you have \$110,000, you'd be risking 1% of that or \$1,100. Thus, your 1% risk would continue to go up as you made money.

What About the Variability?

The way I've presented this information looks very simple and straightforward. You make $0.966R$, on average, per trade. And if your total risk were 1% per trade, you'd make about 1% per

trade. After 100 trades, you'd probably be up over 100%. Well, on average, you would be! But the average is not the total picture. What about deviations from the average?

To understand how much your system can deviate from the average, you must not only know the average R-value (i.e., expectancy), you must also know the variability of R or standard deviation.² This variability will tell us how far away from the mean (expectancy) most samples are likely to be. It would be great if all samples were at the mean, but that is never the case because it would mean that there was no variability to the sample. Every R-multiple in our sample would have to be 0.966R.

You can calculate the expectancy and standard deviation of the R-multiples of your trade samples by simply using an Excel spreadsheet. Put your sample R-multiples in a column. Go to the blank cell at the end of the column, and click on the function (*fx*) at the top. A box will pop up and then you need to click on STATISTICAL, which will give you another box. You can then click on AVERAGE, which will give you the expectancy, then click on STDEV and you'll get the standard deviation. That's all you need to know.

Before you go on, plug in the 10 R-multiples from Table 2-2 into an Excel spreadsheet. Find the expectancy (average) and the standard deviation of R (STDEV). You should get the values 0.966 and 2.66. Now that you can do that, you can keep a running calculation of the expectancy and the standard deviation of the R-multiples of your trades. This is a good practice to do at least once each week.

Table 2-6 shows you a sample of what your trades might look like if you put them into Excel every week. It's simple and I strongly recommend that you do it.

You need to set up a spreadsheet with the following columns at the top:

1. Number of Shares (contracts)
2. Stock
3. Entry Price
4. Stop Price
5. Total Risk
6. Percent Risk
7. Selling Price
8. Profit/Loss
9. R-multiples
10. R-multiples Sorted, (this column is not linked to the others).

Table 2-6: How to Set Up a Spreadsheet to Calculate Expectancy and R-multiple Distribution

# of Shares	Stock	Entry Price	Stop Price	Total Risk	% Risk	Selling Price	Profit/Loss	R-Multiples	R-Multiples Sorted
50	BRCM	\$194.13	\$189.13	\$250.00	0.45%	\$227.00	\$1,643.75	6.58	7.7
55	INSP	\$221.00	\$216.00	\$275.00	0.49%	\$259.50	\$2,117.50	7.7	7.53
55	HLIT	\$130.00	\$125.00	\$275.00	0.49%	\$136.88	\$378.40	1.38	6.58
55	TXN	\$150.13	\$145.00	\$281.88	0.50%	\$161.56	\$629.06	2.23	2.23
55	JDSU	\$255.00	\$250.00	\$275.00	0.49%	\$292.63	\$2,069.38	7.53	2.2
25	JDSU	\$281.19	\$276.00	\$129.69	0.23%	\$292.63	\$285.94	2.2	1.71
60	EMLX	\$179.50	\$174.00	\$330.00	0.59%	\$173.50	-\$360.00	-1.09	1.38
60	COMS	\$112.00	\$107.00	\$300.00	0.54%	\$105.00	-\$420.00	-1.4	0.26
80	NEON	\$87.81	\$82.60	\$417.00	0.74%	\$83.38	-\$355.00	-0.85	-0.1
35	SDLI	\$447.50	\$439.00	\$297.50	0.53%	\$462.06	\$509.69	1.71	-0.11
70	EMLX	\$194.06	\$189.00	\$354.38	0.63%	\$181.00	-\$914.38	-2.58	-0.81
70	INCY	\$231.69	\$225.50	\$433.13	0.77%	\$231.00	-\$48.13	-0.11	-0.85
80	EMLX	\$214.50	\$209.25	\$420.00	0.75%	\$214.00	-\$40.00	-0.1	-1
475	MPEG	\$3.26	\$2.26	\$475.00	0.91%	\$2.24	-\$484.50	-1.02	-1
40	INSP	\$255.25	\$250.00	\$210.00	0.40%	\$251.00	-\$170.00	-0.81	-1.02
80	NEWP	\$170.56	\$165.00	\$445.00	0.86%	\$172.00	\$115.00	0.26	-1.09
95	EMLX	\$211.00	\$206.00	\$475.00	0.91%	\$204.00	-\$665.00	-1.4	-1.2
80	EMLX	\$219.69	\$214.00	\$455.00	0.88%	\$214.00	-\$455.00	-1	-1.4
80	HLIT	\$140.13	\$135.00	\$410.00	0.86%	\$134.00	-\$490.00	-1.2	-1.4
45	JDSU	\$279.00	\$270.00	\$405.00	0.78%	\$247.00	-\$1,440.00	-3.56	-2.58
65	BRCM	\$244.56	\$239.00	\$361.56	0.71%	\$229.00	-\$1,011.56	-2.8	-2.8
75	TXN	\$180.94	\$175.00	\$445.31	0.87%	\$175.00	-\$445.31	-1	-3.56
Totals							\$449.56	10.68	
Expectancy								0.49	
Standard Deviation								3.14	

Notice the following from Table 2-6:

1. How easy it is to calculate the risk: This is a \$50,000 account so all trades should have approximately \$250 risk (0.5% risk) or \$500 risk (1% risk).
2. R-multiples can be calculated automatically and it is easy to sort them and see the R-multiple distribution.
3. The R-multiple total, the expectancy, and the standard deviation can be calculated automatically at the bottom of the spreadsheet.

So What's the Downside?

Now that you know your standard deviation, you can get an estimate of the downside. If you look at the original way the trades came up in Table 2-2, you'll see that at one point we had two losses in a row. Those losses were a 1.13R loss followed by a 2.89R loss. Thus, in our original sample

we had a peak drawdown of 4.02R. But what if we had five losses in a row—which is quite possible in a 50% system with enough trades? We could have a total drawdown of 7R to 10R.

And if you risked 10% on each trade, you'd be pretty close to bankruptcy by the end of the losing streak. You wouldn't be bankrupt, however, because each time you'd only risk 10% of your remaining equity. That might look like the sequence of trades in Table 2-6.

Table 2-6: Five Losses in a Row				
Trade	Equity	Risk	R-Multiple	Result
1	\$100,000	\$10,000	-0.82	-\$8,200
2	\$91,800	\$9,180	-1.53	-\$14,045
3	\$77,755	\$7,776	-0.78	-\$6,065
4	\$71,690	\$7,169	-1.13	-\$8,101
5	\$63,589	\$6,359	-2.89	-\$18,378
	\$45,211	Totals	-7.15	-\$54,789

Most people would consider the system to be totally broken and stop trading. Yet it is something that is possible and it happens quite often even in the best of systems. And by the way, 10% is way too much risk for this system.

NOTES

¹ For example, see Crouchy, M. Galai, D., and Mark, R. *The Essentials of Risk Management*. New York: McGraw-Hill, 2006.

² The standard deviation is a statistical measure of the variability of a sample of data. It's not important for you to understand how to calculate the formula because you can use a simple calculator or an Excel spreadsheet to determine the standard deviation.

Chapter 3

Evaluating the Quality of Your Trading System

There are a number of ways that one might evaluate the quality of a system. You might have some clues about how to do it based upon what you learned from Chapter 2. But let's assume that you don't have that information. Let's assume that you just use your "gut" to determine the best system. To help you understand the accuracy of your "gut", I've given you an exercise to look over six different systems that are given in Table 3-1 and Table 3-2. Look over the first three systems and take about 15 minutes to decide which system you'd be more likely to trade. And after you make that decision, write down why you'd be more likely to trade that system.

Table 3-1: The First Three Sample Systems					
System 3-1		System 3-2		System 3-3	
Number of Trades	R-multiple	Number of Trades	R-multiple	Number of Trades	R-multiple
7	-1R	10	-1R	1	-10R
1	-5R	10	+1.3R	9	+1R
2	+10R				
20% win rate		50% win rate		90% win rate	
25 Trades per Month		75 Trades per Month		60 Trades per Month	

You'll notice that the systems have totally different R-multiple distributions, win rates, expectancies, and even different numbers of trades. One system wins 90% of the time, while another system only wins 20% of the time. So which system would you want to trade and why? Also notice what your criteria are for deciding which system you like the best. Write down what you think about these three systems in the space below.

Now look at the three following systems and decide which you like the best of these three. Then decide which system you'd be most likely to trade of the six systems given in the two tables. Notice that these are rough estimates of the R-multiple distribution using "buckets" of R-multiples with the numbers rounded to the nearest whole number in every instance but one. However, you are to assume that the R-multiples represent the actual populations of trades generated by each system. This means that large samples will generate similar results as small samples.

Table 3-2: The Next Three Sample Systems					
System 3-4		System 3-5		System 3-6	
Number of Trades	R-multiple	Number of Trades	R-multiple	Number of Trades	R-multiple
55	-1R	18	-1R	2	-10R
12	-2R	2	50R	4	-5R
3	-5R			10	-1R
5	+1R			5	+3R
4	+5R			2	+15R
3	+10R			1	+30R
3	+25R				
17.6% win rate		10% win rate		33.3% win rate	
12 Trades per Month		15 Trades per Month		35 Trades per Month	

In the space below write down which of these three systems you like best and your reasons for selecting that system.

In the space below, rank the six systems and then write down which system out of the six you would prefer to trade and why. Also note your criteria for your selection. If you have more than one criterion, list them in order of your preference. Also indicate if you would trade the system you like best and indicate why or why not.

Ranking 1= 2= 3= 4= 5= 6=

Now let's look at a number of ways you could evaluate these systems.

Method 1: Rank in Terms of Win Rate. This is the way I'd expect the average person to evaluate the systems. They want to be right, so they'd pick the system that allows them to have the most wins. Table 3-3 shows you this ranking.

Table 3-3: Ranking the Systems by Win Rate	
System	Win Rate
3-3	90%
3-2	50%
3-6	33.3%
3-1	20%
3-4	17.6%
3-5	10%

Is this the way you ranked the systems? Was your preference for System 3-3? If so, then this book could help improve your trading. And perhaps you should re-read Chapter 2 on expectancy.

Method 2: Rank in Terms of Expectancy. If two systems were fairly close in terms of expectancy, you might prefer the system with the higher winning rate. If you did that, you'd probably have the following results as shown in Table 3-4.

Table 3-4: Ranking the Systems by Expectancy		
System	Expectancy	Win Rate
3-5	4.10	10%
3-6	1.04	33.3%
3-1	0.80	20%
3-4	0.42	17.6%
3-2	0.15	50%
3-3	-0.10	90%

You'll notice from the first analysis, that the expectancy is almost inversely related to the win rate. That's actually quite common for trading systems and it is one reason people tend to lose money. They are attracted to systems with higher win rates, which sometimes have a very low (or even negative) expectancy. Notice that our 90% system had a negative expectancy. So if you picked System 3-3 as your favorite, then you picked a system that will lose money in the long run.

Expectancy alone (even with the win rate of the system) is still one of the most naïve ways to evaluate systems. However, if you ranked your preferences based upon expectancy, don't feel bad. You are already more sophisticated than the average investor.

Method 3: Rank in Terms of Expectancy Times Number of Trades. The next way you might evaluate the systems is to multiply the expectancy by the number of trades or the opportunities it would give you in a month. I call this **expectunity**. The net result would allow you to know how much you'd expect to be up in terms of R, on the average, at the end of the month. That would

seem like a pretty good way to evaluate a system. So let's look at Table 3-5, which ranks our six systems with respect to this criterion.

Table 3-5: Ranking the Systems by Expectancy Times Number of Trades			
System	Expectancy	Number of Trades	Expectunity
3-5	4.10R	15	61.5R
3-6	1.04R	35	36.4R
3-1	0.8R	25	20R
3-2	0.15R	75	11.25R
3-4	0.42R	12	5.04R
3-3	-0.1R	60	-6.0R

Notice that this changes things a little bit. System 3-5 is still the best system. But System 3-6, with 35 trades, now ranks second. And the two systems with the most trades, 3-2 and 3-3, were not helped because their expectancies were either negative or very low.

If you risked 1% on each trade with System 3-5 and System 3-6, then you might expect to be up over 60% with System 3-5 and over 35% with System 3-6. Can you get that kind of return out of your system with just 1% risk? So perhaps now we have the answer.

So did you rank system 3-5 as the best system? If so, then you're getting pretty sharp, but still not as sharp as you could be. What if your criterion for a good system was to make sure that you didn't have a losing month or year? Or what if your criteria ranked the systems in terms of potential drawdowns against you?

Method 4: Determine How Much You Could Lose. So let's take a look at the potential losses of these systems. What is the potential loss against us in terms of R?

In order to look at this information, I ran 10,000 simulations of 100 trades of each of the systems and I then ranked the systems in terms of 1) the average (median) largest drawdown of the systems and 2) the worst possible drawdown in the 10,000 simulations. These drawdowns were measured in terms of R.

Just to illustrate what I'm actually doing, take a look at Table 3-6. This shows the trades of System 3-1 for a month. In the first column, I show the R-multiples for each trade generated, and in the second column I show the cumulative R-multiple.

Table 3-6:
Sample Trades from System 3-1

R-multiple	Cumulative R
-1R (1)	-1R
-1R (2)	-2R
-1R (3)	-3R
-1R (4)	-4R
-1R (5)	-5R
-1R (6)	-6R
+10R (7)	+4R
-1R (8)	+3R
-5R (9)	-2R
-5R (10)	-7R
-1R (11)	-8R
-1R (12)	-9R
-1R (13)	-10R
-1R (14)	-11R
+10R (15)	-1R
-1R (16)	-2R
-5R (17)	-7R
-1R (18)	-8R
+10R (19)	+2R
-1R (20)	+1R
+10R (21)	+11R
-1R (22)	+10R
-1R (23)	+9R
+10R (24)	+19R
-1R (25)	+18R
Total	18R
Expectancy	0.72R

The expectancy of the system is $0.8R$, so the expectancy of this sample is a little worse at $0.72R$. However, since expectancy is the mean R , we can expect many of the samples that we draw out to be better than the average and many to be worse.

But that's not what we're interested in here. What we're looking at is the worst drawdown against us as shown in the cumulative R column. Notice that the first six trades are all losers and we're down $6R$. We then get a big winner and we go up to $+4R$. However, trades 9 and 10 are both $5R$ losers, so now we have an even lower cumulative drawdown of $7R$. We then get four more $1R$ losses and end up with a cumulative drawdown of negative $11R$. We then have a big winner and our sample never gets worse than negative $11R$, so that becomes the sample's worse drawdown.

Well, what would happen if we did this for 100 trades for each system? And what would happen if we simulated the 100 trades for each system 10,000 times? Well that's what I did to illustrate method 4. These are shown in Table 3-7. Both the average drawdown of the 10,000 simulations

and the worst are given in Table 3-7. Notice that the larger the average drawdown, the larger the worst-case drawdown becomes.

System	Drawdown		Expectancy
	Average	Maximum	
3-2	-8.7R	-34.8R	0.15R
3-5	-26.5R	-96R	4.10R
3-1	-27.6R	-99R	0.80R
3-4	-41.8R	-129R	0.42R
3-3	-42.2R	-184R	-0.10R
3-6	-53.4R	-199R	1.04R

Notice what suddenly happens. The system with the worst positive expectancy suddenly becomes the best system in terms of avoiding drawdowns by far. And the system with the second best expectancy becomes the worst system in terms of drawdowns. In fact, System 3-6 is even worse than our system with a negative expectancy, System 3-3.

The only problem with this particular method is that you probably don't have the ability to do 10,000 simulations of 100 trades with each of your systems. However, the good news is that method 4 still isn't the best method for evaluating systems. The best method involves using statistics and evaluating your System Quality NumberSM or SQNSM, for short. You don't need a simulator to determine the SQNSM.

Method 5: Using Statistics to Evaluate the System. The first three methods of evaluating the six systems did not take into effect the variability of the systems and the potential for large drawdowns. What if we were to use some method that would take those factors into account?

Well, we can use the following formula to do that:

$$\text{System Quality Number}^{\text{SM}} = (\text{Expectancy} / \text{Standard Deviation R}) \times \text{square root of Number of Trades}$$

This is actually equivalent to a statistical t-score, which you could use if the expectancy is significantly better than zero.¹ And it is a great tool to determine which system is the best. So let's look at the various systems with this in mind. These are shown in Table 3-8. I recommend that you use Table 3-8 to evaluate how well you did ranking the systems.

Notice what's happened. System 3-2, which had the worst positive expectancy and the smallest standard deviation, now has vaulted into first place.² It suddenly looks like a pretty good system just because it has a lot of trades and very low variability. We had already discovered that based upon potential drawdowns against us using the simulator. What's nice is that you could determine the quality of your system just by doing a simple calculation. You didn't have to do 10,000 simulations of 100 trades.

Table 3-8: Ranking the Systems by System Quality NumberSM			
System	Expectancy/Standard Dev	Square Root N	SQNSM
3-2	0.13	8.66	1.13
3-5	0.26	3.87	1.01
3-1	0.16	5	0.80
3-6	0.12	5.92	0.71
3-4	0.08	3.46	0.28
3-3	-0.03	7.75	-0.23

In addition, notice that System 3-5 again comes out as the second best system, just as it did in the drawdown method. So hopefully, this will make you feel even better about using the System Quality NumberSM.

System 3-6, which ranked fairly high in some of our other tests, now becomes one of the lowest ranking positive expectancy systems. But if you follow the guidelines given later in this chapter, you'll never trade a system like System 3-6.

Lastly, notice that nothing can save System 3-3 with its negative expectancy. The only saving grace of System 3-3 is the fact that it doesn't have a lot of variability in its losses.

So by the most accurate measure System 3-2 is the best system and System 3-5 is the second best. Did you rank either of these systems as the best? If not, then hopefully I've created a major paradigm shift for you.

In Table 3-8, N equals the number of trades generated per month. If you assumed a constant number of trades, such as 100, you would get quite different results, as shown in Table 3-9.

Table 3-9: Ranking by System Quality NumberSM Based Upon 100 Trades			
System	Expectancy/Standard Dev.	Square Root N (100)	Formula
3-5	0.26	10	2.60
3-1	0.16	10	1.60
3-2	0.13	10	1.30
3-6	0.12	10	1.20
3-4	0.08	10	0.80
3-3	-0.03	10	-0.30

Notice that 3-5 now becomes the best system. With an equal number of trades, the System Quality NumberSM is actually just the ratio between the expectancy and its standard deviation.

So which method should you use to determine your System Quality NumberSM—the number of trades in a given time period (e.g., a month or a year) or a constant number of trades? Both have some merit, but I'd recommend that you compare System Quality NumbersSM based upon the number of trades they generate in a year. However, you must have a year's worth of trades to do this!

When using position sizing guidelines, later in this book, we've used the second method of assuming 100 trades for each system, and we recommend that you do the same. However, you still must have a year's worth of trades to do this. Incidentally, in our six systems we know the entire population of trades. They are not samples. Thus, the mean and standard deviation will not vary due to unknown R-multiples that you discover as you get a larger sample. You will never have this luxury with real trades.

So how did you rank the systems and why? And would you trade the systems? Would you trade system 3-2 or system 3-5, for that matter? Why or why not? Put your answer and the reasons for your answer in the space below.

Let's look at all six of our systems and see how they ranked according to each method. These are shown in Table 3-10.

Table 3-10: Summary of the Rankings by Each Method

Method	System Rankings					
	Best	2	3	4	5	Worst
1—Win Rate	3-3	3-2	3-6	3-1	3-4	3-5
2—Expectancy	3-5	3-6	3-1	3-4	3-2	3-3
3—Expectunity	3-5	3-6	3-1	3-2	3-4	3-3
4—R Drawdown	3-2	3-5	3-1	3-4	3-3	3-6
5—SQN SM with Trades/month	3-2	3-5	3-1	3-6	3-4	3-3
6—SQN SM with 100 trades	3-5	3-1	3-2	3-6	3-4	3-3

Notice that the best system, according to the System Quality NumberSM, was only picked out by the drawdown and system quality methods. It was one of the worst systems based upon expectunity and expectancy. And the worst system (the one with the negative expectancy) was ranked best by the win rate, while it was ranked worst by all the other methods except the R-drawdown method.

Rating Your System

Using the System Quality NumberSM, let's see if we can make some guidelines for evaluating a system. These are given in Table 3-11. You will understand how I developed these criteria when you read Part III of this book on *Using Position SizingSM to Meet Your Objectives*.

Table 3-11: Using the System Quality NumberSM to Rate Your System Based Upon 100 Trades

Quality Score	Rating Of Your System
Less than 1.0	Probably very hard to trade
1.01 to 2.00	Average System (needs to be about 1.7 to be statistically significant)
2.01 to 3.00 ³	Good System (significantly different from 0)
3.01 to 5.00	Excellent System
5.01 to 7.00	Superb System (few exist)
7.01 or higher	Holy Grail System

Notice that none of our sample systems are really very good. Just two of them rank high enough to be considered average systems. This is why I believe that if you use the System Quality NumberSM to evaluate your system, you probably have no risk at all of trading something like System 3-6, which might look good to you in terms of expectancy and expectunity. Notice that if you decided that you liked any of those systems well enough to trade one, then your standards are probably way too low.

Some people might trade such systems, but you can do much better trading some newsletters that give recommendations. For example, Steve Sjuggerud's *True Wealth* newsletter, which has been making monthly recommendations since October of 2001, has a System Quality NumberSM of nearly 3.⁴ That's outstanding for a newsletter that must make recommendations each month on a particular date. Furthermore, Steve must limit his recommendations to something that 100,000 people might trade all at once, so everything he recommends must be very liquid. These are extreme limitations.

My simple efficiency system, buying highly efficient stocks with a 25% trailing stop, long only, has a System Quality NumberSM of 4.08 in 23 trades made between July 2006 and July 2007. (See *Tharp's Thoughts*, July 18, 2007). This might be characterized as a quiet, up-market. However, the market then became sideways and volatile and the system didn't work well at all, and I wouldn't expect any trend-following system to work in that sort of environment.

Ken Long teaches several systems in our ETF workshop that have System Quality NumbersSM above 5. Nevertheless, I expect that most people will have systems with scores of 1.75 or less, so don't be upset if your system's score isn't excellent. I suspect that there are very few systems that rank as high as 5.0 or better.

You probably need to be very careful with highly ranked systems. Chances are you have not yet seen your worst-case loss (although that probably applies to every system). However, for highly ranked systems, a significant loss (i.e., a 5R psychological loss) could significantly damage your equity because you may have overestimated your position sizing. Don't just take these guidelines and apply them to your systems. Be sure that you understand the statistical assumptions that you are making before you use them.

All of these SQNsSM assume that you have 100 trades (i.e., N = 100). N should refer to the number of trades gathered in a fixed amount of time (i.e., one year). And in order to compare your

system on this standard, you must use the number of trades you make per year as N in the formula. This is because there is a very critical issue of how fast you get the 100 trades.

A system that makes 100 trades in a week is going to be much better than a system that makes the same 100 trades over a three-year period. For example, a system with an expectancy of 0.35 that makes 100 trades in a month will have an average gain of 35R at the end of the month. When you compare that with another system that has an expectancy of 1.25, but takes three years to make 100 trades (i.e., 2.78 trades per month) it will only have an average gain of 3.47 R per month. The second system might have a SQNSM of 3, compared with a SQNSM of 2 for the first system. However, most people would still be happier with the first system because it makes money fast.

If you only have a sample of ten trades, then you'd need a System Quality NumberSM of at least 3.50 to *begin* to think you have a good system. With 20 trades, you'd need a System Quality NumberSM of 3.00 to *begin* to think of it as a good system. And with 30 trades, that would drop down to perhaps 2.50 to be a good system. However, with such small samples (and even 30 trades is small), you only have an inkling of what to expect from your system.

Also don't just plug 100 trades into your system to determine your System Quality NumberSM. For example, one of the systems that Ken Long teaches in our Exchange Traded Funds Workshop has an SQNSM of 13 after 38 trades.⁵ I was totally floored when I heard that. However, the System Quality NumberSM was calculated based upon 100 trades, not 38. That means it had a multiplier of 10 (i.e., the square root of 100) rather than a multiplier of 6.16. In my opinion, with 38 trades all we can say at this point is that it "looks like" a Holy Grail system with a System Quality NumberSM of about 8. I don't think it's fair to assume that the system will keep the same level of quality over the next 62 trades.

One Problem with the SQNSM and How to Overcome It

Suppose you test 20 years of data for some trading idea. The results of backtesting look really spectacular and give you a SQNSM of over 5. Such a backtest is shown in Table 3-12. Based upon the results, you now have a superb system. Few such systems exist, according to the criteria we've suggested, that are as good as this.

But is that really true? No, it isn't. It simply points out a problem with the SQNSM. When you have too many trades, you can strongly overestimate the quality of your system. In the case of this system, we have an SQNSM of 5.19 and 198 trades.

Table 3-12: Summary Results	
Number of Trades	198
Mean of R-Multiples	0.39
Standard Deviation of R-Multiples	1.06
System Quality NumberSM	5.19

Notice that the expectancy of this system is only 0.39R. And if you look at the ratio of the expectancy to the standard deviation, you get $(0.39/1.06 = 0.368)$. Now let's just assume that we had 100 trades. Our SQNSM would only be: $0.368 \times \text{SQRT}(100) = 3.68$.

That's a good system but not a superb system. Thus, too many trades could cause you to overestimate just how good your system is.

So here are my recommendations:

- If you have fewer than 100 trades, then use the SQNSM to determine the quality of your system. The number of trades you make in a year would be a good estimate.
- But if you have over 100 trades, then simply multiply the ratio (of the expectancy divided by the standard deviation) by 10. In other words, assume you just have 100 trades and calculate the SQNSM. You might be a little conservative by this approach, but it's better to be conservative than to overestimate how good your system really is.

Statistical Assumptions in Using This Material

One major difficulty we have in using this material to evaluate our systems is the statistical assumption we must make that your R-multiple distribution is valid. In other words, does your sample of trades really reflect what will happen when you trade your system?

When you make 10 trades, what you've really done is taken a sample of 10 trades from the universe of possible trades that your system might generate. So, is your system statistically profitable? And, how accurately does this sample of trades represent the population of trades that your system might generate?

Let's look at the two questions separately:

First, is your system statistically profitable? If you look at the formula we gave you to determine the quality of your system, you'll find that it is also a formula that determines whether or not your system is statistically profitable.

$$\text{System Quality Number}^{\text{SM}} = (\text{Expectancy} / \text{Standard Deviation}) \times (\text{square root of Number of Trades})$$

This is basically the formula for a t-score, comparing one sample against an assumed mean of zero. If you have a positive expectancy, the t-score shows whether or not your results are significantly different from a zero or negative return. And if there is a 95% probability that it is different, then you can reject the hypothesis that it has a negative or zero return on the average.

Generally, the larger the SQNSM, the more likely it is that you can reject that hypothesis. Appendix II shows some t-scores at various percentiles that you can use to answer this question for yourself. If you look at the t-scores in Appendix II, *you'll notice that not one of the systems*

given in this chapter, even System 3-2, has a high enough value to be any better than chance at making money. Yet people trade such systems every day.⁶

Incidentally, the t-score is based on the assumption that your data fit a normal bell curve. Most trading systems have fat tails—i.e., they have one or two big trades that make up most of the profits. Nevertheless, the t-score will at least give you a rough estimate of the quality of your system. However, small samples (like 10 to 20 trades) are too small to give you a good idea of the statistical validity of your system. The best you can conclude is that you are off to a good start.

Second, do these trades adequately represent the actual trades that my system will generate?

This is an even more important question if you are going to use your R-multiple distribution to determine such things as how to do position sizing with your system. For example, if you think your system only has a 10% probability of a 20R drawdown, but your sample of trades doesn't adequately represent what your system could do, then you could easily have a 50R drawdown. Thus, the question “Do my trades adequately represent my system?” is a very important one.

Generally, the larger your sample the more likely it will adequately represent the true population statistics. Thirty is usually considered the minimum size to begin to reflect the population. Thus, if you have 30 trades, you probably have enough trades to begin to estimate the overall performance of your system.

Unfortunately, with trading it's a bit more complicated than just having a large number of trades. You must know if your sample represents the real population of trades. It won't unless it represents an adequate sample from all of the various kinds of markets.

For example, you could have picked 200 trades made in high tech stocks during 1998 through 1999 and looked at a system involving trend following with those trades and assumed that you had a “monster” system. That system would have resulted in ruin during 2000 through 2002. The markets during those two periods were entirely different. So you must ask yourself, “What kind of markets did we have when my system produced the sample of trades?” Generally, there are six kinds of markets:

- Up-volatile markets: This was the stock market in 1999.
- Up-quiet markets: This means that everything goes up very smoothly—it's almost a straight line up without a lot of choppiness.
- Sideways (flat)-volatile markets: The stock market was basically flat in 2004. Sometimes it was volatile and sometimes it reflected the next kind of market.
- Sideways (flat)-quiet markets: The first part of 2005 definitely reflected this kind of market. The major averages went nowhere and they seldom moved by much more than a percentage point in an entire week.
- Down-volatile markets: This was definitely the NASDAQ market in 2000.
- Down-quiet markets: Most bear markets also have periods like this when the averages move down every week, but not radically. These sort of eat you to death if you are long.

Your time frame for trading would determine how you might define each market type. The examples given in this chapter assume that you have a long-term perspective and look at three

month periods. You'd use this if your goal was to hold a position for a long time. A shorter-term perspective might look at weekly changes in the market, and a day trader might use daily changes or even have different classifications for types of trading days.

While you might not trade your system in all six kinds of markets, you need a large sample of trades (ideally more than 100, but at least 30) from **each** of these six markets to get an adequate idea of how your system will perform.

If you don't meet these criteria, and few people ever do, then you really have no idea what to expect from your system. The best you can say is something like "I have 50-100 trades from a [insert the kind of market that was going on when you made the trades], but I have a pretty good idea how my system will perform under these conditions. Furthermore, I need to make sure I only trade under these conditions because I have no idea how my system will perform in other conditions."

The last assumption you need to look at is how many simultaneous trades your system could make. You need to be careful here. If your system generates 20 trades that you have open at one time, what will happen to all of them if the whole market crashes? As Steve Sjuggerud is fond of saying, "*Generally, all ships move with the tide.*" So if you have 20 trades and the market crashes, then they may all act like one big trade that is going against you. This issue is also addressed later under the topics of portfolio heat and group heat.

In addition, you need to understand that the market does have periodic price shocks. This means that everything suddenly goes down dramatically and the drops are substantial. If you are trading leveraged instruments such as futures, then all of your capital could be wiped out during one such price shock. You have to assume that one of these shocks might be right around the corner and you must be able to survive it.

There have been two major shocks since I have been a trading coach. The first shock happened in October 1987 during and after Black Monday. The S&P 500 went down 20% in a single day. In some ways, the shocks in other markets (Eurodollar, Silver, and Gold) were even worse the next day. There were huge price jumps with no chance to get out and if you were on the wrong side in a large leveraged position, you could have lost everything.

The second major price shock was in September of 2001. Wall Street closed down on September 11 and basically stayed closed the rest of the week. When the market reopened on September 17th, prices continued their downward move from early September. So if you were short, you did well. The S&P 500 fell more than 12% that week before bottoming. It then rebounded 8% in the following week. These were huge price swings. Imagine being on the wrong side of a large, leveraged position (or worse yet, multiple ones). Again, you could have lost everything.

Improving Your System Quality NumberSM

Generally, the better your System Quality NumberSM, the more you can do with position sizing to meet your objectives. For example, with an SQNSM between 1 and 2, you will probably struggle

to meet your objectives no matter what. However, when your SQNSM jumps above 4, you'll find that it becomes much easier to meet your objectives with position sizing. These topics are discussed extensively in Part IV.

To prove how much easier it becomes to use position sizing to meet your objectives with a better System Quality NumberSM, I created seven model systems with SQNsSM ranging from 1 to 7. The SQNsSM all assume that you have 100 trades. These systems are subsequently used in this book to provide you with guidelines for how to use position sizing to meet your objectives with various SQNsSM. Remember that with these model systems you have the entire population because I generated them. In real trading, all you will ever have is a sample from which to infer what the population is like. System SQN1 through System SQN7 are shown in Figures 3-1 through 3-7, respectively. In each case, I've made the worst-case loss 5R just to be conservative, although you might get worse losses in systems with low SQNsSM.

Count	R-Multiple
23	-5
55	-1
12	3
6	15
4	30

Expectancy (Mean)	0.76
Standard Deviation	7.54
Win %	22
Win/Loss Ratio	5.13
# Trades	100
SQNSM	1.01

Figure 3-1: System SQN1

Count	R-Multiple
1	-5
6	-3
11	-2
10	-1
57	1
15	2

Expectancy (Mean)	0.32
Standard Deviation	1.58
Win %	72
Win/Loss Ratio	0.62
# Trades	100
SQNSM	2.03

Figure 3-2: System SQN2

Count	R-Multiple
2	-5
2	-1.5
32	-1
28	1
21	1.5
15	2

Expectancy (Mean)	0.45
Standard Deviation	1.49
Win %	64
Win/Loss Ratio	1.12
# Trades	100
SQNSM	3.02

Figure 3-3: System SQN3

Count	R-Multiple
4	-5
8	-2
10	-1
40	1
31	2
4	5
3	10

Expectancy (Mean)	1.06
Standard Deviation	2.66
Win %	78.0
Win/Loss Ratio	0.93
# Trades	100
SQNSM	3.98

Figure 3-4: System SQN4

Count	R-Multiple
3	-5
4	-2
9	-1
42	1
33	2
5	5
4	10

Expectancy (Mean)	1.41
Standard Deviation	2.83
Win %	84
Win/Loss Ratio	1.03
# Trades	100
SQNSM	4.98

Figure 3-5: System SQN5

Count	R-Multiple
1	-5
6	-2
11	-1
31	1
23	2
22	5
6	10

Expectancy (Mean)	2.19
Standard Deviation	3.65
Win %	82
Win/Loss Ratio	1.94
# Trades	100
SQNSM	6

Figure 3-6: System SQN6

Count	R-Multiple	Expectancy (Mean)	3.42
1	-5	Standard Deviation	4.89
3	-2	Win %	90
6	-1	Win/Loss Ratio	2.35
24	1	# Trades	100
25	2	SQN SM	6.99
25	5		
16	10		

Figure 3-7: System SQN7

What's Important in Getting High SQNsSM?

First, there is a strong correlation between the win rate and the SQNSM, although System SQN2 has a higher win rate than System SQN3.

Second, adding high R-multiples will definitely improve the expectancy of the system, but at one time I decided to add two 30R winners to a system with an expectancy of 1.1 and a SQNSM that was 4.51. Guess what happened? When I added two 30R trades the expectancy almost doubled to 2.13, but the standard deviation went up a lot more to 5.99. That gives it a ratio of 0.355, and when we assume 100 trades, it produces a SQNSM of 3.55. So by just adding two huge R-multiples to the distribution, I actually reduced the SQNSM by more than 20%. It makes sense now that I think about it because it increased the standard deviation more than the mean, but it is not what I would have predicted before doing the calculation myself. Instead, to increase SQNSM to 5, I needed to add smaller winners.

The higher the SQNSM the more difficult it is to improve. For example let's look at the improvement in the net R and the ratio of positive to negative R for each system. These are shown in Table 3-13.

Table 3-13: SQN 1 through 7				
System	Expectancy	Win Rate	+R less -R	Ratio +R: -R
System SQN1	0.76R	22.0%	76R	1.41
System SQN2	0.32R	72.0%	32R	1.58
System SQN3	0.45R	64.0%	44.5R	1.99
System SQN4	1.06R	78.4%	106R	3.30
System SQN5	1.41R	84.0%	141R	5.41
System SQN6	2.19R	82.0%	219R	8.82
System SQN7	3.42R	90.0%	342R	21.11

Expectancy, win rate, the total R difference between winners and losers, and the ratio of the two all increase as the System Quality NumberSM goes up. However, it is clear that the ratio of the +R total to the -R total is the most predictive of the SQNSM. And, it is also in both the +R less -R data set and the Ratio of +R: -R that a small change is necessary to improve the SQNSM when we

are starting from a low level, but a huge change is required as our system gets better and better. As a result, I am even more impressed by systems with high SQNsSM.

NOTES

¹ The t-score assumes a normal distribution, which we don't have with our R-multiples. However, the t-score is still an excellent way of determining the overall quality of the system. The formula given is used to determine if one sample is different from zero. It is not the formula that compares two samples.

² I've seen a system with an expectancy of 0.07, which I thought was terrible, turn out to have a System Quality NumberSM of 2.21 simply because it generated a lot of trades (i.e., 603) and had a very good reliability (i.e., 78%).

³ A good rule of thumb might be to look for a system that produces a System Quality NumberSM of at least 2.5 before trading it. You might also just look at the ratio between the expectancy and the standard deviation of the R-multiples. If that ratio is 0.25 or better, then you have the makings of a potentially good system.

⁴ This is based on calculations on August 14, 2007.

⁵ The SQNSM could be much different after 100 trades.

⁶ However, we know that five of the six systems make money because we know the entire population of R-multiples generated. You will never have that luxury with your real trades.

Chapter 4

What Can I Expect in the Future?

The purpose of this chapter is to give you an idea of how to answer the question: "What can I expect from my system in the future?" Some people backtest their system to determine if it gives them a good enough return (i.e., expectancy). In my opinion, what most people do to answer this question is totally inadequate, but it still helps to give them enough confidence to trade a system. Typically, they use backtesting software to test possibility after possibility so that one might end up with something that looks profitable, but isn't well thought-out. But this procedure only looks at one possible sample of many possible samples. It usually doesn't represent their system, and that's usually a prescription for disaster.

For example, suppose you want to test a moving average crossover system. It's profitable but not something you'd want to trade. As a result, you start testing other different moving averages and then add an oscillator and suddenly you come across something that seems to work quite well and produces great profits. But what do you have? You aren't really sure you have anything at all because you didn't think it over.

Let's say you have thought out your concept and backtested it with perhaps just a few adjustments to make it work to your satisfaction. For some people, testing one sample in this way is enough to give them the confidence needed to trade that system, especially if you've tested over 20 years of data, with hundreds of samples from each of the different markets. But all you really know is one example of how your system worked on past data. And even if the R-multiples generated by your system in that testing accurately represent what your system can do, you are still missing a lot of information. Your real job at this point is to ask some very standard questions:

1. Does my sample accurately represent the kind of results I can expect from my system?
2. Is this system valid? Does it really do what it is supposed to do?
3. If I answer "Yes" to both questions, what can I expect from this system in the future?
What will happen in terms of drawdowns? What can I expect to earn? How variable will my performance be?
4. What kinds of markets will my system work in?
5. Does my testing assume that one trade is made at a time? If so, what will the implications be on real trading if I have a portfolio of multiple, correlated trades?
6. And, with the objectives I have in mind and the results of my testing, how should I position size this system to adequately meet my objectives?

Question 1: Is My Sample Representative?

So you've now done some backtesting on your system. You have a sample of 25 trades, representing a year of trading. Now you must ask yourself the critical question: "Are these results

representative of what could really happen with my trading system, trading real money in the markets?"

There are several rules that you can generally use to help you answer this question. First, statisticians usually require a minimum sample size of thirty trades to even begin to estimate the real population of trades. In other words, your system could generate an infinite number of trades and you need at least thirty samples to even begin to estimate what that infinite population might look like. If you have 100 (or better yet 500) samples, then you can feel even better about the results you might be getting.

As a trader, however, you can do even better than a large sample size. You can use some common sense logic by asking yourself more important questions:

1. What is the purpose of my system? For example, your system might be a trend following system. Wouldn't it make sense that your system would only work well when the markets are trending? But will it perform equally as well in down-trending markets as in up-trending markets? Will it perform equally as well when the market is volatile and trending (very active with large daily ranges) as when the markets are quiet and trending? If you understand your system, then you should be able to answer these questions at least roughly.

Once you understand the purpose of the system, you can then focus on your sample representativeness. Pollsters understand sampling very well. If they want to find out how voters think about some particular issue, they will call several hundred people and ask them. But this only works if they get a reliable sample. Their sample must represent the population of voters adequately. Do they have an accurate representation of each age group, each sex, each ethnic group, and any other variable that they believe to be important to this issue? If the sample does represent the voting population, then they can conclude that they have a pretty good idea how the country thinks about that particular issue.

Just as the pollsters must determine if their sample of voters is representative of the population, you must also determine if your sample of R-multiples is representative of the markets you'll be trading. So here is the next question to ask yourself:

2. What kind of markets did I take my sample from? In order for you to adequately predict how your system will do in the future, you need to sample at least 30 trades from each of the six kinds of markets mentioned previously. That means you need a sample of at least 180 trades—30 from each market type—to adequately answer the question, "How will my system perform in the future?" A sample of 500 trades really won't do you any good if it is just from up-trending quiet and volatile markets. Why? Because it won't tell you how your system will perform in other types of markets. Your sample will not represent its performance in those markets.

If a pollster wants to know how Democrats will respond to a particular stand on some issue that their candidate has taken, then they must poll only Democrats. Similarly, you can restrict your trading to certain kinds of markets by putting some sort of filter on it.

3. Thus, you could ask yourself, "How can I filter for the kind of markets I want to trade?" For example, in *Safe Strategies for Financial Freedom*, I presented a strategy for trading bear market mutual funds in a down market. However, this requires either a 1) down quiet market or 2) a down-volatile market for it to work. So how do I filter for those markets? First, I require that the 1-2-3 model be in the red-light mode (see *Safe Strategies for Financial Freedom* for how that model works). And, second, I require that all three major indices be down over the last five weeks. The model doesn't take a trade unless those conditions are met. And third, I need a weekly drop in the S&P 500 of 2.5%, which is volatile by today's conditions. The book was finished in late 2002 and we have not had that kind of market between late 2002 and the publication of this book. The S&P 500 seldom moved more than 1.5% per week in 2003 through 2006 and throughout most of this period the market also had a slight upward bias. And the chances are pretty good that you won't see this sort of signal in an up market, although it might happen occasionally in a sideways market.

Question 2: Is My System Valid?

Now that you have answered the first of our five questions and decided that your sample does represent the real performance of your system in the markets you'll be trading, you must ask the second question: "Does this system do what it is supposed to do—make money?" If it does, then you probably have a decent system. There are several ways that you can answer this question.

First, you can do a Monte Carlo simulation of your system to determine if a sufficient number of samples make money. Let's say you have a sample of 30 trades. You want to determine what happens when you sample 100 such 30-trade samples. What percentage of these samples makes money? Are you happy with those results?

Most people would probably be happy with the system if 95% of the samples made money. Think of the implications of this. It means that you'd only have about one losing month every other year. That would delight most people. If 95% of your samples made money, then you would definitely have a statistically significant system. System 3-1, for example, when 30 trades are taken over 10,000 simulations, makes money about 85% of the time. This means that if you made 30 trades per day with it, that 85% of your days would be profitable. If you made 30 trades per month, then 85% of your months would be profitable. And System 3-1 doesn't even have an acceptable SQNSM.

What happens if only 85% of your samples make money? This would mean that you'd lose money in two of the 12 months of trading. Would you be satisfied with that? Most people probably would, since it's still way above average. How about if only 75% of your samples make money, implying that you'd only make money in 9 out of the 12 months of the year? Or how about 60%, implying that you'd only make money in 7 of the 12 months—would you be happy with that? Anyway, at some point, you'd decide that your system wasn't good enough and wasn't worth trading. I suspect that most of you would want at least 75% of your samples to make money.

Another approach to this would be to look at your system's SQNSM by plugging in the exact number of trades you will have in a year into your sample (i.e., N = ?). Now you basically have a t-score and you can get a rough idea of whether or not your results are statistically different from zero simply by using Appendix II. You'll be asking the question, "Can I statistically reject the assumption that my system won't make money?" If the chances of that assumption being true are less than 0.05, then you can statistically reject that hypothesis and assume that your system will make money. Again, many of you won't have a statistically significant system.

Once you are confident that your system will make money, you can go on to answer the third and fourth questions.

Question 3: What Can I Expect from My System in the Future?

Question three now takes system performance testing way beyond the scope of backtesting. In backtesting you only have one sample—a historical sample of some many months or years of data. You might have 1,000 samples of data over 20 years, but it only represents what happened in the past—not what will happen in the future.

However, you can get a better idea of what might happen in the future by taking your data sample and plugging the R-multiple distribution into a Monte Carlo simulator. My friend, Chris Anderson, has developed such a simulator and has allowed me to use it for my personal use. And through it, I can determine several things¹:

1. What can I expect from my systems in terms of drawdowns? What is the maximum drawdown in terms of R? What is the probability of getting a drawdown as big as 20R in my sample of 100 trades? How long might that drawdown last?
2. How will I know what to expect in terms of losing streaks? What is the chance of getting a losing streak of 10 in a row or bigger with this system in 100 trades?²
3. How will I know when this system is broken or no longer working?
4. And most importantly, given the results of the simulation, how can I position size this system to adequately meet my objectives in trading it?

The first three questions in this set are answered next, but we'll wait until Part III to answer question four.

You can do such simulations by 1) making up a bag of marbles that represent the R-multiples of your system and simulating 100 trades, 2) using the simulator in the *Secrets of the Masters*TM game, or 3) using one of the simulators reviewed in Chapter 17.

Let's assume that I have a valid and reliable sample of R-multiples from my system. I can put those into a simulator that can do 1,000s of simulations, just to show you the process. For example, we could run a simulation of 10,000 runs of 130 trades.

The simulator takes the R-multiple distribution we plug into it and assumes that it is the population of trades possible for our system. This assumption is fine if you have answered the

first two questions in this chapter. For trade one, the simulator randomly selects an R-multiple value from the sample it has and assumes it's the result of the first trade. For trade two, it does the same thing and it could select the same value again because every time it selects randomly from the possible population. For example, you could have a 20R trade that only occurs 1% of the time. That particular trade might be sampled ten times in a row. This would be a very unlikely occurrence (with a probability of 1.0E—20), but it's possible. Remember that you can do this yourself (although much more slowly) with a marble bag or with the *Secrets of the Masters*TM game, recording the R-multiples as you get them. The net result will be a set of equity curves. The personal level of the game will also give your worst-case drawdown each time you play. You should save this data.

Figure 4-1 shows a hypothetical set of equity curves (in terms of R) for 10,000 samples. The middle one is what you can expect, on average, but there is a chance for curves at the extremes and that's how you learn what to expect from your system. The lines show what might be expected; what's above average and what's below average.

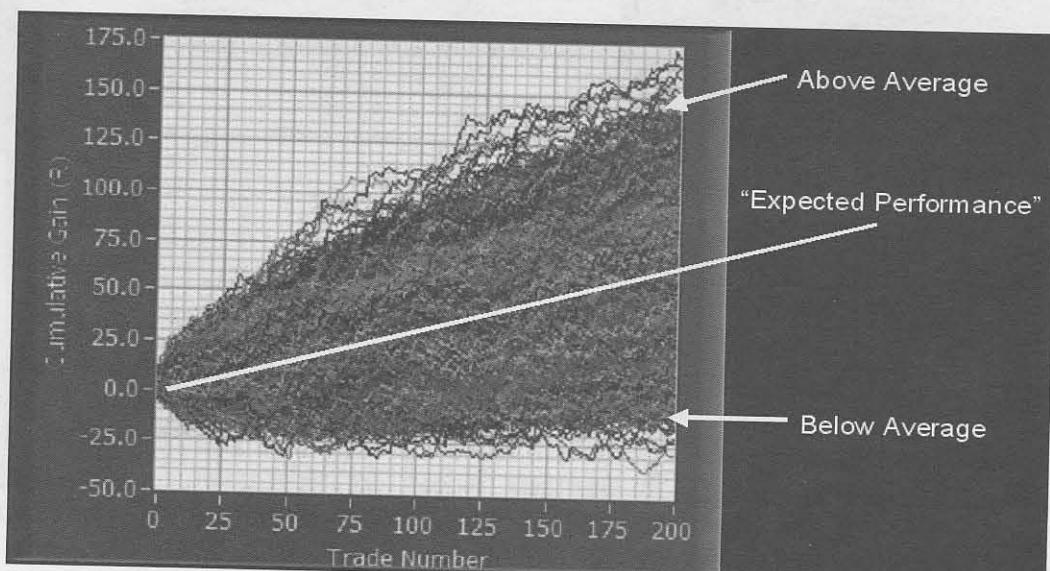


Image created from Know Your System software. Software not available for sale.

Figure 4-1: A Set of 10,000 Results

People want to know the possible drawdowns of their system. What's the peak drawdown against you in terms of its cumulative R-multiple?

Suppose you had the following sequence of trades: +1R, +2R, +10R (here you make an equity peak and then start a drawdown), -2R, +1R, -3R, +1R, -2R, -1R, -1R, -5R, (the drawdown peak occurs here and then you start to move out of it) +2R, +2R, +1R, +10R, +5R, etc. If you add up all of those R-multiples during the drawdown, you'd find they added up to a total drawdown of -12R. You then get four trades, giving you +15R, so by the time you hit the 10R, you are at a new equity peak in terms of R. If you started another streak of losing trades before you hit a new equity peak, then you might find that your peak-to-trough drawdown was even bigger than -12R.

Suppose you are simulating 200 trades as we are doing in this example. Simply record the maximum peak-to-trough drawdown achieved during the 200 trades. The *Secrets of the Masters*TM game will calculate this for you. Write that down and then repeat the process at least 100 times. It will take some time, but the results you'll get will be worth it.

I did it with my simulator, which keeps track of that number for each of the 10,000 simulations and then let's you know the average peak-to-trough drawdown and the chances of getting a drawdown as big as XR. This is illustrated in Figure 4-2.

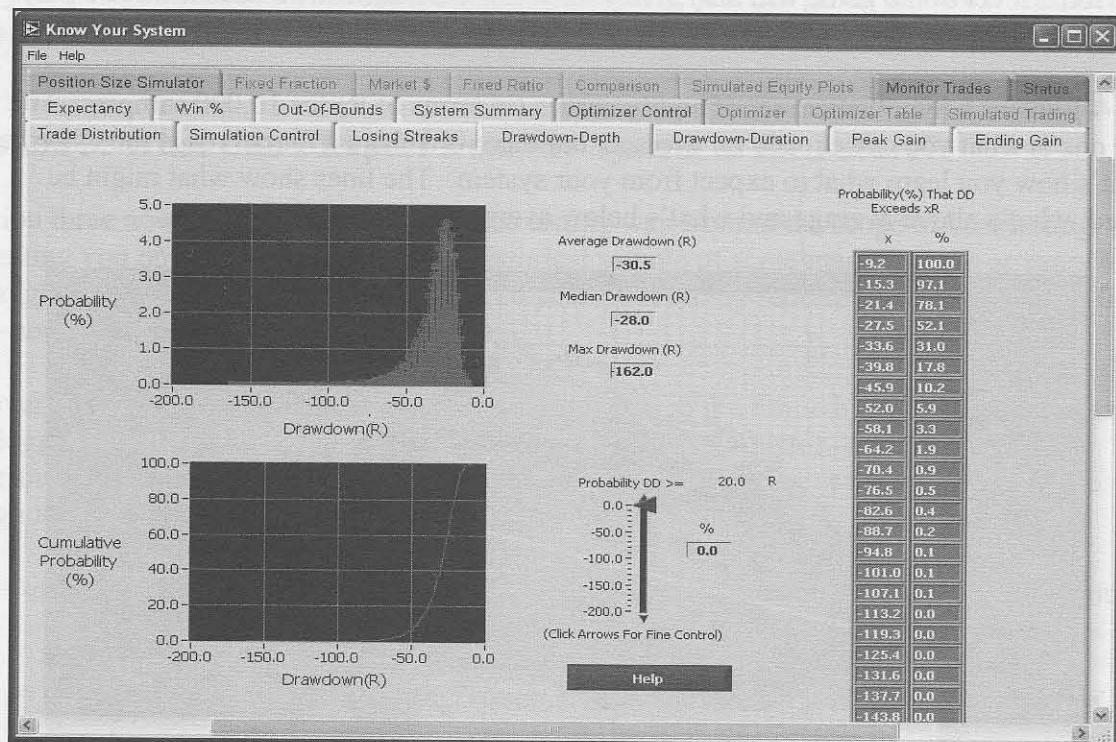


Image created from Know Your System software. Software not available for sale.

Figure 4-2: Determine Your R Drawdowns

Another very interesting thing the simulator can do is tell you about potential losing streaks that you might have to face. This is shown in Figure 4-3.

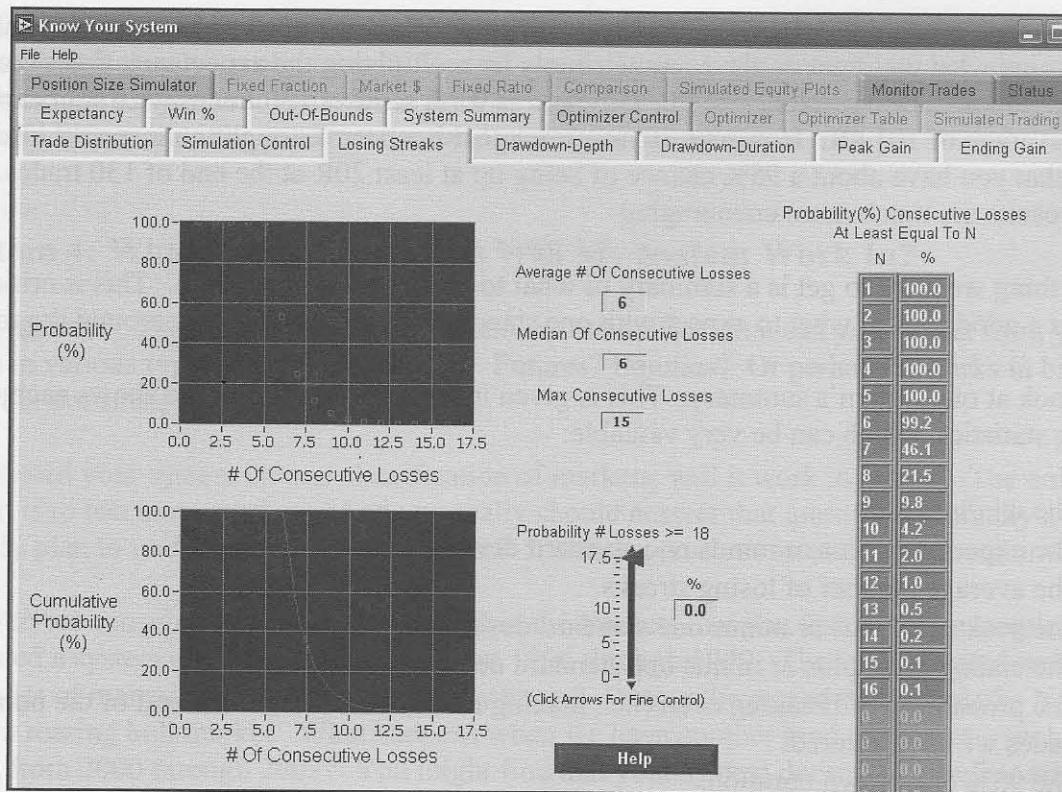


Image created from Know Your System software. Software not available for sale.

Figure 4-3: Losing Streaks in Your System

The graphs at the left of the figure show the probability of each sized losing streak plus the cumulative probability. Furthermore, the little boxes in the middle show the average number of consecutive losses, the median number, and the maximum number. You can also determine the probability of any particular losing streak just by moving the arrow to the appropriate length losing streak and then reading the probability in the little box.

There are always precautions to determining such data. For example, one of my clients tested his system over eight years and had 2,000 samples. He determined that the system had 70% winners and that the largest losing streak was 11 consecutive losses. However, suddenly he was doing real trading. He had 84 trades. The system had 52% winners and had already reached 8 consecutive losses. Was the system broken? The temptation was certainly to say the system was broken. But most of the characteristics of the system appeared normal. And, I pointed out to my client that when you get a streak of 8 losses in 100 trades, it will certainly take your hit rate down. Chances are that the system was not broken, but had just hit one of those periods. And he knew it was possible to get 11 losses in a row, so it had not exceeded its outer boundaries.

At this point in your testing, you might feel a little discouraged. In the case of our sample system, it shows that we can expect an average of 6 consecutive losses and that it's possible to get as many as 15 losses in a row. We've also determined that our average drawdown is 30R and it could get as big as 162R. It looks very discouraging, but remember that these are average and worst-case scenarios.

Now we need to see what's possible from the profit side. We don't need a simulator for that. We can determine what we'll get on the average simply by multiplying the expectancy times the number of trades. The expectancy of our sample was 0.78, so after 130 trades we might expect to be up an average of 101.4R. However, if you simulate this system enough times, you'll also discover that you have about a 95% chance of being up at least 20R at the end of 130 trades. So now the results are much more encouraging.

The next thing we want to get is a summary of what to expect from the system. This is critical and it gives us a good idea of what to expect with one standard deviation boundary around the mean.

So let's look at our system's summary. This is given in Figure 4-4. The figure shows each of the following statistics, which can be very valuable:

- The win/loss ratio.
- The expectancy plus or minus one standard deviation.
- The average number of losing streaks.
- The peak gain, plus or minus one standard deviation.
- The ending gain, plus or minus one standard deviation.
- The probability of breaking even (i.e., making money or better) at the end of the number of trades we have entered.
- The 95% drawdown duration.
- The average yearly gain in terms of R (based upon the number of trades per month).
- And the gain to drawdown ratio, which is important.

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	130.00			
Avg # Trades Per Month	10.00			
Win/Loss Ratio	6.67			
Expectancy		0.37	0.78	1.19
Win %		16.4	19.9	23.4
Losing Streaks			17	
Drawdown(R)		-42.4	-30.5	-18.6
Peak Gain (R)		63.1	112.3	161.6
Ending Gain (R)		48.1	101.7	155.3
Prob. Of Break Even or Higher (%)	97.6			
# Trades For Break Even (95%)	96			
95% Drawdown Duration (Months)	9.6			
Yearly Gain(R)	96.0			
Avg Yearly Gain/Avg Drawdown	3.1			

Image created from Know Your System software. Software not available for sale.

Figure 4-4: System Summary

This information now gives you some very important guidelines against which to evaluate your system. Will it meet your objectives? That is, can you tolerate the drawdowns and does it make enough money for you to tolerate those drawdowns? The figure gives you all sorts of valuable and useful information for you to understand your system better.

Question 4: What Kinds of Markets Will My System Work In?

At this point you know a lot about your system as tested. But what can you expect from your system in various types of markets? Forex? Futures? Equities? Or perhaps it works in big liquid stocks but not small cap stocks.

If you tested your system on one classification of markets, will it work in others? The only way to find out is to test more markets. And you really should answer that question eventually even if you only plan to trade your system on the S&P 500 Index (such as an e-mini contract or the SPY).

However, we can even get more specific within the markets that you tested. For example, suppose you tested a system on NASDAQ stocks from 1996 through 1999. The system tested well and made a lot of money. But what do you really know? During the period you tested, the NASDAQ was in a roaring bull market. What happens when we have another kind of market—such as the market from 2000 through 2002? You might find that your system doesn't test well at all, unless it was also designed to go short.

With a given product, such as the S&P 500 index, there are really six different kinds of markets. And you need to understand, and perhaps even collect R-multiples, for each of them. Markets can go up, down, or sideways. And they can do so with a lot of variability or in a quiet manner. You could even classify them as quiet, normal, and volatile—which would give you nine different kinds of markets. Figure 4-5 gives an illustration of the six different types of markets.

Up-Volatile Market	Up-Quiet Market
Sideways-Volatile Market	Sideways-Quiet Market
Down-Volatile Market	Down-Quiet Market

Figure 4-5: The Six Potential Markets

To really understand your system, you should understand how your system will perform in all six kinds of markets. So let's say you wanted to determine these six kinds of the markets on the S&P 500, which represents the U.S. blue chip stocks. What you might do is determine the weekly volatility over an 11 year range from 1995 through 2005. That range would certainly include all types of markets.

Thus, to give you an idea of what this might be like, I calculated the weekly volatility (weekly high minus the weekly low stated as a percentage of the close) in the price of the S&P 500 from January 1995 through December 2005.³ This involved 580 weeks and certainly gives us a good

estimation of what to expect from the S&P 500. The average (mean) price volatility was 3.3% per week and the variability (standard deviation) was 1.85%. This data was quite interesting because during the same period the weekly change (i.e., this week's close minus last week's close) averaged +0.15% with a standard deviation of 2.29%.

If we wanted to look at six market types, we could look at 13 week periods and define a quiet period as being one in which 7 or more weeks were below the mean.⁴ A volatile period could be one in which 8 or more weeks were above the mean. So based upon that criteria, let's look at our ten years of S&P 500 data and classify them as being quiet or volatile. These are shown in Table 4-1.

Table 4-1: Quiet and Volatile Periods in the S&P 500

Date	# Weeks > Mean	Classification
October—December 2005	1	Quiet
July—September 2005	0	Quiet
April—June 2005	1	Quiet
January—March 2005	0	Quiet
October—December 2004	2	Quiet
July—September 2004	1	Quiet
April—June 2004	1	Quiet
January—March 2004	1	Quiet
October—December 2003	0	Quiet
July—September 2003	3	Quiet
April—June 2003	7	<i>Borderline, but Quiet</i>
January—March 2003	11	Volatile
October—December 2002	11	Volatile
July—September 2002	13	Volatile
April—June 2002	8	Volatile
January—March 2002	4	Quiet
October—December 2001	11	Volatile
July—September 2001	9	Volatile
April—June 2001	7	<i>Borderline, but Quiet</i>
January—March 2001	9	Volatile
October—December 2000	11	Volatile
July—September 2000	1	Quiet
April—June 2000	10	Volatile
January—March 2000	11	Volatile
October—December 1999	6	Quiet
July—September 1999	7	<i>Borderline but Quiet</i>
April—June 1999	9	Volatile
January—March 1999	9	Volatile
October—December 1998	8	Volatile
July—September 1998	10	Volatile
April—June 1998	5	Quiet
January—March 1998	3	Quiet
October—December 1997	9	Volatile
July—September 1997	12	Volatile
April—June 1997	5	Quiet
January—March 1997	5	Quiet
October—December 1996	5	Quiet
July—September 1996	4	Quiet
April—June 1996	2	Quiet
January—March 1996	5	Quiet
October—December 1995	0	Quiet
July—September 1995	1	Quiet
April—June 1995	0	Quiet
January—March 1995	0	Quiet

The table shows, for example, that in 2005 there were only two weeks (out of 52) that exceeded the mean volatility of the ten year period. And in 2004, there were only five weeks (out of 52) that exceeded the mean volatility. Thus, 2004 and 2005 were certainly extended periods of a quiet market and that has continued through mid-2007 (which is not shown because it is not part of our baseline period). In 1995, we only had one week that exceeded the mean.

But for the 52 weeks from April 2002 through March 2003, there were 43 weeks out of 52 that exceeded the mean volatility of 3.3%. And from July 1998 through March of 2000, representing

19 quarterly periods, we only had three non-volatile quarters plus two borderline quarters. Thus, it is certainly easy to contrast the markets of 1995 through 1997 and 2004 through 2006 with the immensely volatile periods of 1998-2000.

If we wanted to look at nine types of markets, we might call normal as being the mean plus or minus one standard deviation. Volatile would be anything more than one standard deviation from the mean and quiet would be anything less than one standard deviation from the mean. The mean is 3.3% and the standard deviation is 1.85%. Thus any weekly period above 5.15% would be volatile. Any weekly period below 1.45% would be considered quiet. And, lastly most periods, which fall between 1.46% and 5.14% would be considered normal.

With this definition, there were 10 quiet weeks in 2005, no volatile weeks, and the rest were all normal. And, in 2002, we had 19 volatile weeks, one quiet week, and the rest were all normal. I don't particularly like this "9-market" definition because it becomes very difficult to classify large periods as being anything but "normal." About 68% of all periods will fall within one standard deviation of the mean and thus be called "normal."

The next thing I did was to visually inspect a 10-year chart of the S&P 500. I believe that it's actually easier to visually determine whether the market is up, down, or sideways than it is to have some mathematical algorithm to determine it. Table 4-2, shows my classification of the direction of the market along with the volatility. And Table 4-3 summarizes how many periods we have had of each classification from 1995 through 2005. Notice that down market periods (i.e., 5 of 7) are much more likely to be volatile than up market periods (i.e., 4 of 22), while sideways markets are almost evenly divided between quiet and volatile. Table 4-2 summarizes the data in Table 4-3.

Table 4-2: Summary Classifications of the S&P500 from 1995 through 2005

	Up	Sideways	Down	Total
Volatile	4	7	5	16
Quiet	18	8	2	28
Total	22	15	7	44

Since the Secular Bear Market started in 2000⁵ (although really not until late 2000 for the S&P 500), not counting 2006, we have had 5 down periods, 11 sideways periods, and 8 up periods. Thus, 67% of the time, from 2000 through 2005, it was going down or sideways. In contrast, during the preceding five years of the Secular Bull Market, we had 2 down periods, 4 sideways periods, and 14 up periods. Thus, during the last part of the Secular Bull Market the market was up 70% of the time. Quite a contrast, isn't it?

The one problem with the market classification presented here is that it does not tell us what the market type is each week and it is not automatic. I've now developed an automatic way to do this, and I'll be preparing a special report on how to do it with 30 years of market classification done weekly and daily. When this report is available, I'll notify you through *Tharp's Thoughts* and we'll start reporting results in our monthly update.

Table 4-3: Up, Down and Sideways Periods of the S&P 500

Date	Direction	Classification
October—December 2005	Up	Quiet
July—September 2005	Up	Quiet
April—June 2005	Sideways	Quiet
January—March 2005	Sideways	Quiet
October—December 2004	Up	Quiet
July—September 2004	Sideways	Quiet
April—June 2004	Sideways	Quiet
January—March 2004	Sideways	Quiet
October—December 2003	Up	Quiet
July—September 2003	Up	Quiet
April—June 2003	Up	<i>Borderline, but Quiet</i>
January—March 2003	Sideways	Volatile
October—December 2002	Sideways	Volatile
July—September 2002	Sideways	Volatile
April—June 2002	Down	Volatile
January—March 2002	Down	Quiet
October—December 2001	Up	Volatile
July—September 2001	Down	Volatile
April—June 2001	Up	<i>Borderline, but Quiet</i>
January—March 2001	Down	Volatile
October—December 2000	Down	Volatile
July—September 2000	Sideways	Quiet
April—June 2000	Sideways	Volatile
January—March 2000	Sideways	Volatile
October—December 1999	Up	Quiet
July—September 1999	Down	<i>Borderline but Quiet</i>
April—June 1999	Up	Volatile
January—March 1999	Up	Volatile
October—December 1998	Up	Volatile
July—September 1998	Down	Volatile
April—June 1998	Up	Quiet
January—March 1998	Up	Quiet
October—December 1997	Sideways	Volatile
July—September 1997	Sideways	Volatile
April—June 1997	Up	Quiet
January—March 1997	Up	Quiet
October—December 1996	Up	Quiet
July—September 1996	Up	Quiet
April—June 1996	Sideways	Quiet
January—March 1996	Sideways	Quiet
October—December 1995	Up	Quiet
July—September 1995	Up	Quiet
April—June 1995	Up	Quiet
January—March 1995	Up	Quiet

So let's say that you manage to accumulate at least 30 trades from each of these markets for your system. You then calculate your System Quality NumbersSM for each type of market and come up with the results in Table 4-4.

Table 4-4: System Quality NumbersSM for System X for the Various Markets				
	Up	Sideways	Down	Average
Volatile	1.73	-1.13	1.65	1.12
Quiet	4.32	0.78	4.45	2.72
Average	3.03	-0.18	3.05	1.94

Overall, your system produces a System Quality NumberSM of 1.94, which is not that great. But when you break it down into market type you find that it works well in up markets, with a System Quality NumberSM of 3.03, and down markets, with a System Quality NumberSM of 3.05, but that it doesn't work well at all in sideways markets. Furthermore, you find that it is better in quiet markets than volatile markets. In fact, if you pick quiet, trending markets (both up and down), your system has a very high System Quality NumberSM above 4 in each of them. Thus, suddenly a system that didn't look so good is now revealed as a system that will probably perform very well in the future if you select your market conditions appropriately.

At this point, if you do everything I've suggested, then you should have answered your question about whether or not your system can meet your trading objectives. Thus, even though you might not have access to powerful software that will do simulations for you, you can still run a single simulation of a year's worth of data in a short period of time. And if you do this 100 times or more, keeping track of the important statistics for each run, you'll find that you will have a good idea of what to expect from your system.

Question 5: What If I Have Multiple Correlated Trades?

Most simulators assume that you make one trade at a time. However, very few people really trade that way. Quite often, you might have a portfolio of 20 or more positions. And some of these trades might be highly correlated. For example, what if you had purchased three home building stocks simply because they were the best performing stocks when you bought them? When home builders start to fall, chances are that all of them will fall at one time.

Similarly, if you have a portfolio of stocks, futures, or forex, chances are that there will be times when all of them fall (or rise) together. My friend Steve Sjuggerud is fond of saying that "all ships fall with a falling tide" to describe what happens when the stock market goes down. And what he really means is that most of your portfolio will have a tendency to move together. For example, by July 15th, 2007, IITM's retirement portfolio was up about 5% for the month. Towards the end of the month the markets started to crash. On Thursday July 26th and Friday July 27th, 2007, both big losing days, everything in the portfolio moved down. By July 31st, the portfolio was down about 1% because of the problem of multiple correlated trades.⁶

Simulations that you might do will assume that each sample is independently drawn from the population, but if your trades are all somehow correlated, you could have some real problems in your portfolio, unless you trade in such a way as to assume that all of your trades could move together.

My purpose for including this question was just to point out a serious mistake that you could make at this point. However, the solutions to this question and question 6, how to position size to meet your objectives, will be covered in later sections.

Summary: What Do I Know About My System at This Point?

1. For every trade, you must have a predetermined worst-case exit, which determines your initial risk or R.
2. The results of your trading can be expressed as a ratio of the initial risk or R and what you get is your results expressed as a set of R-multiples.
3. Every system can be classified by the R-multiple distribution it generates, with the mean telling you the expectancy of the system and the standard deviation telling you the variability of your potential results.
4. You can then evaluate your system by its System Quality NumberSM.

$$\text{System Quality Number}^{\text{SM}} = (\text{Expectancy} / \text{Standard Deviation R}) \times (\text{square root of Number of Trades})$$

5. You want systems that will make money and systems with high System Quality NumbersSM will do that if your data is reliable (consistent with what you'd expect from your system) and your sample is representative.
6. You should know how your system will perform in each of the six major market types: up-volatile, up-quiet, down-volatile, down-quiet, sideways-volatile, and sideways-quiet. Often you might find that a so-so system overall is an excellent system under the right market conditions.
7. Once you have the R-multiple distribution that your system generates, you really only have one sample of its performance, but if you have enough data in the sample from enough markets, then it probably does represent the population of R-multiples that your system will generate.
8. Now you need to simulate that performance to determine what to expect from your system in the future. What percentage of the time will X trades make money? What's the average worst-case drawdown against you in terms of R? How big are the losing streaks? What kind of gains can you expect? What's the ratio of gains to drawdowns?
9. Once you've completed all of these steps, then you will know what to expect from your system in the future. And most importantly, you should know that you can live through the worst-case scenarios ahead of you, including the possibility that all of your trades will move against you at once. However, a critical aspect to helping you do that is position sizing, which we will be covering in remaining sections of this book.

How Will I Trade Differently with This Information?

Most people are concerned about each trade making money. You can now look at all of your data and know what to expect in the long run. You might have the following data:

- You have a system that makes money 39% of the time.
- Its expectancy is 2.34R.
- It has a System Quality NumberSM of 4.82 in trending markets.
- You've developed a filter and you only take trades when the market, according to your filter, says it is in a trending market. This could be as easy as saying that the prices are above the 50-day moving average, which is above the 200-day moving average. Or for a down-trending market, whose prices are below the 50-day moving average, which in turn is below the 200-day moving average.
- You know that in 100 trades you could see 20 losses in a row.
- You know that your average maximum drawdown each year will be about -32R, but could be as big as -61R.

What does that do for you as a trader? First, you don't have to worry about whether the last trade was a winner or not. It doesn't matter. You know that over the long run you will make money, so you don't need to care about what any one trade does.

In addition, you don't need to worry about the current trade. You know it will make money about 39% of the time and that on the average you will make 2.34R. Thus, it really doesn't matter what the current trade does.

And, because you know what to expect as a worst-case scenario, you can protect yourself from that through your position sizing algorithm. You'll learn how to do that in Chapter 14.

Congratulations! You are now thinking in terms of probabilities and statistics. And as a result, you can pay attention to just following your system, and making as few mistakes as possible, because when you do that, you know what your results will be.

NOTES

¹ Throughout this book, I've done much of the simulation work for you. However, some of the software reviewed in Chapter 17 has simulation capabilities.

² The chance of getting ten losers in a row with your system might be quite remote, but the chances of getting a streak of ten losses in 100 trades might be much higher than you'd think.

³ Remember that I'm looking for a long-term perspective on the market. A short-term trader probably classifies market types differently.

⁴ Seven weeks is really in the middle, but I've included it in the quiet period so that I only have two classifications.

⁵ Secular bear markets tend to last 15-20 years and are periods when PE ratios tend to go down.

⁶ I was also holding about 60% cash at that time and only keeping a few long-term positions.

Chapter 5

Are You Doomed to Failure?

Despite the importance of the material presented so far in Part I, most people have psychological biases that will cause them to 1) ignore the material totally or 2) do exactly the opposite of what is recommended. As a result, in this chapter, I want to show you some of those biases and what you can do to overcome them.

Judgmental Shortcuts

Why Judgmental Shortcuts Are Important: French Economist George Anderla found that the rate of information flow with which we human beings must cope doubled in the 1,500 years between the time of Jesus and Leonardo DaVinci. By the year 1750 (i.e., in about 250 years), it doubled again. The next doubling only took about 150 years to about 1900. The onset of the computer age, in the 1960s, reduced the doubling time to about 5 years. And, with the Internet, the amount of information to which we are exposed currently doubles in less than a year.

Researchers now estimate that humans, with what we currently use of our brain potential, can only take in 12% of the visual information available. And, for traders and investors the situation is at an extreme. A trader or investor, looking at every market in the world simultaneously, could easily have about a million bits of information coming at him or her every second. And since there are usually some markets open around the world at all times, the information flow does not stop. Some poor traders actually stay glued to their trading screens, trying to process as much information as possible for as long as their brain will permit.

The conscious mind has a limited capacity to process about 7 (plus or minus 2) chunks of information at a time under ideal conditions. A “chunk” of information could be one bit or it could be thousands of bits (for example, a chunk could be the number 0 or a number like 7,941). Read the following list of numbers, close the book, and then try to write them all down.

34 39 85 93 21 98 43 56 76 53

You probably couldn't do it because we can only consciously process 7 (plus or minus 2) chunks of information at one time. Yet we have millions of bits of information coming at us every second. And with the current rate of information availability doubling every year, how do we cope?

The answer is that we generalize, delete, and distort the information to which we are exposed. We generalize and delete most of the information. For example, “Oh, I'm not interested in the stock

market.” That one sentence takes about 90% of the information available on the markets, generalizes it as “stock market information,” and then deletes it from consideration.

Psychologists have taken a lot of these deletions and distortions and grouped them together under the label “judgmental heuristics.” They are called “judgmental” because they affect our decision making process. They are called “heuristics” because they allow us to sift through and sort out a lot of information in a short period of time. Heuristics are shortcuts! We could never make market decisions without them, but they are also very dangerous to people who are not aware that they exist. They affect the way we develop trading systems and make investment decisions.

The primary way most people use judgmental heuristics is to preserve the status quo. We typically trade our beliefs about the market and once we've made up our minds about those beliefs, we're not likely to change them. And when we play the markets, we assume that we are considering all of the available information. Instead, we may have already eliminated the most useful information available by our selective perception.

Interestingly enough, William Eckhardt points out in his chapter of *The New Market Wizards* that progress in knowledge results more from efforts to find fault with our theories, rather than prove them.¹ If his concept is true, then the more we tend to realize our beliefs and assumptions (especially about the market) and disprove them, the more success we are likely to have making money in the market.

Thus, what are the beliefs and theories that need to be disproved for us to make progress? These beliefs represent many of the biases that we must overcome in order to make progress. My journey as a trading coach and as a modeler has certainly involved a lot of disproving the status quo.

The secret to success is in understanding how these biases affect you, and then turning yourself into an effective investor/trader. If you try to project what you learn outside of yourself onto the market, you will not be able to apply any of the principles taught in this book. Money is made through the personal application of these principles.

Bias 1: Locus of Control—The Lotto Bias

This particular bias has to do with the need for control—a need we all seem to have—so investors focus on that area of investing in which they think they have the most control—picking the right stocks. However, it's really just a bias.

This bias is particularly evident in the lottery game, Lotto. Almost every government that runs a lottery offers the game Lotto. And, just in case you are not familiar with it, you buy a card and you get to pick some numbers—usually seven of them. If the numbers you pick match the numbers that are randomly drawn, then you win the big multi-million dollar prize. People are quite willing to play this game in large numbers because 1) they have the potential to turn a one

dollar investment into a multi-million dollar prize (but it usually is a negative expectancy game), and 2) they get to pick any numbers they want.

Being allowed to pick any numbers you want in the Lotto game is what makes it appealing. In fact, there is a whole industry that has sprung out of helping people pick the right numbers. First, there are actually services that help people pick numbers. They are cheap—only a dollar per pick—and they basically give everyone a different number. But if they help someone win, they'll make a million dollars in the next lottery. Second, there are people who'll read your astrological chart and help you pick the right numbers. Third, you can buy software that will analyze previous numbers that have been picked so you can discern patterns and make better picks. And fourth, you can even buy software that will randomly generate numbers, just like the machine, so you can pick one of the randomly generated numbers. On top of that, remember that the lottery usually announces the store at which the last winning number was sold and when they do, people will flock to that store to buy tickets for the next lottery.

Does this all sound a little familiar? It should because it is very similar to what happens in the stock market. People think that winning the stock market game has everything to do with picking the right stock. About 30% of all books on how to make money in stocks have the word “picking” in the title. Television shows related to the market frequently bring in fund managers or analysts. And what does the host ask them? “What stocks are you picking for us today?” They might also give the track record of the person being interviewed.

Last time Mr. X was on the show he picked XY and it's up 12%. He also picked CV, but it's down 26% and he picked TY and it's down 18%. What happened, Mr. X? You didn't do so well last time.

Notice how the presupposition in all of this is that it's all about picking the right stocks. And, obviously, my mistake when I bought my first stock, based on this kind of logic, is that I picked the wrong stock.

The logic that says that success is all about picking the right stocks is so deep that mutual funds are always at least 95% invested because they feel they are paid to pick the right stocks and keep your money working for you. Furthermore, analysts are paid huge six figure salaries and their only job is to analyze the balance sheets of the companies they research so that they can pick the right stocks. And, by the way, I have yet to meet an analyst who has managed to become a good trader through picking the right stocks. Some of them are okay as portfolio managers, but very few become good traders.

Thus, the average investor, armed with this bias that he can control his success by just picking the right stocks, finds himself in a world in which picking the right stocks is emphasized by everyone. So when they lose money, they just assume that they picked the wrong stocks or that someone else (who was giving them advice) picked the wrong stocks. And what typically happens? The average investor *never learns some of the key factors that are important for success*—namely, the **Golden Rules of Trading** given earlier.

What to Do About the Lotto Bias

In this particular case, realize that you also have control over your exits. You can exit at your predetermined stops and almost guarantee that your losses will be 1R or less. You can use trailing stops to let your profits run. This will almost guarantee that many of your profits will be greater than 1R. And if you follow these rules, pretty soon the returns that you generate will be enough to convince you of the wisdom of the Golden Rules of Trading.

Bias 2: The Need to Be Right

The educational process in most industrial countries came about not to really educate our children, but to develop good workers for our factories and other businesses. When most people worked in agriculture, we didn't need a great educational system—it was just for the chosen few. But now we need "educated workers" to help with our businesses. Sure, we want these highly skilled workers to be able to think and come up with new ideas. But we also want them to be good employees and do what the boss wants them to do. So how do we do that? We do it through our educational process where children learn that the teacher is always right.

Children go to school for 12 to 16 years and what's emphasized over and over again is that the teacher is always right. For example, as a child in school, you have to take tests. You learned that if you got less than 70% right, you are a failure. And you don't get an excellent mark, an A, unless you get 94% correct or better on your test. Perhaps you get 95%. When you showed it to your dad, he responds, "Why didn't you get 100?" So your dad wanted you to be right as well.

As a result, we grow up with a passionate need to be right. If you are not right at least 70% of the time, you are ostracized as a failure. But you want to be right 100% of the time so that your dad won't criticize you. As a result, you even criticize yourself first so that you can correct the problem before your Dad starts to criticize you.

Now, let's apply that to the stock market or to the futures market or to any other investment you might make. You want to be right and that to you means making money. Let's say you buy a stock for \$50 and know enough to set a stop loss—you'll get out if it drops to \$45 per share.

But let's say it drops to \$45 per share. You really want to be right, so if you got out you'd be wrong, or at least feel as if you were. All sorts of thoughts go off in your head. "It's just a temporary setback." "The analysts are predicting a great increase in the earnings this quarter—I can't sell now!" "What if this downturn is just a few traders manipulating the market?" "I think I'll hang onto the stock and not sell—at least for a few days."

So you hang onto the stock and watch it fall even further. It drops to \$40. Now you have a 2R loss. If it was hard to take a 1R loss, it's even harder to take a 2R loss. And all the same arguments apply. Thus, you hold onto your stock.

Now the stock drops to \$35 and you have a 3R loss. You know you really should get out, but now your portfolio is down \$4,000. You can only write off \$3,000 in losses, so you'd better keep this stock. You know it will turn around. However, you have a good solution to keep away the anxiety of watching yourself lose money. You won't watch it anymore. You'll look at it in six months and by that time perhaps you'll have made a lot of money.

There is an old joke about the man who was dreaming about some "evil" entity that was stalking him. It kept getting closer, no matter how fast he ran. It got nearer and nearer. Finally, when the entity was almost on top of him, and he felt sure he was doomed. He turned to plead for his life, and what did he see? He saw the postman handing him an envelope, saying, "It's just your brokerage statement."

Perhaps, now you can understand why a psychologist and an economist won the Nobel Prize in economics for basically showing that it was very hard for people to take losses. People, according to those Nobel winners, become much more "tolerant of risk" when they are behind. Obviously, people have trouble cutting losses short. But that's only half the golden rule. The other half is to let your profits run. The Nobel winners also showed that people tend to tolerate little risk when they are ahead, making it difficult to let profits run.

So let's go back to our bias—the need to be right. What happens when you are right about your investment and it starts to go up? The golden rule says let your profits run—let it go up more. But you have a strong need to be right. Your \$50 stock has gone up to \$55 and if you sell now, you'll be right and have a profit.

However, you know you should let your profits run and to do that you've got a 10% trailing stop. Now that the stock has reached \$55, you won't sell it unless it drops \$5.50 to \$49.50—your trailing stop level. However, suddenly your stock starts to drop. It drops to \$54 and then to \$53. You get nervous because your profit is slipping away. Now it drops to \$52 and then to \$51. You feel tied up in knots. It's getting close to your stop and if you get stopped out, you'll have another loss. You'll be wrong. Suddenly, it drops to \$50.50, and that's enough for you. You sell the stock quickly for a \$0.30 profit after costs. You really feel proud of yourself because you made money.

So what just happened here? Our investor, because of his overwhelming need to be right, sold out for a minimal profit. The stock actually dropped to \$49.90 and then turned around and kept going until it hit \$75. But our investor was happy because at least he didn't lose any money.

Notice what he's done here. He's cut his profit short and let his loss run. And isn't that exactly the opposite of the golden rule of trading? What do you think your trading profits would look like if your results were similar to those shown in Table 5-1?

Table 5-1: Typical Investor R-multiples Resulting from the Need to be Right

Trade #	R-Multiple
1	+0.1R
2	-3.0R
3	+0.2R
4	+0.2R
5	+0.4R
6	-4.0R
7	+0.2R
8	+0.1R
9	+0.3R
10	-3.0R
Total	-8.5R

Notice that because of the bias to be right, our investor has managed to only have three losers. But those three losers total -10R. Our investor is right 70% of the time with seven winners. However, those seven winners total +1.5R. And the net result of our investor's bias to be right is that he is down -8.5R after ten trades. Thus, if he were investing about 1% in each trade, he'd be down about 8.5%. Not a very good result for someone who was right 70% of the time—just above the failure level. And as he wonders what went wrong, he thinks to himself, "Perhaps I picked the wrong stocks."

Yet, let's look at the opposite situation. Let's say that our investor made money three times out of the ten trades, two 3R gains and one 4R gain. He lost money seven times out of ten—all 1R losses. This is shown in Table 5-2.

What's the net result for this person? Well, they are right 30% of the time, but the net result in terms of R is +3R. Had they risked 1R one each trade (and about 1% of their equity), they would have been up about 3% at the end of 10 trades. Now can you begin to see why the need to be right bias can be so deadly to your bottom line?

Table 5-2: Typical Investor R-multiples When Following Golden Rule

Trade #	R-Multiple
1	-1R
2	+3R
3	-1R
4	-1R
5	-1R
6	+4R
7	-1R
8	-1R
9	-1R
10	+3R
Total	+3R

So now we have both halves of the research done by the Nobel Prize winners in economics. People tolerate risk more when they are behind (i.e., they won't cut their losses) and tolerate risk less when they are ahead (i.e., they won't let their profits run). And the net result is most people have trouble making money in the market.

So what can you do about your need to be right? Instead of focusing on being right, focus on not making any mistakes, where a mistake occurs when you don't follow your rules. Your rules should be the golden rules of trading:

- Always know your exit point, the point at which you'll get out in order to preserve your capital, before you enter a trade. And if you don't take such losses when they occur, consider it a major mistake.
- Always at least keep some sort of trailing stop so that you can let your profits run. And if you find yourself taking profits too quickly just to make sure you don't lose money, then that's another major mistake.

If you consider breaking these rules as being wrong (i.e., making a mistake), you'll find that suddenly you can make money—big money—in the stock market or any other investment field. And let me repeat the major lesson from the last chapter, because it applies here as well:

In short, you now think in terms of probabilities and statistics. And as a result, you can pay attention to just following your system, and making as few mistakes as possible, because when you do that, you “know” what your results will be in the long run.

Bias 3: Percent Gain

Imagine the headlines....

If you'd taken this recommendation, you'd have been up 150%.

If you had taken all of my recommendations this year, you would have turned \$10,000 into \$40,000

XYZ, after I recommended it, went up 300%.

When each statement is made *you visualize your entire portfolio being up that much*. Instead of thinking XYZ went up 150%, you think of your portfolio being worth \$250,000, instead of \$100,000. However, that would only occur if you invested everything you had in that particular stock and managed to get the exact amount of profit that was reported. And what's wrong with that logic? If you invested everything in that particular stock, your risk would have been huge. No one should take that kind of risk on a single stock.

Let's look at what a stock being up 150% really means in terms of an R-multiple.

Say you bought the stock with a 25% trailing stop. You bought it at \$10 per share with an initial stop loss at \$7.50. The stock is now up 150%, meaning it is now up to \$25 per share. You have a paper profit of \$15, compared with an initial risk of \$2.50, which means you are really up 6R in the stock.

Just because the stock is up 150%, doesn't mean that you've sold it. At \$25, your tailing stop is now at \$18.75. Hopefully, it'll go up more. But if you get stopped out, your total profit shrinks to \$8.75. When you compare this with your initial risk of \$2.50, it means you have a 3.5R profit. And that means if you risked 1% of your equity on the trade, you will make 3.5%. That is a far cry from thinking that your portfolio has moved from \$100,000 to \$250,000—but that is what most people envision when they read this headline, “if you invested in this stock, you'd be up 150%.” You'd probably find that if you invested 100% in each recommendation that you'd blow out your account very quickly.

Are you beginning to see how this bias works? More importantly, can you see how much better your thinking would be if you thought of your results in terms of R-multiples or risk-reward ratios?

Let's look at the next example: “If you had taken all my recommendations this year, you would have turned \$10,000 into \$40,000.” This is another real headline from an advisory service. However, when I made some inquiries as to what it really meant, this was the answer:

If you had risked \$10,000 on every trade recommendation that was made this year, then at the end of the year you would have been up \$40,000. If you now translate that into R-multiples, the statement becomes “If you had taken a 1R risk on each recommendation during the year, then at

the end of the year you would have been up by 4R.” Let’s say that this advisor made 20 recommendations. That means the expectancy of his trading recommendations was a paltry 0.2R.

Looking at the original statement, you see your account up 400%. But if you demand enough information so you can think in terms of R-multiples and expectancy, you discover that it is a poor system with an expectancy of 0.2R. If you risked 1% on every trade, you’d only be up 4% at the end of the year.

Now let’s look at the third recommendation, if you’d bought XYZ, it went up 300%. Again, with this one you see your account up 300%. However, let’s assume that in this case it was an option trade. Your risk was the entire amount of the option contract. Your eventual profit was 3 times your initial risk, but since your initial risk was everything, your net profit is a 3R profit. Thus, we suddenly move from seeing our portfolio up 300% to realizing that we are probably up 3% because of this one trade.

And, when an adviser tells you about all of the trades that went up 200% or 300%, they are not telling you about the losses. Thus, you have no idea about the real expectancy of the system or the real performance of the portfolio.

So let’s say an advisor makes the recommendations in Table 5-3.

Table 5-3: What if Your Newsletter Had the Following Recommendations?

Trade Recommendation	Result of Trade	R-Multiple
Buy GE at \$38	Loss to \$28	-2R
Buy IBM at \$60	Loss to \$50	-2R
Buy GM at \$45	Loss to \$40	-1R
Buy CREE at \$15	Gain to \$45	6R
Buy VLO at \$75	Loss to \$67	-2R
Buy TSRA at \$41	Loss to \$29	-3R
Buy BHP at \$65	Gain to \$75	2R
Buy AAPL at \$28	Gain to \$82	8R
Buy WRF at \$33	Loss to \$16	-5R
Buy HD at \$64	Loss to \$58	-2R
Total Gain/Loss		-1R

During a period of six months, the advisor’s overall track record is negative 1R. What does he tell you? In April we bought CREE and sold it two months later for three times what we paid for it. We also bought Apple and sold it for a nearly a 300% gain. Wouldn’t you like that kind of success?

And what's your reaction to that? "Wow, I could have bought CREE and tripled the value of my portfolio in two months." Would you have? If you had bought the entire portfolio, as recommended, you'd have been down. But the advertising doesn't say anything that is incorrect. It just leads you to think that their performance is much better than it really is.

In late 2005, the media announced a merger in which Valero was planning to buy out Premcor and become the largest refiner in the United States. One advisor had both stocks in his portfolio earlier in the year. However, *both stocks were stopped out of the portfolio a week or two prior to the merger*. However, when the merger was announced, this is what was sent to potential subscribers.

"One of our stocks recently bought out another one and both stocks had huge jumps in price on the announcement. You could have made huge profits in both of these stocks had you followed our recommendations."

Again, can you see how this bias would hurt most people, especially since he sold both stocks prior to the merger? However, in this case the solution to the bias is simple. Don't believe anything anyone tells you unless they can show you their track record in terms of R-multiples or as data that you can convert to R-multiples! Otherwise, they are just telling you about a portion of their recommendations and framing it so you imagine huge gains.

As a result, we recommend that you convert everything that people tell you about their performance into R-multiples. What was the initial risk? What was the reward-to-risk ratio (i.e., R-multiple)? Determine the SQNSM and then see what really happened. And if you do, ask, "How does that SQNSM compare with other SQNsSM I've seen?" For an example of this, see the 2nd Edition of *Trade Your Way to Financial Freedom*.

Bias 4: Lots of Input Says the Same Thing

This is another significant bias related to the amount of information to which you are exposed. Typically, the more people are exposed to certain information, the more likely they are to believe it. Yet, it could be the same information (i.e., from the same source). For example, let's look at the idea that "stock picking is important to investment success. Someone develops a story about how some guru made a fortune picking the right stocks. Let's say that all of the news wires carry the story, so you read four different versions of the same story written by four different people. Now, one source started the story but because you are exposed to it four different times, your conclusion is "It must be right/true/correct."

A huge number of sources say that picking stocks is important. For example, I looked up "picking stocks" in Amazon.com and the inquiry returned 158 items, including

- *How to Pick Stocks Like Warren Buffett* by Timothy Vick, and
- *Pick Stocks Like Warren Buffett* by Warren Boroson.

Notice how there is an assumption here that Warren Buffett, considered by many to be one of the world's greatest investors, makes his money by picking the right stocks. However, Warren Buffett didn't write the book—someone else did. Using his name and including "picking stocks" in the title makes it seem as if the key to success is picking stocks. And you don't have to read the book to assume that—you just have to look at the title.

Here are a few more:

- *Michael Sivy's Rules for Investing: How to Pick Stocks Like a Pro* by Michael Sivy
- *How to Pick Stocks* by Fred Frailey
- *World's Greatest Stock Picks of All Time* by W. Randall Jones
- *Investing Smart: How to Pick Winning Stocks with Investor's Business Daily* by Dhun Sethna
- *Pick Winning Stocks* by Edward Mrkvicka.

There are many more books with stock picking in the title. These are just to show you the prevalence of the bias.

However, the topic is even more common on television:

- Wall Street Week always has its panel of experts who pick the stocks they like.
- CNBC has programs like "Stock Picking Friday." In fact, stock picking is predominant on CNBC and I have never heard one expert say, "I like this stock, but I'd sell it if it dropped to this level."
- Bloomberg will also interview experts and ask them which stocks they like.
- CNNfn (which no longer exists) would frequently interview people to find out which stocks they were recommending. And my guess is that Rupert Murdoch's new Fox Business News will strongly feature stock picking.

The list goes on. If you just watch television to determine how to invest, you would be sure that the key to success was picking the right stock.

What to Do About Lots of Input Saying the Same Thing

Again, if you do what we suggest in this book and have enough confidence in yourself and your system, it shouldn't matter what other people say. At tops and bottoms of markets, most people are always wrong, so do you really want to listen to what most people say?

Bias 5: Authority

We believe people who are in authority. If the analysts say so, they get paid six figure salaries, so it must be true. I actually pointed it out in the last bias. Two books on picking stocks had to do with how Warren Buffett picks stocks. In fact, there are nearly a dozen books that have been

published on Warren Buffett. I even cover some of his style of investing in *Trade Your Way to Financial Freedom*. Furthermore, every author makes the assumption that Buffett's success is because he is the key stock picker. And if Warren thinks it's so, we believe it must be so. However, Warren Buffett has written none of those books and I'm sure that if Buffett told the truth about how he invests, he'd also emphasize his exit strategy. Now in one sense he doesn't have an exit strategy because he buys stocks that are tremendously undervalued. If they meet those criteria, he will buy them and keep them. But in another way, he does have an exit strategy: when it becomes clear to him that the stock he's bought is now overvalued or that the reasons for his investment have changed, then he'd probably sell it quickly.

People also assume that when analysts and fund managers talk about the importance of stock picking that these people are authorities. Consequently, it also carries a lot more weight when these people give an opinion.

What to Do About the Authority Bias

The answer here is obvious. If you do the sort of analysis of your system that we've recommend here, then you don't need any authority other than your own data. It will give you the answer to each of the following:

- **How to trade?** You follow your system because you are confident in the results.
- **When do you exit?** Your system predetermines that prior to each trade (and even Warren Buffett does this indirectly by knowing he'll sell when his company is no longer a good value).
- **How do you pick investments?** You don't pick anything, your system trades when it gets a signal. Furthermore, you understand that picking stocks and your trading system's entry are only a small part of what it takes to be successful.
- **How do you predict the future?** You can't predict anything except that you will make money in the long run. You don't even know whether your current trade will make money. In fact it probably won't because it only makes money 39% of the time.
- **What if someone says you are wrong or stupid or crazy doing what you are doing?** If you have confidence in your system and its long-term results, then you won't care what other people will say.

Bias 6: Prediction and Understanding

One key need most people have is the need to understand. One of my clients, Joe, claimed that he had the most difficulty with the market when he got into a position and didn't understand what was going on. As a result, I asked him a number of questions. "How often are your positions winners?" His response was that he was right about 60% of the time. "When you don't understand what's going on, how often do you come out a winner?" This time his response was that he almost never came out a winner when he didn't understand. I then said, "Since your system isn't much above chance, you probably don't understand that much about the markets

anyway. But when you clearly are confused, you should just get out." He agreed it was probably a good idea.

When you think about Joe's trading system, however, he really didn't have one. Why? Joe was so concerned about understanding that he didn't have clearly defined exit signals that told him 1) when he was wrong so he could get out and 2) when to take his profits.

Most people still need to make up elaborate theories about what is going on in the markets. The media is always trying to explain the market even though it knows nothing about the market. As I was working on this section of this chapter, a 91.52 point drop occurred in the Dow. The next day the newspapers were filled with statements like:

"Investors, spooked by prospects of an economic slowdown, switched en masse Tuesday to what's become an alluring bond market. The stock market sell-off was accelerated by computerized program trading.... Money managers are making a major shift all at the same time, that's why we're seeing such a heavy surge now. When it fell, it triggered a rush of computerized selling.... Wall Street now believes that the latest Fed rate increase will slow the economy. That's good news for the bond market, which hates inflation because it erodes the value of fixed interest bond payments. But it's bad news for stocks. There's a growing perception that maybe the rising rates we've had could have an impact on the economy, which could lead to some corporate disappointments."

The "need to understand" bias becomes even more elaborate when it comes to trading system design. People manipulate daily bars in any number of strange ways and then develop even stranger theories to explain the market based upon those manipulations. The resulting theories then take on a life of their own, but have little basis in reality. For example, what is the rational basis for Elliott Wave Theory? Why should the market move in three legs one way and two legs the other?

When you think about academic theories about the market, those theories are all based upon predicting the market. Fundamental analysis is devoted to determining the fundamental characteristics behind the market. Some people believe that when you understand these fundamentals well enough, you can trade well because you know the factors influencing the market. In fact, most academicians believe that the markets are totally efficient if you could just understand the fundamentals. Anything else that might affect the market is just considered to be random noise.

Some people rebelled against fundamental analysis and developed technical analysis. Technical analysis amounts to trying to predict the market by looking at pictures of price bars from the market's past. Market technicians believe that if you draw enough lines and observe enough patterns, you will eventually be able to perfectly predict the market.

Now that the Dow 30 has 300-point moves with some regularity—suggesting that the market is not efficient and random—a new field of study is beginning to replace fundamental analysis. That

new field is called behavioral finance. It attempts to predict changes in the market by studying the inefficiencies in human decision-making. In other words, psychologists and economists study some of the same inefficiencies that I am pointing out to you to determine why the market is so unpredictable. However, the value in understanding these judgmental heuristics comes from neutralizing how they impair you. When they no longer impair you, then you have a chance to make very high return rates with low-drawdowns.

I went to a conference on psychology and the markets in Frankfort, Germany in 1997. Numerous presenters talked about various ways that human decision making was flawed and how that might be better used to predict the markets. One even said that what our traders were doing was impossible—no one could consistently make over 50% in the market. All of the presenters missed the point. People don't make money by predicting the markets. They make money by *cutting losses short and letting profits run* and by using proper position sizing to accentuate those effects.

The secret to success is in understanding how these biases affect you and in turning yourself into an effective investor/trader. If you try to project what you learn outside of yourself onto the market, you will not be able to apply any of these principles we teach in this book. Money is made through the personal application of these principles.

What to Do About the Prediction and Understanding Bias

Do you really need to understand how markets work? No you don't. You only need to understand how the concept that you are trading works. For example, if you are a trend follower, all you need to understand is that the markets will occasionally move in very large trends and if you can catch the big moves, you'll make a lot of money. You have a system that does that, so that's all you need to understand about the market.

If you are a value investor, then all you need to understand is why something is undervalued and be confident in your ability to determine that. The other two things you need to understand are (1) when your investments are no longer undervalued, meaning it's probably time to sell, and (2) when you might be wrong about your evaluation so you can safely abort and preserve your capital. You don't need to understand the market at all. Warren Buffett doesn't—he thinks the markets are irrational—so why do you need to understand them?

Similarly, no matter how confident you are in your system, you will have trouble making market predictions. But you don't have to. You know your R-multiple distribution and you have its expectancy, standard deviation, and SQNSM. That information will help you determine what to expect from your system in the long run. And as long as you position size to avoid any worst-case disasters, you should be able to achieve that expectancy. Do you need to predict anything else?

Are you beginning to see the importance of this kind of thinking and how it can steer you away from what works? When a pollster predicts how the American population will vote, he doesn't necessarily understand why. He just knows what the likely outcome of the vote will be. You have enough information to know the likely outcome of your system and that's all you need.

Bias 7: Wanting Lots of Facts

About 75% of the population have a sensory/detail orientation, while the other 25% have a big picture orientation. The sensory/detail orientation people have a tremendous bias that keeps them from trading successfully, which I call the “wanting lots of facts” bias. They want lots of facts and evidence to support their decisions, whereas the big picture people want to understand how it all fits together (i.e., the big picture) and then draw their own conclusion. Now how do you think this affects the two types of people?

Let’s say you went to an investment talk in which some guru was telling you about his Holy Grail indicator. He might show you something like the indicator shown in Figure 5-1.

His pitch is that he has a magic indicator and when the price goes above that indicator and hits a new 40 day high (as determined by his software), then look what happens to the price. Now one chart might not tell you much, but our guru will show you 50 such examples—all followed by a substantial price increase. And if you are one of the 75% of the population who needs a lot of facts, then you just got what you needed. Now you know how to pick the right stocks to give you a lot of money. You’ve been shown 50 examples that his software, with its magic indicator, leads to higher prices. That’s enough information to convince you it works. You buy the software for \$3,000 and you start to make a lot of money, right? No, quite the opposite is true.

First, you only saw 50 examples in which the price went up. You did not see the examples in which the price did nothing or went down. As a result, from our guru’s pitch, you have no idea that the way you make money is through your exits and that the key to meeting your objectives (as discussed in Part III) is through position sizing. People who need the big picture might pick up on this, but people who just want lots of facts probably won’t until it’s too late.

What to Do About the Needing Lots of Facts Bias

If you understand the information in this book, but you still need lots of facts in order to be comfortable, then perhaps trading isn’t for you. Otherwise, simply make enough trades following your system with low position size until you are convinced that what we are saying is true.

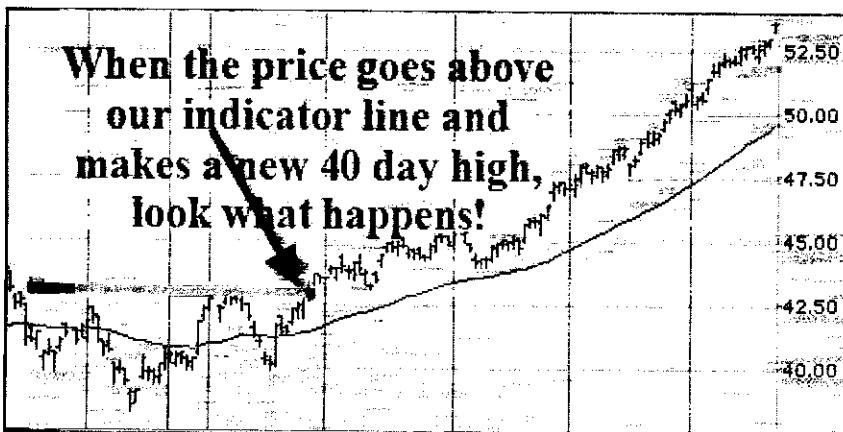


Figure 5-1: The First Piece of Evidence

Other Biases That Influence Being Right

In the remainder of this chapter, I'd like to focus on the issue of wanting to be right. It's often been said that most traders would rather be right than make money. So let's explore what causes this to happen.

So now imagine someone who desperately wants to make money in the markets. It's this person's passion. They get a software package that has lots of charting ability and they pour through chart after chart.

They start looking at the big moves in the market, wondering what those moves have in common. First, they notice that many big moves follow a consolidation period—not always—but often enough that it catches their eye. So their first trading idea is to trade moves breaking out of a consolidation period.

But how do you know what's a real move or not? Suddenly, it hits them. There is a four-bar pattern that seems to occur on about 70% of the patterns they see. "That's it!" they exclaim. And a new trading idea is born.

Now while this process might be better than what the average person is doing—buying investments simply because of a news story or a guru recommendation—it still has some major flaws in it.

Bias 8: The Law of Small Numbers

If you want to find something, such as a pattern that will lead to a big gain, it's easy to do so. Our minds naturally gravitate toward finding what we want, in fact creating it, out of chaos. As a result, we tend to see patterns where none exist, and it only takes a few well-chosen patterns to

convince people that the pattern has meaning. In the example given above, our trader found a great pattern that he thought would lead to success. In reality, he only found six examples of this pattern, but that was enough to convince him that the pattern was real and decide that he had a trading system.

However, here's what he was missing:

- He only saw the six patterns that work and decided it was real. What he didn't do was look at several hundred consolidations to see how often the pattern appeared and whether it always preceded a new trend. If he can come up with data that said, "Out of 300 consolidation periods, this pattern appeared in 213 cases prior to a new upmove," then he would at least have a reasonable idea that the signal was real.
- Second, and this is a common bias, he didn't look for how often the pattern leads to failure. How often does it occur and not lead to an improvement? Does it occur in non-consolidating periods? What happens when it does? For example, he might have developed a computer program to screen his data and found that the pattern occurred with some regularity, about once every ten days. Thus, in the same time period that he found 213 patterns leading to up moves, there were actually 7,124 other examples of this pattern that did nothing. Suddenly, we have a pattern that only works about 3% of the time.
- Now this problem might be fixed by saying, "I'll screen for a consolidation pattern first and then look for the four-bar pattern." This might make it workable. But there is still the matter of how often the pattern led to up moves. And when you check this out, it turns out that in the 300 consolidation moves there were 732 examples of the pattern. Thus, while 213 of them lead to up moves, the other 519 examples lead to nothing.

At this point, the pattern doesn't look so good at all. But even if it did, we'd only have one part of a trading system—a filter and an entry. A full trading system also needs a worst-case stop, an exit plan, and good position sizing.

So now you have some idea what the mind can do for you when you want to be right and you don't consider all of the issues involved in good trading.

Furthermore, people only see the patterns that lead to success and not the patterns that lead to failure (i.e., big losses). Imagine what this one bias could do to convince you to buy a stock with a certain pattern.

Again this particular bias is fixed by following the recommendations you've just been given in the book: learn to adopt a statistical approach to the markets and have a goal of not making any mistakes, where a mistake means not following your proven rules.

Bias 9: Once We Think We've Got It, It's Hard to Get Rid of It

Once you believe you have found a pattern and become convinced that it works (by means of the law of small numbers), you will do everything you can to avoid seeing evidence to suggest that it doesn't work. For example, once you found the pattern described above, most people would be very reluctant to see any sort of evidence that says it doesn't work.

When you read the example above, you probably say to yourself, "Sure, it's really important to do all of those things to determine if what I've found is meaningful." But the bias most people have is to totally avoid doing anything like that. Once you've found it, you don't want to know that you really haven't found it.

There are numerous examples of this:

- If you believe that stock picking is the key to success, you'll avoid evidence that suggests it doesn't work.
- If you think you can make money with options because of the high leverage and limited risk, you'll keep trading options despite loss after loss.
- I've even seen traders who develop a specific arbitrage strategy that has given them a real edge. They trade it and make a small fortune and then the strategy stops working. They'll even tell me the strategy no longer works, but because of this bias they keep trading it and lose a lot of money. Perhaps they need real-world verification that the strategy doesn't work.

What to Do About the What I Know Is Right Bias

Let me ask you a simple question. Do you believe what I've told you about how to evaluate systems? If you believe that, then that's all you need to know. If you don't believe it, then test it out for yourself. And if you don't want to do that, then perhaps trading or investing is not for you.

Bias 10: Representation

Is reality what it really seems to be? As someone trained in how the brain works, I can tell you without knowing about such biases that it is not. Our brain just sees patterns of light that trigger cells to go off in the brain. We don't know that something is a book or a ship or a bar chart until we are trained to recognize it.

So how does this pertain to investing? When people see a pattern in the market, is it really that? We already saw this example played out with the law of small numbers. But let's jump further into what we are actually doing.

When people see something like Figure 5-2, they just assume it represents the market. First, the description says it is a chart of the S&P 500 so it must represent the market. But does it? When something is supposed to represent something, people assume that it is that thing.

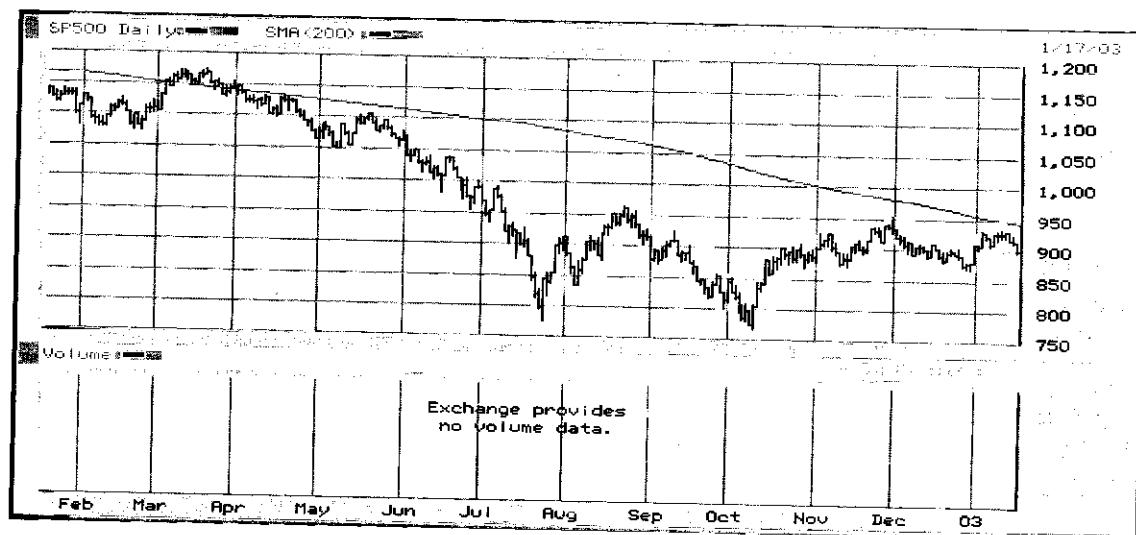


Figure 5-2: A Bar Chart

Think about it. That chart collapses months of data into simple bars on a page, but you are willing to assume that it represents the market. Do you really know what was going on? Who bought and who sold? Who wanted to buy and who wanted to sell? Or more importantly, what's going on right now? We assume that it is somehow in that chart. But that chart isn't the market. The chart is just a representation of the stock prices presented in some easy to understand manner. And a lot of information is deleted in that bar chart.

However, when we start to think that our representations are real (and we all do this), it clearly distorts our thinking. And most people take it one step further because they do things to the data (i.e., draw trendlines; determine Fibonacci numbers; determine moving averages), which they think represent the market even more. But in reality, the more transformations you do on data, the less likely it is to represent the market.

In reality, the more transformations you do on data, the less likely it is to represent the market.

You might be feeling that “Van is full of it” by making such statements. “Of course, that represents the market!” But isn’t that Bias 9 acting in your head?

The only safeguard that I know of for this bias is to step back from everything, be in the “now”, and just notice what is actually happening. And you can do that if you have confidence in the long term results of your trading.

I’ve always recommended that your business plan for trading include worst-case contingency planning. Part of your worst-case contingency planning should center on this particular topic. What if something I think is real, really isn’t real? What are the implications for my trading?

Conclusion

Perhaps you can begin to see why I tend to gravitate toward the notion that everything is psychology. The more you understand this, the more you realize that at some level you are responsible for everything you experience.

And in my opinion, that's the first key to being a great trader. You must own your own performance. You must believe that your system will make money long term because you've taken a valid, reliable sample of your system's R-multiples. You've determined its SQNSM for each kind of market and you know what to expect in the future. You have specific objectives and you are going to use position sizing to meet your objectives based upon the methods illustrated in Part III. As a result of this process, you simply concentrate on the now. Are you doing the process? Are you following your system or are you making mistakes?

NOTES

¹ Schwager, Jack, and William Eckhardt. *New Market Wizards*. Harper Collins, 1992.

Part II:

Understanding the Basics of Position SizingSM

Introduction to Position SizingSM Basics

My objectives in writing this section are 1) to show you the importance of position sizing to your overall performance, 2) to show you how to position size, and 3) to give you some basic models, which will become the core of what you need to know about position sizing. Overall, three equity models and 31 position sizing models are given in this book. Since you could use each equity model with each position sizing model, you have a total of 93 possible models. However, the fact that many of the models presented have thousands of variations illustrates the complexity of this topic.

In Chapter 6 you learn how a low-risk idea is formed through position sizing and how this important topic is almost totally neglected by Wall Street and academia. You'll also learn about some of the psychological biases against practicing proper position sizing.

Chapter 7 presents CPR for traders, the basic idea behind all position sizing if you substitute whatever your model is based upon (i.e., volatility, leverage, margin, etc.) for the R component. You'll also learn the three basic equity models that you can use for position sizing.

In Chapter 8 you'll learn the five core position sizing models, including fixed units, equal units, percent margin, percent volatility, and percent risk (sometimes called fixed fractional position sizing).

Chapter 9 presents six additional core position sizing models. These include group control, portfolio heat, and long versus short positions. You'll also learn how asset allocation is a form of position sizing, how portfolio managers who must be totally invested can use position sizing, and how to position size when you do not know how much equity you have.

Finally, Chapter 10 will show you the impact that various position sizing models can have on your equity. You see the specific impact of using some of the models described earlier on your equity curve.

Chapter 6

The Most Important Factor (Besides You) in Your Trading

John was a little shell shocked 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, *it is not likely and the chance of ruin for anyone who attempts it is almost certain.*

Ralph Vince did an experiment with forty PhDs.¹ He ruled out doctors with a background in statistics or trading. All other PhDs were qualified. They were given a computer game to trade. They started with \$10,000 and were given 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 (1R). When they lost, they lost the amount of money they risked for that trial (-1R).

This is a much better game than you'll ever find in Las Vegas. Yet guess how many of the PhDs 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 position sizing.

Let's 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. Let's say they started out betting \$2,500. They have three losses in a row betting \$2,500 and are now down to only one more risk of \$2,500. They now must make 300% just to get back to even and they probably won't be able do to 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 position sizing just because their account is too small. Their mathematical odds of failure are very high just because of their account size.

Let's say you have \$5000 in your account. That means that a reasonable 1% risk is only \$50. If you are disciplined enough to stick to 1% risk, which most small investors are not, you'll still probably have about 2% risk with slippage and commissions. But most people will probably buy more and risk \$500. Well, that's 10% risk and could have a huge impact on your account.

Remember the story of how I bought my first stock when I was 16 years old—over forty years ago? The net result of that story was that I lost everything—about \$1,400—which was a lot of money for a 16 year old in 1962. In those days, you could buy a car for that amount and that would certainly be enough to put a down-payment on a house. So losing \$1,400 on one stock was a huge loss. But what was the **major** mistake that I made?

I didn't have an exit point. And since the stock was selling for \$8 per share, I was risking \$8 per share. I also didn't have a plan and I didn't know how to take profits. Those were both huge mistakes. But one mistake towers above all the others: I risked 100% on the one stock. My position sizing was huge. You've probably made that mistake. In fact, probably 99.9% of all investors and traders have made the same mistake. So let's talk about how to rectify it.

Understanding Low-Risk Ideas

We've already talked about the fundamentals of trading, but now it's essential that you understand what a low-risk idea is all about. Let me define a low-risk idea and that definition will help you understand these examples better.

A low-risk idea is an idea with a long-term positive expectancy that's traded at a risk level to allow for the worst possible occurrence in the short term so that you are able to realize the long-term positive expectancy.

Notice how this simply states what we've repeated many times now—that if you have faith in the long-term expectancy of your system and just follow the process, then everything will work out. But also notice how the idea of position sizing is so critical to a low-risk idea. If your position sizing is too big, you are guaranteed to eventually lose your funds. Let me state that another way. If you risked too much money on one trade, then you risk depleting your funds so much that you can no longer trade effectively. And if you trade with too little money, almost any trade you make will be “too much.”

Look at Table 6-1. 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.

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

In my opinion, position sizing is the most significant part of any trading system. Many professionals, and most amateurs, do not understand its importance. In fact, I once attended a seminar for stockbrokers 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 really determine what he was talking about. As a result, 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 is how one makes trading decisions."

I once looked up the topic of money management in an Internet search. Although the search engine returned many articles on the topic, very few of them had to do with what I call money management. Numerous searches came up with topics on "how to manage your personal finances." Other searches came up with web sites describing professional money managers who would manage your finances for you. Still other searches went to web sites having to do with the futures industry where money management seemed to be confused with "risk control," "managing your worst-case risk through a stop loss," or "achieving maximum profits." My definition of money management (or position sizing) is none of those.

Let's look at a couple of other definitions:

I looked up money management in the Free Dictionary by Farlex (an online dictionary) and got the following (none of which is correct for what I'm talking about):

"The process of budgeting, saving, investing, spending or otherwise overseeing the cash usage of an individual or group. The predominant use of the phrase in financial markets is that of an investment professional making investment decisions for large pools of funds, such as mutual funds or pension plans. Also referred to as 'investment management' and/or 'portfolio management'."

"Notes: While the term is usually used in reference to professional money managers, everyone practices some form of investment management with their personal finances. There are a wide range of money management services, from the operation of passively-managed mutual funds with low fees to in-depth estate planning and consulting."²

InvestorWords.com (which is what you might be exposed to if you are actually looking for an investment type definition) says the following about what's critical to your investments:

"Here are the seven fundamental principles of investing that every investor should know. Topics include knowing your current situation, goals and risk tolerance; getting your finances in order; thinking long term and focusing on stocks; researching and monitoring your investments; and knowing when and how to get financial help."

The site then goes on to define money management:

"The process of managing money, including investments, budgeting, banking, and taxes, also called investment management."³

I searched Google for "money management definition" and went through the first ten pages without finding a single useful definition. The examples given above are pretty typical. However, I did go directly to Wikipedia (which is pretty good) and got the following definition, which is about as accurate as I could find online:

"Money management is used in investment management and deals with the question of how much risk a decision maker should take in situations where uncertainty is present. More precisely what percentage or what part of the decision maker's wealth should be put into risk in order to maximize the decision maker's utility function."⁴

Curtis Faith (who in my opinion understands the topic fairly well) says in his new book, *Way of the Turtle*, that money management is "the art of keeping your risk of ruin at acceptable levels while maximizing your profit potential." And by money management, he definitely is referring to position sizing, but is that really what he means?⁵

I would suggest that both Curtis and other authors have substituted their trading objectives for the words money management. What they are all really saying is that "money management is the way to achieve my trading objectives." And since almost everyone has a different objective, they all have different money management definitions. But notice that my definition is much more

concrete and really says what it is—it tells you how much to invest throughout the course of a trade. It helps you achieve your objectives.

Isn't it interesting that most professionals cannot even agree on the definition of what is probably the most important topic for all traders and investors to understand? In fact, in my three books, *Trade Your Way to Financial Freedom*, *Financial Freedom through Electronic Day Trading*, and *Safe Strategies for Financial Freedom*, I totally eliminated the term money management and coined a new one, position sizingTM. Since position sizing 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.

Position sizingTM (what some call 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 to a number of different investments or products. Equalizing your exposure over the various trades or investments in your portfolio gives each position 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 position sizing. 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 Kovner⁶

“Never risk more than 1% of your total equity in any one trade. By risking 1%, I am indifferent to any individual trade. Keeping your risk small and constant is absolutely critical.” —Larry Hite⁷

“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 Dennis⁸

Thus, the key to success in the markets is to find a system with a positive expectancy (which we discussed in Part I) and then to do something that most people don't even consider—trade it at a position sizing level that will allow us to survive and then thrive.

It sounds simple, doesn't it? But the problem is that there are more psychological biases that prevent us from practicing proper position sizing. And these are just as strong as the biases that make us think that success is all about picking the right stocks.

Psychological Biases Against Proper Position Sizing

The Need to Be Right Bias in Position Sizing

We've already discussed how the need to be right can make it almost impossible to follow the Golden Rule of Trading. In terms of position sizing, this bias translates into a technique of reducing the position when you are at breakeven on the whole position, taking another part of the position when you have some profit and then letting a small portion of the position run. This almost guarantees that you have the maximum sized position when you have your biggest losses and the smallest position when you have the biggest profits. As a result, needing to be right tends to undo most traders and investors because they exit inappropriately and do their position sizing inappropriately. However, this bias will work in your favor when you are doing countertrend trading in which there is a limited profit potential.

People have an overwhelming desire to be right. Over and over, I hear traders and investors tell me how important it is for them to be right when they make a market prediction or, even worse, when they invest their money in the market.

I once worked with a client who published a daily fax giving predictions for a particular commodity. Big traders all over the world subscribed to his fax because his accuracy was outstanding. He was known worldwide for that accuracy. However, despite the fact that his accuracy was outstanding, his ability to trade that market was rather poor. Why? The answer is because of the need to be right. Once a person makes a prediction, the ego becomes involved in it, making it difficult to accept anything that happens in the process of trading that seems to differ from your prediction. Thus, it becomes very difficult to trade anything that you publicly predict.

The Gambler's Fallacy

People tend to assume that long streaks will end on the next trade. This shows a total lack of understanding of what happens with random draws—they produce long streaks. And when you've had five or six losses in a row, the odds of having another loss are just the same as when the streak started.

The gambler's fallacy probably affects position sizing more than any other bias. What happens is that when you have a long winning streak, you start lowering your position size because you think a loss is now due. Again, this is the opposite of letting your profits run.

Similarly, when you've had a long losing streak, people tend to expect a winner. As a result, they increase their position sizing for the next trade. Yet, as we've said earlier, the fact that you are in a losing streak does not increase the probability of a win on the next trade. Making larger bets on losing trades is behavior that is the opposite of cutting your losses short. This is what happened in the Ralph Vince experiment discussed earlier in the chapter.

However, there is another, even more insidious, bias—the long streak that occurs when we don't know the probabilities.

Streaks Cause Us to Doubt Probabilities and Change Our Risk

Most people who have little confidence in a system (such as one they have purchased or one they get through a subscription to someone else's advice) will abandon it after three or four consecutive losses. However, suppose you have a system that you have tested. You've had a negative run of perhaps five or six straight losses. What do you do? You start to doubt the system. Perhaps the markets have changed. Perhaps my testing had some flaws in it. Streaks generally cause people to doubt their systems. As a result, we are most likely not to trade it, but when we do, we trade it with little confidence and thus trade with a minimum position size. We vastly under trade the system and when the good trade comes along, the system does not perform up to expectations.

An even more dangerous situation occurs with long winning streaks, through which the trader thinks his system is better than it really is. After a long winning streak, the trader starts to think he really knows the market and that he is the market. The trader then increases his position size to very risky levels. Eventually, the streak comes to an end at a time when the trader has such a large position on that he gets wiped out.

A great example of this happened when we were testing the *Secrets of the MastersTM* trading game. In this particular simulation, the odds of winning were 60%, 55% of the time you win what you risk and 5% of the time you win 10 times what you risk. The odds of losing are 40%, 35% of the time you lose what you risk and 5% of the time you lose five times what you risk. I recently came across an example when one of our game testers (who knew the odds very well) had a very improbable win streak. Table 6-2 shows the trades this person made and the percentage risked.

On the first trade, the person risked bankruptcy by risking 20% on Bedoyn, Inc. On the next trade, his risk was extremely high at 12%. The person said that he didn't care if he risked bankruptcy at first since he could always play again. He just wanted to get a good start.

Notice that the person risks about 5% through the next eight trades. At this point, the trader is really beginning to suspect that something is wrong. "How can this be a 60% winning game, when I've had nine winners in a row? Something must be wrong." As a result, he now risks close to bankruptcy again with an 18.7% bet. Again, he wins.

Our trader then settles down a little and starts risking about 10% of his equity on the next seven trades. Again, they are all winners. Our trader has now had 17 straight wins in a 60% trading system. He's beginning to think, "I know something is wrong, but I'll just play along." Incidentally, the odds of this happening are 0.00028 or about 3 chances in 10,000.

The trader now feels he cannot lose and starts risking much larger amounts—13.9%, 20.3%, 16.9%, 44.8%, 61.9%. All of these are still winners as his bet size gets larger and larger. The trader has now had 23 consecutive winners. The odds of this occurring are 0.0000079 (about 8 times in a million), so he is convinced that something is wrong with the programming. He cannot

lose. At this point, he has turned his \$10,000 into a new equity of over million dollars and he is wishing he had risked a lot more in the prior 23 trades.

What happens? He risks one million dollars on the next trade. And what was the result? What else—his first loser comes up and he now has \$45,960 left. **This really happened in the particular game! He had 23 straight winners, risked one million dollars and then lost!**

Let's look at what happened next. Our trader now is perplexed, but he thinks that the odds of winning are much better than 60%. As a result, he risks 11% on the next trade. It's a winner. He then risks 96% and it's a winner. He's now feeling better again. By trade 28, he has \$847,960. He risks \$400,000 and loses 1 to 1. Now he's back down to \$447,960.

Now he decides, "It's possible to lose, but not very likely. Let's risk about 50% per trade. With a few more winners, I'll soon be back to a million again." On trial 31, he gets his equity back to \$647,960. He risks \$300,000 and hits a five to one loser. The result is a loss of \$1.5 million, and he's bankrupt.

Table 6-2: Trades in the Internet Qualifying Game

Trial	Equity	Item Traded	Amt. Risked (R)	% Equity	R-Multiple	Amt. Won/Lost
1	\$10,000.00	Bedodyn, Inc	\$2,000.00	20%	1	\$2,000.00
2	\$12,000.00	International Papers	\$1,200.00	12%	1	\$1,200.00
3	\$13,200.00	National Auto Repair	\$700.00	5.3%	1	\$700.00
4	\$13,900.00	Specialty of the House	\$700.00	5%	1	\$700.00
5	\$14,600.00	Doctors Support Systems	\$850.00	5.8%	1	\$850.00
6	\$15,450.00	Onray Pharmaceuticals	\$800.00	5.2%	1	\$800.00
7	\$16,250.00	Plymouth Engineering	\$800.00	4.9%	1	\$800.00
8	\$17,050.00	Y2K Wizards	\$850.00	5%	10	\$8,500.00
9	\$25,550.00	Key Software	\$1,250.00	4.9%	1	\$1,250.00
10	\$26,800.00	Wonder Restaurants	\$5,000.00	18.7%	1	\$5,000.00
11	\$31,800.00	Joes Quick Foods	\$3,180.00	10%	10	\$31,800.00
12	\$63,600.00	Entertainment Aware	\$7,000.00	11%	10	\$70,000.00
13	\$133,600.00	Net Realities	\$13,360.00	10%	1	\$13,360.00
14	\$146,960.00	Investors Guide	\$15,000.00	10.2%	1	\$15,000.00
15	\$161,960.00	Bestall Genetics	\$16,000.00	9.9%	1	\$16,000.00
16	\$177,960.00	Sure Cuts	\$18,000.00	10.1%	1	\$18,000.00
17	\$195,960.00	Pets Unlimited	\$20,000.00	10.2%	1	\$20,000.00
18	\$215,960.00	Rocket Science, Inc.	\$30,000.00	13.9%	1	\$30,000.00
19	\$245,960.00	Journey Into Light	\$50,000.00	20.3%	1	\$50,000.00
20	\$295,960.00	ABC, Inc.	\$50,000.00	16.9%	1	\$50,000.00
21	\$345,960.00	Advanced Systems	\$100,000.00	28.9%	1	\$100,000.00
22	\$445,960.00	Auto Electronics	\$200,000.00	44.8%	1	\$200,000.00
23	\$645,960.00	Parts Unlimited	\$400,000.00	61.9%	1	\$400,000.00
24	\$1,045,960.00	Sure Oil and Gas	\$1,000,000.00	95.6%	-1	-\$1,000,000.00
25	\$45,960.00	Gulf Drilling	\$4,000.00	11.5%	1	\$4,000.00
26	\$49,960.00	Security Finance	\$48,000.00	96.1%	1	\$48,000.00
27	\$97,960.00	Down Home Cooking	\$50,000.00	51%	1	\$50,000.00
28	\$147,960.00	Westward Ho	\$70,000.00	47.3%	10	\$700,000.00
29	\$847,960.00	Mississippi Mud Boats	\$400,000.00	47.1%	-1	-\$400,000.00
30	\$447,960.00	Gallore, Inc	\$200,000.00	44.6%	1	\$200,000.00
31	\$647,960.00	Best Hauling Co.	\$300,000.00	46.3%	-5	-\$1,500,000.00

Notice that our trader had 31 trades and he made money on 28 of them. Nevertheless, his three losses totaled \$2.9 million and he ended up nearly a million dollars in debt. He had expectancy on his side—the winners were more probable and bigger (on the average) than the losers. He also had probability on his side—he was right on over 90% of his trades. Yet, at the end, he was one million dollars in debt just due to greed and improper position sizing. **When you have a long**

streak, you could easily assume that the known odds are wrong and end up risking an inappropriate amount.

Remember that this set of trades really happened in our simulation. And that was in a situation in which the odds were known. The trader simply thought the software was broken. I've also explained the example to several people and their response was "Impossible, something must have gone wrong." However, nothing was wrong. It simply occurred by chance. Sometimes, in our trading lives, very improbable occurrences have a way of showing up and wrecking our plans.

If it can happen in a simulation in which the odds are known, then it can certainly happen in the market where the odds are not known. Indeed, this phenomenon of becoming crazy during a winning streak is probably what happens to traders with phenomenal records who suddenly blow out of everything.

Just to illustrate the point, we simulated systems that had winning probabilities ranging from 80% to 20%. Each system was simulated over 100 trades 20,000 times. And from that data, we calculated losing streaks.⁹ These are shown in Table 6-3. The table shows the losing streak that has 100% chance of occurrence (i.e., a 99.9%+ chance that you'll have a losing streak this long), the average maximum losing streak in 100 trades, the maximum streak that you have a 10% probability of getting, the maximum streak you have a 1% probability of getting; and the largest losing streak we saw in all our simulations.

When a range is given in the table, it means that a higher number has a slightly higher percentage of occurring than the boundary condition and the lower number has a slightly lower percentage of occurring than the boundary condition. For example with an 80% win rate, at the 1% level there is about a 2.6% chance of five losses or greater and a 0.7% chance of six losses or greater.

Table 6-3: Losing Streaks as a Function of Winning Percentage

System Win Percent	100%	Average	10% Probability	1% Probability	Maximum
80%	2	3	4	5 to 6	7
75%	3	3	5	6 to 7	9
70%	3	3	5 to 6	7 to 8	10
65%	3	4	6 to 7	8 to 9	13
60%	4	5	7	9 to 10	14
55%	4	5	8	10 to 11	16
50%	5	6	9	12	19
45%	6	7	10	13 to 14	22
40%	7	8	11 to 12	15 to 16	25
35%	8	9	13 to 14	18 to 19	34
30%	9	11	15 to 16	22	38
25%	10	13	18 to 19	25 to 26	41
20%	12	15	22 to 23	32	51

Let's summarize this bias again to be sure that you understand it. *When a long streak occurs, you tend to readjust the odds in your head and risk appropriately.* Thus, during a losing streak, traders

tend to assume that the system is no good or the market has changed. Consequently, they have little chance of coming back. And during a win streak, they think their system is the Holy Grail. If the streak gets long enough, they could be risking so much that they guarantee that they will eventually go bankrupt.

Not Enough Money or Too Much Greed

In this book, we will detail strategies for making optimal amounts of money. However, most people approach the market with too little money and risk too much of what they do have. To understand this better, let's look at a couple of simulated trading games. In the first game, you will get 100 trades of which 60% will be winners and 40% will be losers. In the game, you win or lose the amount you risk. Is there such a thing as too much? Of course, there is!

Imagine you risked all of your money on the first trade. You have a 40% chance of going bankrupt on that first trade. Four times in ten, you will go bankrupt.

Let's say you risked 50% of your money and you had two consecutive losing trades. On the first trade, you would lose 50% of your capital. On your second trade, you would lose 50% of what remains and you'd be down to 25% of your original capital. The chances of two losses in a row are 0.4×0.4 , which is equal to 0.16. Yet when you do that you now have to make 300% just to break even. At a 50% risk level, it would require four consecutive wins to put you ahead. The odds of four consecutive wins are $0.6 \times 0.6 \times 0.6 \times 0.6$, which is equal to 0.1296. Thus, you are less likely to get ahead than you are to fall behind. Eventually, you'd lose most (or all) of your capital risking 50% on a single bet.

The "optimal" bet size in this game is 20% of your remaining equity, and you'll learn how to determine that using the Kelly Criterion later in the book.¹⁰ However, risking any more than 20% puts you in a clear losing situation.

Because most trades can have huge losses—the amount you risk plus the amount of slippage—maximum bet size in trading is usually much smaller than 20%. In fact, if you have multiple positions on at one time, you need to assume that all of them could go against you at once. Thus, in most trading situations, the maximum bet size is more like 3-4%. Thus, if you approach the markets with only a \$5,000 account, you can only lose \$200 as a maximum bet. And in most situations, you don't want to be anywhere near the maximum bet. As a result, people with small accounts usually don't have enough money to trade.

Summary: Most people have psychological biases that cause them to want to understand the markets, predict the markets, and be right in their trading. As a result, they totally ignore what is important—cutting their losses short and letting their profits run. They do this by trading without enough money, taking half their position off at breakeven, risking too much, changing their perception of the odds during a long streak, and/or risking more when they are losing and less when they are winning. All of these tactics bias us against using position sizing strategies that will really make a difference in our results.

NOTES

¹ Vince, Ralph. "The Ralph Vince Experiment." *Technical Trader's Bulletin*, eds. David W. Lucas and Chuck LeBeau. March 1992, pp. 1-2.

² Free Dictionary. Farlex. 19 Apr. 2007

<<http://financial-dictionary.thefreedictionary.com/Money+Management>>

³ InvestorWords.com. 1999. WebFinance Inc. 19 Apr. 2007

<http://www.investorwords.com/3104/money_management.html>.

⁴ "Money Management." *Wikipedia*. 2001. Wikimedia Foundation. 19 Apr. 2007
<http://en.wikipedia.org/wiki/Money_management>.

⁵ Faith, Curtis. *Way of the Turtle*. New York: McGraw-Hill, 2007, p. 109

⁶ "Bruce Kovner: The World Trader." Schwager, Jack. *Market Wizards*. New York: New York Institute of Finance, 1989, pp. 51-83.

⁷ "Larry Hite: Respecting Risk." Schwager, Jack. *Market Wizards*. New York: New York Institute of Finance, 1989, pp. 175-190.

⁸ "Richard Dennis: A Legend Retires" Schwager, Jack. *Market Wizards*. New York: New York Institute of Finance, 1989, pp. 85-116.

⁹ If you are interested in winning streaks, look at the losing streaks for the system with $(100 - X)$ where X is the win percentage of your system. They will be the same.

¹⁰ The Kelly Criterion is discussed in the *Position Sizing Methods to Avoid* section of Chapter 15.

Chapter 7

CPR for Traders and Investors

Position sizing tells you “how much” with regard to any position in the market. How many shares of stock should you buy? How many futures or options contracts should you buy? How big should your forex position be? “What proportion of your portfolio should you allocate to that position?” is basically the same question. But how exactly do you determine how big or small your position should be? The purpose of this chapter is to provide you with some basics that will help you in making your “how much” decisions.

The Importance of Position Sizing

Let me introduce you to a game that I’ve played all over the world. Top hedge fund managers and top portfolio managers have played the game. In fact, I’d estimate that I presented this game over 200 times to audiences as large as 300 professional traders and dozens of times with small groups of about 5 VIP traders at various funds.

The game works as follows. I have a bag of ten marbles. Seven of the marbles are 1R losers. Another marble is a 5R loser. But two marbles are 10R winners.

These marbles are randomly drawn out of the bag (and replaced) for 30 trades. You now know enough about expectancy so that you should be able to determine the quality of your system. What’s its expectancy?¹ It’s actually System 3-1, so we’ve already discussed it thoroughly.

The most outstanding thing about the game is the variability of results in a room of 300. First, everyone gets the same trades—the 30 marbles that are pulled out of the bag. But usually everyone also has a completely different final equity, with the exception being those who go bankrupt. In fact, after starting out with \$100,000, the final equities can easily range from zero to well over a million dollars. Yet everyone gets the same trades. Thus, the only two variables that are important to this game are people’s individual psychology and their position sizing. And what’s the message? Position sizing produces huge variability in your performance.

Position sizing produces huge variability in your performance.

Even more interesting is a study by G. Brinson and his colleagues that appeared in the *Financial Analysts Journal* in 1991.² They studied the performance of 82 portfolio managers over a 10-year period. The primary variable they were looking at was “how much money was allocated to bonds, how much money was allocated to stocks, and how much money was allocated to cash.” Their conclusion was that over 91% of the performance variance of these portfolio managers was due to asset allocation.

So here is an academic study that suggests that most of the performance variability of portfolio managers is due to asset allocation. But just what is asset allocation as they defined it? It's the "how much" question.³ And that's what I call position sizing. Thus, you might rephrase their conclusion to read that over 91% of the performance variation of these portfolio managers was due to position sizing. And that conclusion perfectly matches what I've observed conducting over 300 marble game trading simulations—**position sizing results in huge variations in the performance of the participants.**

I recently looked at a book on asset allocation by David Darst,⁴ Chief Investment Strategist for Morgan Stanley's Global Wealth Management Group. On the back cover there was a quote from Jim Cramer of CNBC saying, "Leave it to David Darst to use plain English so we can understand asset allocation, the single most important aspect of successful performance." Thus, you'd sort of think that the book would say a lot about position sizing, would you not?

When I looked at the book, I asked myself the following questions:

- Does he define asset allocation as being position sizing?
- Does he explain (or even understand) why asset allocation is so important?
- Is position sizing (or how much) even referenced in the book?

Here is what I discovered. There was no definition of asset allocation in the book, nor was there any explanation, related to the issue of how much, as to why asset allocation was so important. Topics such as position sizing, how much, and money management were not even referenced in the book. Instead, the book was a discussion of the various asset classes one could invest in, the potential returns and risks of each asset class, and the variables that could alter these factors. To me it proved the point that *many top professionals really don't understand the most important component of investment success: position sizing.*

Many top professionals really don't understand the most important component of investment success: position sizing.

The Three Components of Position Sizing

In my opinion, the performance variability produced by position sizing has three components. They are all intertwined, so it is very difficult to separate them.

The first component is the trader's objectives. For example, someone who thinks, "I'm not going to embarrass myself by going bankrupt" will get far different results from someone who wants to win no matter what the potential costs. In fact, I've played marble games in which I've divided the audience into three groups, each with a different objective and a different "reward structure" to make sure they have that objective. While there is clearly a sizable variability to the "within group" ending equities, there is also a distinct, statistically significant difference between the groups with different objectives.

The second component, which clearly influences the first component, is a person's psychology. What beliefs are operating to create the person's reality? What emotions come up? What is the person's mental state? We've already covered some of the effects of judgmental heuristics on position sizing in Chapter 6. The person whose primary thought is not to embarrass himself by going bankrupt, for example, isn't going to go bankrupt even if his group is given incentives to do so. Furthermore, the person with no objectives and no position sizing guidelines will position size totally by emotions.

The third component is the position sizing method that is selected—be it intuitive or a specific algorithm. We'll be examining the effect of various position sizing models (i.e., 30 different models) throughout the remainder of this book. Each model has many varieties including the method of calculating one's equity that we'll discuss later in this chapter. For example, if each model is multiplied by the three ways of calculating one's equity, then there are now over 90 different position sizing models. Plus there are numerous ways to calculate market's money or how to scale in or out of trades.

So now that we know how important position sizing is to our performance, we also need to know how to determine "how much." In the rest of this chapter, we'll be discussing position sizing basics, and in subsequent chapters we will get into much more sophisticated models.

The CPR Model for Position Sizing

A simple model for determining "how much?" involves risking a percentage of your equity on every trade. We've alluded to the importance of this decision throughout this book so far. But how exactly do you do that?

What you need to know are three distinct variables. The first variable is how much of your equity you are going to risk. This is your total risk, but we will call it Cash (or C) for short. Thus, we have the C in our CPR formula. For example, if you were going to risk 1% of your equity, then C would be 1% of your equity. If you had a \$50,000 account, then C would be 1% of that or \$500.

The next variable is how much you are going to risk per unit that you purchase. We will call this variable, R, which stands for risk. We've already talked about R in our discussion of expectancy. For example, if you are going to buy a \$50 stock and risk \$5 per share, then your risk (R) is \$5 per share. In prior discussions R could be your risk per unit or your total risk, but in the CPR model, R is the unit risk.

Our last variable is our position sizing. How many units do we buy? I call this variable P for position size. Essentially, you can use the following formula to determine how much to buy.

$$\mathbf{P = C/R}$$

Let's look at some examples so that you can understand how easy it is to apply this formula.

Example 1: You buy a \$50 stock and decide to sell if the stock drops to \$45, for a risk of \$5 per share. You want to risk 2% of your \$30,000 portfolio. How many shares should you buy?

Answer 1: $R = \$5/\text{share}$; $C = 2\% \times \$30,000$ or $\$600$. $P = 600/5 = 120$ shares. Thus, you would buy 120 shares of a \$50 stock. Those shares would cost you \$6,000, but your total risk would only be 10% of your cost (i.e., assuming you kept your \$5 stop) or \$600.

Example 2: You are day trading a \$30 stock and enter into a position with a 30 cent stop. You only want to risk a half percent of your \$40,000 portfolio. How many shares should you buy?

Answer 2: $R = 30 \text{ cents/share}$. $C = 0.005 \times \$40,000$ or $\$200$. $P = 200/0.3 = 666.67$ shares. Thus, you'd buy nearly 700 shares, costing you \$30 each. Your total investment would be \$19,999 or approximately half of the value of your portfolio. However, your total risk would only be 30 cents per share or \$200 (assuming you kept your 30 cent stop).

Example 3: You are trading soybeans with a stop of 20 cents. You are willing to risk \$500 in this trade. What is your position size? A soybean contract is 5000 bushels. Let's say soybeans are trading a \$6.50. What size position should you put on?

Answer 3: $R = 20 \text{ cents} \times 5,000 \text{ bushels per contract} = \$1,000$. $C = \$500$. $P = \$500/\$1,000$ which is equal to half. However, you cannot buy a half contract of soybeans. Thus, you would **NOT** be able to take this position. Sorry, it was a trick question, but you need to know when your position has way too much risk.

Example 4: You are trading a dollar/Swiss franc forex trade. Swiss franc is at 1.4627 and you want to put in a stop at 1.4549. That means that if the bid reaches that level, you'd have a market order and be stopped out. You have \$200,000 on deposit with the bank and you are willing to risk 2%. How many contracts can you buy? Let's say a forex contract is \$100,000 worth of Swiss francs.

Answer 4: Your R value is 0.0078, but a regular forex contract would be trading \$100,000 worth, so your stop would cost you \$780. Your cash at risk (C) would be 2% of \$200,000 or \$4000. Thus, your position size would be \$4,000 divided by \$780 or 5.128 contracts. You round down to the nearest whole contract level and purchase 5 contracts.

Example 5: You are trading July 35 QQQQ put options at \$0.75. Your account is worth \$85,000 and you don't want to risk more than 5% on the options. You make the assumption that you'll get out if it drops to 0.40 cents or below (i.e., a mental stop that you'll be following closely). How many contracts can you buy?

Answer 5: Each option contract is for 100 units of the QQQQ, the NASDAQ 100 ETF. Thus, your risk of 0.35 must be multiplied times 100 to get the risk per contract. $R = 0.35 \times 100 = \$35$. You total risk, or the cash amount is 5% of \$85,000 or \$4,250. Thus, your position size is equal to \$4,250 divided by \$35 or 121.43. You can buy 121 option contracts. By the way, this is a huge amount of risk, but I just wanted you to have some practice with options.

More Basics: Equity Models

All of the models you'll learn about in this book 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 position sizing 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 a \$5,000 position sizing allocation, using one of the methods described later in the book. You now have a core equity of \$45,000. You open another position with a \$4,500 position sizing 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.

I first learned about the term Core Equity from a trader who was famous for his use of Market's Money. This trader would risk a minimum amount of his own money when he first started trading. However, when he had profits, he'd call that Market's Money, and would be willing to risk a much larger proportion of his profits. This trader always used a Core Equity model in his position sizing.

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 of all of your open positions.** Thus, your total equity is \$60,000.

Tom Basso, who taught me methods for maintaining a constant risk and a constant volatility, always used the total equity model. And it makes sense! If you want to keep your risk constant, you'd want to keep the risk a constant percentage of your total portfolio value. (See Model 21 in Chapter 14).

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, **reduced total equity is equivalent to 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.⁵**

Here's an example of reduced total equity. Suppose you have a \$50,000 account that you are investing. You open a position with a \$5,000 position sizing allocation. Thus, your core equity (and reduced total equity) is now \$45,000. Now suppose the underlying position moves up in value and you have a trailing stop. Soon 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 of \$3,000, 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 \$4,700 position sizing 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 (\$4,700) plus the locked in profit of \$11,000 on the first position. The resulting new value is \$56,300.

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.

The models, given in subsequent chapters, generally 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.

NOTES

¹ The expectancy is 0.8R, on the average, per trade. If you were not able to get that answer, review Part I.

² Brison, G., B. Singer, and G. P. Beebower. "Determinants of Portfolio Performance II: An Update." *Financial Analysts Journal* 47.3 (1991).

³ Interestingly enough, most portfolio managers believe that asset allocation is very important to their results. But because of the bias that says picking stocks is what's important to investment success, these managers believe that asset allocation is a decision of which asset class to pick (i.e., a selection decision rather than a "how much" decision).

⁴ Darst, David. *Mastering the Art of Asset Allocation*. New York: McGraw-Hill, 2007.

⁵ 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.

Chapter 8

Core Position SizingSM Models

The purpose of this chapter is to cover the core position sizing models that you ought to be familiar with as a trader. Make sure that you thoroughly understand the five models presented in this chapter before you move on because they form the foundation of everything else.

The System Used

To demonstrate several strategies, I tested them with a single trading system that traded the same commodities over the same time period. It doesn't matter that I used a futures system because the calculations would be the same no matter what instrument you trade. The system was Donchian's 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 for a long position or a new 55-day low for a short position. The stop, for both the initial risk and for 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. They are also very difficult to trade without sufficient funds. As a result, the system was tested with a million dollars in start-up equity with a basket of 10 commodities in the years 1981 through 1991. Whenever futures data are presented in this chapter, they are 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 position sizing model used.

In this chapter, I'm going to present five different position sizing models: 1) Units per fixed amounts of money, 2) equal units/equal leverage, 3) percent margin, 4) percent volatility, and 5) percent risk. So let's get started with Model 1.

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 position sizing. 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 position sizing are about diversification or

about optimizing the gain from your trading. Books on systems development or technical analysis don't even begin to discuss position sizing adequately. As a result, *most traders and investors have no place to go to learn 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 equity 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 position sizing use this model. It is simple. It tells you "how much" in a straightforward way.

The one unit per fixed amount of money has one advantage in that you never reject a trade for being too risky. Let me give you an example of an experience of two Commodity Trading Advisors (CTAs) that I knew. One traded one contract per \$50,000 in equity, while the other limited his risk to 2% of equity (see model 5) and would not open a position in which his exposure was more than that. Each of them was presented with an opportunity to trade the Japanese Yen. The person trading one contract, no matter what, took the trade. The subsequent move in the Yen was tremendous, so he was able to produce the biggest monthly gain that his firm had ever experienced in their history, 20%.

The other trader couldn't take the trade, even though his account size was \$100,000 because the risk involved exceeded his 2% 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. The only difference in the result is the position sizing model used.

Table 8-1 shows the results with this system using the first position sizing model. 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 use at least \$70,000 if you wanted to avoid a 50% drawdown.

**Table 8-1: 55/21-Day Breakout System with 1 Contract per \$X in Equity
(Starting Equity is One Million Dollars)**

1 Contract per \$X in Equity	Profits	Rejected Trades	Annual % Gain	Margin Calls	Maximum Drawdown
\$100,000	\$5,034,533	0	18.20%	0	36.86%
\$90,000	\$6,207,208	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%

To really evaluate this position sizing method, you'll have to compare it with the tables developed from the other models (see Tables 8-2 and 8-3) and the equity curves that are shown in the figures.

Despite the advantage of allowing you to always take a position, I believe that the one unit per fixed dollars type of position sizing is limited because 1) all investments are not alike and 2) it does not allow you to increase your exposure very rapidly with small amounts of money. In fact, with a small account, the units per fixed amount model amounts to very minimal position sizing. Let's 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 position sizing strategy is to trade one contract of anything in that portfolio that your system signals. Let's say you get a signal for both bonds and corn. Thus, your position sizing says you can buy one corn contract and one bond contract.

With T-bonds futures at \$116¹ you are controlling \$116,000 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 \$12,000 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 85% on what bonds do and only about 15% 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 15% of the impact on your account that bonds would have.

Cannot increase exposure rapidly. The purpose of an anti-martingale strategy² 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 \$50,000 account it almost amounts to no increase in position sizing.

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.

Position sizing allows for 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 want to spread your risk equally across 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 position sizing plan that gives you more units on the trades that have a higher probability of success—perhaps a discretionary position sizing strategy.³ However, 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.

This model 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 allocating positions by 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 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 that 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, 1,000 shares of a \$10 stock, and 1,428 shares of a \$7 stock. Part of the position sizing in this strategy would be to determine how much of your portfolio you might allocate to cash at any given time.

Figure 8-1 illustrates the number of shares as a percentage of total shares, for each of the five \$10,000 units.

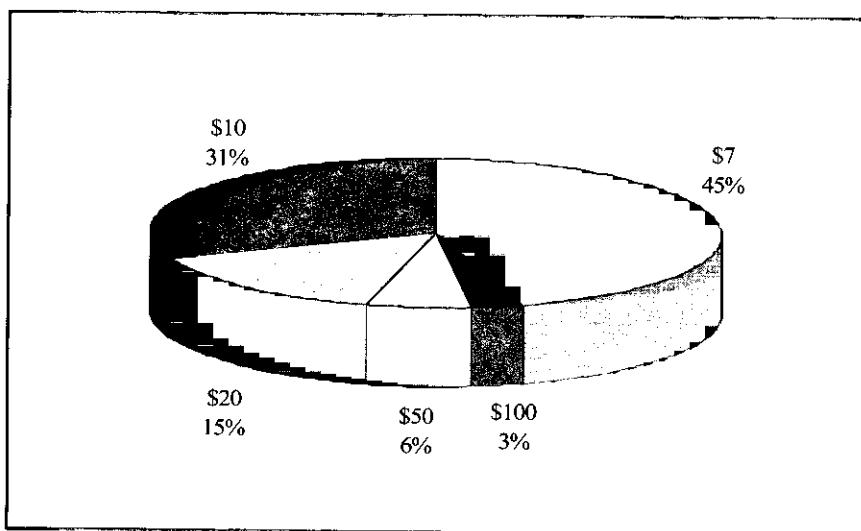


Figure 8-1: Distribution of Funds as Shares
(Each unit represents \$10,000)

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 let's say you arbitrarily decide to divide that into five units of \$50,000 each.

Let's say that a bond contract is currently worth about \$112,000. You couldn't buy any bonds, using this position sizing 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 corn contracts or \$45,000 worth.

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

The equal units approach allows you to give each investment an approximately equal weighting in your portfolio. It also has the advantage 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 know that you control about 5-to-1 leverage, since your \$50,000 controls \$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 is such valuable information that I recommend all traders keep track of the total product value they are controlling and their leverage. This information can be a real eye opener.

Louis Navallier, who is both a portfolio manager and an investment adviser, uses this approach. For example, Navallier might recommend a portfolio of about 20 stocks, suggesting that you buy all of them with an equal dollar weighting on each. Thus, if you had a \$100,000 portfolio, he'd recommend that you buy \$5,000 worth of each stock. What makes Navallier's approach a little different is that he recommends that you periodically readjust your portfolio. For example, if one stock suddenly moves from being \$5,000 in your portfolio to being \$7,000, then he'd recommend that you sell off \$2,000 worth of stock so that you maintain an equal weighting. The cash is then used to purchase additional positions as they are recommended. While most portfolio managers think this way, it basically limits your ability to let your profits run.

The equal units approach also has the disadvantage that it only allows you to increase "how much" very slowly as you make money. In most cases with a small account, equity again has to double to increase your exposure by one unit. Again, this practically amounts to an inability to increase position sizing for the small account.

In addition, although the exposure per unit seems to be equal, it might not be. For example, the daily volatility of \$50,000 worth of one product might be \$1,500, whereas the daily volatility of \$50,000 of another product might be \$6,000. The product with the higher volatility would have four times the impact on your account as the other one even though they were "worth" about the same amount.

Model 3: Percent Margin

The third model one might use for position sizing 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 need \$25,000 in your account to purchase \$50,000 worth of stock. In contrast, the margin requirement on one S&P futures contract might be \$11,250. Thus, you could purchase one S&P contract, controlling stock worth approximately \$290,000 at this 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 the margin on each trade to 5% of your account equity. In a \$50,000 account this would mean that the margin of your first purchase could be no more than \$2,500. You could not buy an S&P contract, but you could buy \$5,000 worth of stock on margin at 2 to 1.

The margin of your second purchase would depend on the equity model you were using. Let's say you had one open position worth \$2,500 and still had \$47,500 remaining to allocate. With the total equity model, your next purchase could also have a margin of \$2,500, or 5% of the total. However, with the core equity model or the reduced total equity model, you could only use margin in the second position of 5% of \$47,500, or \$2,375.

Let's look at a few examples of adding positions using the Total Equity Model. Let's say that the margin requirement on corn is \$675.⁴ When you divide \$675 into your 5% level of \$2,500, you get 3.7 contracts. Thus, you could buy 3 contracts. The margin requirement on silver is \$2,500 so your 5% requirement would allow you to buy one contract. However, the margin requirement on bonds is \$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 initially could not total over \$15,000 (i.e., 30% of your \$50,000). If you wanted to purchase a new position that would increase your total margin over that value, you could not do it.

Percent margin (model 3) 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 exchanges and the brokerage houses arbitrarily set the margin values. 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 position sizing doesn't necessarily give you

equal exposure across all positions. You could have two positions, each with an equal margin, and still have tremendous differences in the volatility exposure of the two.

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 you are exposed to in the short term.

Volatility is the difference between the high and the low of the day. If IBM varies between 115 and 117.5, 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 117.5 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 117.5 or 4.5 points.

Here's how a percent volatility calculation might work for position sizing. Suppose 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 true range as our measure of volatility. How many gold contracts can we buy?

Since the daily range is \$3.00 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 position sizing, based on volatility, would allow us to purchase 3 contracts.

Let's 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 position sizing 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 position sizing, 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 that you wanted to limit your exposure to 10%. Thus, you could have five

positions, since your individual position limit is 2%. If all of your positions went against you 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.

Just to make sure you understand how volatility position sizing works, here are some exercises to complete. The answers to the exercises are given at the end of this section.

1. Your account has \$100,000 in it. You elect to have a 1.5% volatility position. How much can you allocate to that position? Use this information in the next two questions.
2. The average volatility of a stock over the last three days is \$4. How many shares can you purchase with a \$5 stop?
3. The average volatility of corn over the last ten days is 3 cents. A corn contract is 5,000 bushels, so that means the dollar fluctuation per contract is \$150 on average. If you use a 10 cent stop, how many contracts can you purchase?
4. Redo questions two and three with the assumption that your account has \$250,000 in it and you are using a 0.8% volatility allocation.

If you are perplexed by these questions, remember that you are doing volatility position sizing, not risk position sizing. *Risk is irrelevant to position size in these questions.*

Table 8-2 illustrates what happens with our breakout system in our portfolio of 10 commodities over 11 years when you size positions based upon the volatility of the markets as a percentage of your equity. This is the same system and the same data described in Table 8-1. The only difference is the position sizing algorithm.

Table 8-2: 55/21 Breakout System with Volatility-Based Position Sizing

% Volatility	Net Profits	Rejected Trades	Annual % Gain	Margin Calls	Maximum Drawdown
0.10%	\$411,785	34	3.30%	0	6.10%
0.25%	\$1,659,613	0	9.50%	0	17.10%
0.50%	\$6,333,704	0	20.30%	0	30.60%
0.75%	\$16,240,855	0	30.30%	0	40.90%
1.00%	\$36,266,106	0	40.00%	0	49.50%
1.75%	\$236,100,000	0	67.90%	0	69.70%
2.50%	\$796,900,000	0	86.10%	1	85.50%
5.00%	\$1,034,000,000	0	90.70%	75	92.50%
7.50%	-\$2,622,159	402	0.00%	1	119.80%

Notice in Table 8-2 that a 2% volatility position sizing allocation would produce a gain between 67% and 86% per year and drawdowns of 69-86% per year.⁵ The table suggests that if you used a

volatility position sizing algorithm with the system, you probably would want to use a number somewhere between 0.5 and 1.0% per position, depending upon your objectives. The best reward-to-risk ratio in this system occurs at a 2.5% allocation, but few people could tolerate the drawdown of 86%.

Volatility position sizing has some excellent features for controlling exposure. Few traders use it. Yet, it is one of the more sophisticated models available.

Answers to Questions:

1. 1.5% of \$100,000 = \$1,500.
2. \$1,500 divided by \$4 = 375 shares
3. \$1,500 divided by \$150 = 10 contracts, note that in the last two examples the stop has nothing to do with the volatility. I just put it in there to keep you aware of what you were calculating.
4. 0.8% of \$250,000 = \$2,000
\$2,000 divided by \$4 = 500 shares
\$2,000 divided by \$150 = 13.3 = 13 contracts

Model 5: Percent Risk (also known as Fixed Fractional Position Sizing)

When you enter a position, it is essential to know the point at which you would get out 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 position sizing systems involves controlling position size as a function of this risk. Most of our discussion about position sizing in this book has been about the percent risk model, including the CPR discussion. So now it's time to explore it thoroughly. Incidentally, both Ralph Vince, in his many books on money management, and Ryan Jones, in his book *The Trading Game*, refer to this model as a fixed fractional model. This is because a percentage really is a fraction and if you use the same percentage, such as 10, then it is fixed. Let's look at an example of how this position sizing 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 multiplied by \$100/point or \$1,000.

You have a \$50,000 account. You want to limit your total risk on your gold position to 2.5% 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, position sizing using this model will only allow you to purchase one contract.

Suppose 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.

Let's 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 position sizing model.

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, let's 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 \$1,250. In the core equity model, our new core equity is \$1,250 less. Thus, we only have \$48,750 left on which to base the risk for our next position in corn. Since our position sizing allows us to risk 2.5% of this core equity, we can risk \$1,218.75.

We now want to sell short corn with a risk of \$250 per contract. If you divide \$250 into \$1,218 you get 4.875 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.

Let's 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 \$1,525. If the corn signal occurred with \$250 risk per contract, your position sizing would now permit you to sell short 6 contracts (\$1,525 divided by \$250 = 6.1). In contrast, the core equity model would still be based upon \$48,750 and would only allow you to sell short 4 contracts of corn.

As I mentioned before, the core equity model is the most conservative of the three equity models. Reduced total equity ranks in the middle, and the total equity model is the riskiest.

How does percent risk position sizing compare with percent volatility position sizing? Table 8-3 shows the 55-/21-day breakout system (from Tables 8-1 and 8-2) with a position sizing algorithm based upon risk as a percentage of equity. The starting equity is again \$1,000,000.

Table 8-3: 55/21 Breakout System with Risk Position Sizing

% Risk	Net Profits	Rejected Trades	Annual % Gain	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
25.00%	\$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

If you compare Table 8-3 with Table 8-2, 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.** My examples should not be used as guidelines because the relationships change between products and time periods. However, 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 were set at current rates at the time of testing and are not historically 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 8-3 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 0.5% per trade. And at 0.5%, your returns with the system would be very poor. You should now understand why you need at least a million dollars to trade this system.

How much risk should you accept per position with percent risk position sizing? **Your overall risk using risk position sizing 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 40-50% 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 position sizing percentages. Part III of this book will help you explore the relationship between position sizing and your objectives.

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 your SQNSM is good enough. If you are risking over 3%, you are a "gunslinger" and had better understand the risk you are taking for the reward you seek. However, we'll help you better determine what you want to do with position sizing later in this book when we discuss position sizing to meet your objectives. **But don't use these numbers as your primary guidelines. Use the guidelines given later.**

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, but that could produce unequal position sizing if all of your stops are basically equal. Similarly, with tight stops you could use very small position sizing such as 0.1%.

Perhaps the best way to do volatility position sizing is to use a volatility-based stop such as some multiple of the ATR. When you do that, you equalize all of your positions both in terms of the total risk exposure and the total volatility exposure.

More Examples

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 position sizing routine tells you to limit your risk to 2.5% or \$1,250. Dividing 4 into \$1,250 results in 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 1,250 shares based upon the model. But those 1,250 shares would cost you \$138,750—which you couldn't execute 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.

Most equity traders don't consider this sort of model at all. As a result, I've included a few questions to help you understand it better. The answers are given at the end of the chapter.

1. You have an account with \$100,000 in it and you want to risk 2% on a position. How much do you risk?
2. In this same account you want to buy Valero at \$70 with a 1.5 point risk. How many shares can you buy with your 2% risk model?
3. You change your mind. You want to buy Valero at \$70 with a 0.75 point risk. How many shares could you buy based on a 3% risk model?
4. You've already allocated \$5,000 of your account. Based upon a 2% core equity model, how many more shares of Valero could you buy at \$80 with a 2 point risk?
5. (a) Could you make all of the purchases in questions 2 through 4 in a fully margined account? (b) You think about risking another 2% core equity risk, using your figures from question 4, and buy Valero at \$100 with a 2 point risk. How many shares could you buy and could you buy it with the margin requirements?

Answers to the Questions

1. 2% of \$100,000 = \$2,000.
2. \$2,000 divided by \$1.50 = 1,333 shares.
3. 3% of 100,000 = \$3,000.
\$3,000 divided by \$0.75 = 4,000 shares.
4. 2% of (\$100,000 – \$5,000) = 2% of \$95,000 = \$1,900.
\$1,900 divided by \$2 = 950 shares.
5. (a) No, you could not buy all the stocks at a 50% margin. Even though you've only risked \$6,900, you could not purchase \$449,310 worth of securities in a \$100,000 account. (b) 2% of (\$100,000 – \$6,900) = 2% of \$93,100 = \$1,862. \$1,862 divided by \$2 = 931 shares which, at \$100 per share would cost you \$93,100. Again, you would not have enough money to do all of it.

NOTES

¹ In all of the examples I just picked a price, which may not reflect the price at the time you are reading it. It doesn't matter because the examples are just to help you understand the concept.

² Generally, position sizing strategies that are useful are all anti-Martingale strategies in which the bet size goes up as your equity increases. You should generally avoid Martingale strategies, discussed in Chapter 15, in which your bet size goes up as your equity goes down, because they do not work.

³ Discretionary position sizing strategies are discussed in Chapter 15 under the topic of *Strategies to Avoid*.

⁴ Margin levels on futures contracts may vary from brokerage company to brokerage company and may also change as the price and volatility go up.

⁵ 2% risk isn't given in the table. The gain and drawdown will simply fall someplace between the figures for 1.75% risk and 2.5% risk, which is shown in the table.

Chapter 9

More Position SizingSM Models

The purpose of this chapter is to present you with six additional position sizing models, giving you more tools to meet your trading goals. These tools will help you minimize your risk and/or achieve your trading goals, including when you must trade under unusual circumstances.

Model 6: Group Control

Suppose you are trading a system that makes money on average in 5 out of 12 trades or 41.7%. 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, or worse yet, a losing year that would cause you to 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 one trade each month. Table 9-1 shows 1) the number of winning trades out of 10 you might have, 2) the probability of that happening, and 3) the amount of money you'd make or lose on that combination assuming equal risk on each trade and a 2.5-to-1 reward-to-risk ratio. Table 9-1 also assumes that all trades are closed out within the month they are taken.

Table 9-1: Possible Results with 10 Independent Units

Number of Winning Trades	Probability	Amount Won/Lost
0	0.0046	-10 R
1	0.0326	-6.5 R
2	0.1047	-3 R
3	0.1995	0.5 R
4	0.2494	4 R
5	0.2172	7.5 R
6	0.1272	11 R
7	0.0519	14.5 R
8	0.0139	18 R
9	0.0022	21.5 R

Notice that you would need to have less than three winning trades out of ten in order to not make money. The probability of having less than three winners in a given month (in which you have 10 trades) is equal to 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. Notice that the most likely outcome is to have four out of ten winners (i.e., you have a 41.7% winning system), which would give you +4R for the month.

When you try to put this plan into effect, however, you run into the difficulty **that most trades are not independent**. For example, if you buy several home building stocks (because they are moving well) and have a portfolio consisting of Meritage Homes, Toll Brothers, Pulte, and D.R. Horton, then you might suddenly find yourself in a position where a significant analyst downgrades the industry and all of your stocks start to plunge together. Instead of losing 1%, you've lost 4%.

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 to optimize your position sizing is to minimize the number of highly correlated positions in your portfolio at any given time. You could do this by pre-selecting 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 position sizing 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, 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 that you have pre-selected to trade.

Suppose your overall position sizing 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, Euros, muni-bonds, 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.

Model 7: Portfolio Heat

Steve Sjuggerud likes to say that "all ships rise and fall with the tide." And the same goes for your investments. When the market goes up, all of your investments will tend to rise. When the market goes down, all of your investments will tend to fall.

In addition, the entire market will occasionally be exposed to unexpected price shocks, such as October 16, 1987 and September 11, 2001. When these price shocks happen, prices can move 10% or more overnight, wiping out highly leveraged positions.

As a result, it's also important to limit the total risk to which your portfolio is exposed. Ed Seykota and Dave Druz have called this measure *portfolio heat*.¹ Most great traders would argue that 20-25% portfolio heat is probably a maximum level for you. However, portfolio heat should also depend on the quality of your system. For example, if your system has a System Quality NumberSM of 5.3, then you could tolerate a much greater portfolio heat than another system with a System Quality NumberSM of 1.7

Let's look at some of the systems that we have examined previously, plus three others with higher System Quality NumbersSM that we'll explore later in Chapter 11. We'll compare the risk percentage that gives the highest median return to the System Quality NumbersSM of each system. The data is shown in Table 9-2.

System Number	% for Max. Median Return	System Quality Number SM
11-7	19.4%	2.94
11-6	8.0%	2.12
11-5	7.6%	1.89
3-2	9.8%	1.13
3-5	6.0%	1.01
3-1	3.2%	0.85
3-6	1.0%	0.71
3-4	1.0%	0.27
3-3	0.0%	-0.23

Notice how well the risk percentage that gives us the largest median return correlates with the System Quality NumberSM. It's almost perfect, except for System 3-2, which has a median risk that is way too high for its System Quality NumberSM. In addition, System 11-7 shows a very high jump in the median return from Systems 11-5 and 11-6. However, the losses in that system were all about 1R. There were no surprises and that sort of narrow distribution of losses doesn't happen often with real trading.

Based upon these numbers, my guess is that the risk percentage that gives the highest median return is probably equivalent to the portfolio heat that you should use. Remember that the simulator assumes that you only make one trade at a time. When you have multiple trades on, they could all move against you. Furthermore, price shocks (such as those that occurred on October 16, 1987 and September 11, 2001) will wipe you out if you are highly leveraged and your portfolio heat is too high.

Table 9-3 shows you some rough guidelines for the maximum portfolio heat that you should use. You should also look at the largest possible loss in your R-multiple distribution and make sure that your maximum portfolio heat is less than 100% divided by the largest negative R. Thus, if you have a potential 5R loss against you, then your maximum portfolio heat should be less than 20%.

Table 9-3: Some Rough Guidelines for Your Maximum Portfolio Heat Based Upon Your System Quality NumberSM

System Quality Number SM	Maximum Portfolio Heat
5.0 or higher	25% (20% if highly leveraged)
4.0 to 4.99	20% (15% if highly leveraged)
3.0 to 3.99	15%
2.5 to 2.99	12%
1.7 to 2.49	8%
1.3 to 1.69	4%
Below 1.3	1% if you trade it at all

Determine the portfolio heat from the table and then work backwards to determine the individual risk on any given position. How many positions are you likely to have on at one 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.

Let's say that you trade a maximum of ten positions at a time. With a System Quality NumberSM of 5.0 or higher, you could probably have a maximum of 2.5% risk in each position if you are not highly leveraged. With only five maximum positions, you could go up to 5% risk if you are not highly leveraged. But both of these estimates would be exceptional risk for someone who wants maximum returns with minimum risk of ruin. And even with an exceptional system, you are still flirting with disaster with these numbers.

If you have a weak, but tradable system (i.e., System Quality NumberSM between 1.7 and 2.49) then your maximum risk per position with 10 positions should be no more than 0.8% per position. And if your System Quality NumberSM falls below that, and you are willing to trade it, then I wouldn't suggest more than a few positions at 1% risk or less. That way, your portfolio, under terrible conditions, will not damage you extensively.

Portfolio heat was a term coined to describe 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. Thus, you could apply it to total volatility, total leverage, total margin, etc., instead of total risk. However, the guidelines could be different for each model. Notice how position sizing is getting more complex and more sophisticated as we add more models.

Model 8: Long versus Short Positions

Several famous traders have distinguished between long and short positions in considering group risk and portfolio heat. They believe that the long and short positions somewhat counteract each other, so that one long position and one short position—each at your desired market position sizing level—would 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 position sizing models already presented.

Curtis Faith, in his book *Way of the Turtle*, indicates that the Turtles were never allowed more than 10% risk on the long side plus 10% risk on the short side.² Thus, although one could argue that they had 20% portfolio heat, it was never more than 10% on one side of the market. And with these limits to their risk, many of the accounts still came close to ruin in October 1987. If you are going for higher risk, then you must ask yourself if you think you can trade better than the best of the Turtles.

Equalizing different long and short positions can only be used with those models that equalize your exposure in some way. Thus, it could not be applied to Model 1 in Chapter 8, but you could apply it to Models 2 through 5.

Model 9: Equity Crossover Position Sizing

One of the advantages of developing position sizing software is that you often come up with new ideas about position sizing. I asked my client base to report on software packages they were using for position sizing, and one client mentioned a product called *Market System Analyzer*. That package had a complete manual and tutorial on position sizing and it actually had a method that I had never seen before, called equity crossover position sizing. The basic idea is to add more size when your equity curve crosses over some moving average (i.e., your system is working well) and to reduce (or even eliminate) size when your equity curve crosses below some moving average.

You could use this idea in two ways. First, you could stop trading or reduce positions when the equity curve crosses some extreme moving average with the idea that your system may be breaking down. The second way would be to stop trading or reduce positions when your equity curve crosses below some level, which might indicate that your system has stopped working. Chances are, if you used the first method, you'd use a much more extreme moving average than if you were using the second method.

Furthermore, you could add positions based upon similar logic. You could add positions when your equity curve crossed some threshold, meaning that your system is now working well. You would probably want to use a fairly short term moving average if you used this method.

You could use this method as a Martingale strategy (and these generally DO NOT WORK) by adding positions when your equity falls below a certain level. The logic for doing this is that your system is probably now ready to start working well and you'd like to have maximum position size on when it does. While I tend not to like this sort of position sizing, *Market System Analyzer* (which does this sort of analysis) actually has a dependency analysis that you can run on your system to see if it has any of these trends with some statistical significance. Thus, if the system showed with statistical significance that the Martingale strategy would work, then I'd be in favor of using it.

Overall, there are a number of variables that you can select from should you want to use position sizing based upon your equity curve:

1. **The number of periods or trades in your moving average.** If you were going to use this method as a signal to stop trading for a while, then you might want more trades/periods in your moving averages.
2. **The size of your increment.** By how much should I increase my position size when I cross the equity curve (in whichever direction you deem to be appropriate)? For example, you might increase your position sizing by 30% or 50% or even 100%.
3. **The size of your decrement.** By how much do I want to decrease my position size when I cross the equity curve (in whichever direction you deem to be appropriate)? For example, you could decrease your position sizing by 20%, 50%, or even 100%.

I cannot give you any clear guidelines on how to use this method because it would depend upon your objectives and whether or not your system has statistical dependencies in it. However, if this method appeals to you, it's nice to know there is a software product that will support you in using the method.

Position Sizing Under Unusual Circumstances

In this section, I want to address position sizing under unusual circumstances.

- What happens, for example, when your trading system signals you to put most of your capital in one particular asset class and you don't have any real idea when you'd get out? For example, you are bullish on the Latin American stock market and you want to put your money on ILF, an ETF, which represents the 50 top Latin American stocks. How much would you invest?
- What happens if you are trading money for a company or a bank, and you don't really know how much money you are trading? This is the case for most forex traders at banks.
- And lastly, what happens if you are a mutual fund portfolio manager and you must be 98% invested. You don't even know the stops because you have to be fully invested. In fact, your performance depends upon how well you beat a particular market index. Absolute performance doesn't matter. How will you position size under these circumstances?

These are unusual circumstances for most traders and investors, but they do apply for many professionals. We will see examples of all of these in the next three models.

Model 10: Asset Allocation to Determine Position Sizing

The formulas for position sizing were all designed to be used with a system that generates specific trades. However, what if you have a system that says, when X happens, buy this particular exchange traded fund (ETF), which represents a whole collection of stocks? ETFs represent a collection of stocks that are usually in a single industry, country or commodity. This puts all of your capital in a single asset class. How do you position size and control risk with a system like this?

Let's look at an example. In *Safe Strategies for Financial Freedom*, I described a bear market mutual fund system. When the following criteria are met, you buy a bear market mutual fund that is the inverse of the S&P 500:

- Steve Sjuggerud's 1-2-3 Model is in Red Light Mode (I report on this in *Tharp's Thoughts*³ on the first Wednesday of each month).
- All three major U.S. stock averages are down at least 2.5% on the week. These averages include the DOW 30 Industrials, the S&P 500, and the NASDAQ 100.
- All three averages are lower than they were five weeks ago.

The first time this happens I recommend that you invest 25% of your portfolio in a mutual fund that is the inverse of the S&P 500. When it happens a second time, invest another 25%. Thus, you could be up to 50% invested in this strategy.

There were a few other exit rules, but generally when the market moves higher than it was five weeks ago, you exit the position. You don't know the exact price where you'll exit. It just needs to be higher than it was 5 weeks ago. So how do you determine position sizing?

The solution is to use some sort of asset allocation model to do your position sizing. In the case of the bear market mutual fund strategy we can make the assumption that the S&P will move on average 2 to 2.5% each week (which was the average weekly move for the prior five years).⁴ Thus, if the market is now lower than it was five weeks ago and the market had gone down 2.5% every week, then the market would be down about 15%. This is a huge risk assumption because it is much more likely that the market would be down 3 to 5% over the five weeks. However, if the market retraced the 15% the next week to stop you out, you would lose 15% of 25% of your equity. This is equivalent to a loss of 3.75% of your portfolio. That size loss certainly falls within the boundaries of the guidelines set forth in the previous section on portfolio heat.

There is one more scenario that is worse. Suppose that the market went down another 2.5% and you are now 50% invested in this strategy. The next week there is a huge rally in the market (i.e., 15%) and since the market is now higher than it was five weeks ago, you must exit. You would probably be down 3.75% in the second 25% invested and 3.12% in the first 25% invested. You'd have a total loss of nearly 7% of your portfolio.

However, if you'd been short about 10 stocks with 1% risk in all ten stocks, you'd probably have a 10% total loss. Thus, this asset allocation model still falls within the portfolio heat guidelines presented previously.

If you have a similar system that simply puts much of your equity in this particular asset class when X happens, then you can use a similar asset allocation model to determine your position sizing. It involves a three-step process:

- First, determine what the maximum loss would probably be based upon your exit rules. Let's say you decide it's 20%.
- Next decide your maximum tolerable loss to your portfolio. Here, let's say you decide that it is 10%.

- Now simply determine how much of your total portfolio you can allocate. In this example, we could allocate 50%, since 50% of 20% is only a 10% loss.

Model 11: Position Sizing for Portfolio Managers

Let's say you are a mutual fund manager. You are only interested in relative performance, and beating your benchmark index, which might be the S&P 500. You must be 98% invested at all times because your charter says so. In fact, you don't even keep any stops. As a result, how do you do any sort of position sizing?

I once interviewed a portfolio manager about this very question. He was quite familiar with these teachings involving position sizing, but he still had to operate according to his charter. This was his solution:

Van: As a portfolio manager, do you really concentrate on position sizing or is it somehow clouded under asset allocation?

I concentrate on position sizing and I have to do it under the asset allocation constraint.

First, some background info: Most stock managers have a benchmark that they say they are going to beat. For many, this is the S&P 500 index and the amount you beat it by is your excess return. Every stock in the index has a weight. The S&P 500 is market capitalization (cap) weighted, where market cap is simply current price times shares outstanding. If you have access to the data, it's relatively easy to use Excel to calculate the weight of each stock in the S&P 500: put the ticker in column A, price in B, shares outstanding in C. Then market cap in D = B × C. And weight in E = D / (sum of all D).

Active weight is the difference between the weight of a stock in my portfolio and its weight in the index. For instance, Microsoft (MSFT) is currently about 3.5% of the S&P 500. If I own 5% of it in my fund then my active weight is 1.5%. One of the key things I had to do was translate IITM's ideas on position sizing and risk management into the fund management world of active weights.

In terms of asset allocation, our stock management group restricted our active weights at the stock and sector level. We said we would be ±3% on stock and sector active weights. Using MSFT as example, my minimum weight in MSFT would be 0.5% and my maximum weight would be 6.5%. And in the Technology sector, which is currently about 15% of the index, my minimum and maximum weights would be 12% to 18%. This is a simple but very effective form of risk control for diversified stock fund managers. One of the things it forced us to do was to keep buying techs as the sector became a bigger and bigger percent of the S&P 500 index. Many managers were left behind as the techs began their big run in '95 and it continued through '99. But the active sector constraint forced us to follow them.

It also forced us out of techs on the way down and into areas like Consumer Staples.

Van: So how would you cut losses short and control your risk?

I could and did do this on my active weights. For example if I had been overweighted on IBM and a stop was hit I would remove the active bet. On the other hand, if almost all my technology stops were hit, I would still have to hold my minimum weight in technology so I would hold more stocks with no active weights.

Thus, everything is done with active weighting. If a position seems particularly good because it is moving up or undervalued or whatever your criteria, what you'd simply do is overweight it. If you didn't like a position because it was falling or overvalued, you'd simply underweight it.

Personally, I think the smart investor or trader has a huge advantage over the portfolio manager who must position size this way, but you decide for yourself. If you like the portfolio manager strategy, then just buy and hold a mutual fund, but remember that you'll pay 1-2% of your assets each year in fees for your manager to attempt to outperform the averages.

Model 12: Position Sizing for Professional Traders Who Don't Know How Much Equity They Have

I've taught the marble game described earlier in this book to professional bank traders, usually forex or debt instrument traders. I was amazed to learn that very few of them know how much money they have under their control. They just put on positions every day based upon their company policy.

The problem with not knowing this information is that you will never know how much of your equity to risk. And that's a huge disadvantage. According to Bill Lipschutz in the *New Market Wizards*:

“Citibank, which is the largest and probably the most profitable currency trading bank in the world...makes about \$300 million to \$400 million a year in their trading operations. However, if Citibank traded only for the bid ask spread and never took any position trades, they probably make \$600 million a year.”⁵

This means that they lose \$200-\$300 million each year in their proprietary trading.

“Let's say you're a bank trader and you're supposed to make \$10,000 per day. At the beginning of the morning you do a big trade and make a total profit on the spread of \$250,000. The rest of the day, you just spec your buns off. That's what most currency traders in New York do every day.”⁶

Their trading is just sort of random with no position sizing whatsoever. How could one change that?

First, I'd require the traders to have a plan and a thorough knowledge of the big picture. Next, I'd make sure they each had a specific equity account that they were responsible for which they could continue to grow throughout the year. This trading account would be separate from their market making account. And, lastly I'd make sure they totally understood position sizing.⁷

Bankers Trust developed such a plan in the mid-1990s (at least they did in Australia where I was consulting). It seemed to work well for the Aussies. However, when the New York traders failed to perform (and I have no idea if they were doing position sizing, but I doubt it) none of the traders, including those in Australia who were doing well, got bonuses. That really undermined their motivation. And, finally, when a new president took over the bank, he decided the major risk in the bank was in the trading department and cut it all back. They never had a chance. Bankers Trust was then bought out by Deutsche Bank, so a whole new management with none of this training took over the operations.

Anyway, if you are a bank trader and still want to practice position sizing, then I'd suggest that you determine the amount of money that might cause you to lose your job. You might not know this amount, but you can probably ask enough questions to guess what amount that might be. Suppose you decide that a loss of \$10 million would cause you to lose your job. What you can then do is base your position sizing on a \$10 million account with your position sizing designed to do the best you can while at the same time making sure you don't lose the \$10 million. Specific strategies for doing this are covered later. If you thought that a loss of a million would cause you to lose your job, then you'd base your position sizing on a million.

Furthermore, once you are profitable on the year, then you can use one of the "go for the moon" techniques on the profits, while still using a very conservative amount on your base capital (i.e., the amount you cannot lose).

NOTES

¹ Seykota, Ed, and Dave Druz. "Determining the Optimal Risk." *Technical Analysis of Stocks and Commodities* Mar. 1993: 46-49.

² Faith, Curtis. *Way of the Turtle*. New York: McGraw-Hill, 2007.

³ *Tharp's Thoughts* is the Van Tharp Institute's free weekly e-mail newsletter. To sign up for this newsletter please visit www.iitm.com.

⁴ This was the absolute value of the average weekly move. Over the last 30 years, the absolute value of the weekly change has only been 1.6%. Between 2004 (when the book was published) through Mar 2008, only 11 weekly moves that big have occurred. Seven of them were after June 2007, signaling the late 2007 downturn.

⁵ "Bill Lipschutz: The Sultan of Currency." Schwager, Jack, *New Market Wizards*. New York: John Wiley and Sons, Inc, 1992, pp. 17-68.

⁶ See Endnote 4.

⁷ This is a very simple version of what I'd recommend. There are also some complex things I'd recommend that are beyond the scope of this particular book.

Chapter 10

Comparing the Impact of Various Models

In the original version of *Trade Your Way to Financial Freedom*, I did a comparison of some of the models presented with a random entry system using position sizing software that's no longer available.¹ I took that section out of the new edition because 1) I no longer have access to the software, 2) the data is old, and 3) I presented some models that I did not explain. These included scaling out models and scaling in models. Since I explain those models later in this book, I thought it only fair to add that material here where I also have the room to explain any problems that might arise in interpreting the results.

The Models Compared

So let's see how several position sizing paradigms perform in a complex trading environment. The complex trading environment consisted of twelve different commodities (soybeans, corn, live cattle, world sugar, gold, silver, crude oil, the German Mark, the British Pound, the Eurodollar, treasury bonds, and the S&P index) tested between 1985 and 1995 on a random entry system. Notice that some of those contracts no longer exist. The random entry system, which was built into the software, was used so that people would not think that the results were due to some marvelous entry system.

The random entry system has the following criteria: it enters the market on a coin flip to determine if it is long or short; it is always in every market; whenever it is stopped out, it simply enters again on a coin flip; it exits on a three times volatility trailing stop that is recalculated each day from the close and always moves in the direction of your position. To make the system realistic for the average trader, we tried using an account of only \$100,000. However, all of the models were stretched to the limit with \$100,000, so we changed the starting equity to \$1,000,000.

The random entry signals and all of the position sizing algorithms were generated by the software. The graphics and tables were also generated with that software. We allowed a portfolio heat of 50% throughout the trading, which was important since we were trading 12 commodities. This means when the total risk in the portfolio was 50% or greater, no more new trades were taken. This algorithm rejected a few trades even in the simplest models. Slippage and commissions of \$100 were deducted for each trade including 1) rollovers and 2) scaling in or scaling out of the position.

The random entry system, when run this way over 11 years, is profitable about 80% of the time. Please note the following: *We ran the system until we got an exceptionally profitable set of data and used those trading signals for all of the position sizing studies.* Thus, the system entry is

random, but we deliberately selected the sample of results we used. Table 10-1 shows the profitability of each commodity over the 11-year period.

Notice that a total of 1,306 trades were generated over the 11-year period. This amounts to about 10 trades per month or a little less than one trade per month per commodity. Thus, our 3 times volatility exit did a good job of keeping us in a trade long enough for a trend to start despite the random entry.

**Table 10-1: Results from Random Entry System
with Position Size One, \$1,000,000**

Contract	Net Profit	Number of Trades	% Profitable	Win/Loss Ratio	Maximum Drawdown
British Pound	\$59,893	125	41.60%	1.99	2.72%
D-Mark	\$41,179	119	43.70%	1.84	2.32%
Crude Oil	\$43,905	104	45.19%	2.04	2.76%
Sugar	\$14,904	94	40.43%	2.09	0.91%
Corn	\$4,139	120	33.33%	2.25	1.09%
Soybeans	\$26,283	108	41.67%	2.08	1.08%
S&P 500	\$72,200	104	46.15%	1.55	5.13%
Eurodollar	\$8,002	107	42.06%	1.68	0.99%
30 Year Bond	\$73,030	104	42.31%	2.41	1.75%
Live Cattle	\$3,160	120	38.33%	1.71	1.43%
Gold	\$10,804	106	38.68%	1.91	1.66%
Silver	\$25,354	95	46.32%	1.67	1.40%
Portfolio	\$382,853	1,306	41.50%	1.99	4.72%

When subsequent tests are shown, you can use 1,306 trades as a benchmark. If fewer trades are taken, it means that the position sizing algorithm rejected them for various reasons. If more trades are taken, it is because scaling in or scaling out, used in some of the position sizing routines, created more trades.

Figure 10-1 shows the portfolio equity curve when the position sizing algorithm was to continually trade one position per commodity throughout the 11 years. This is a fairly good profit considering there is essentially no boost from position sizing. It makes \$382,853 with a maximum drawdown of just over 4.72%.

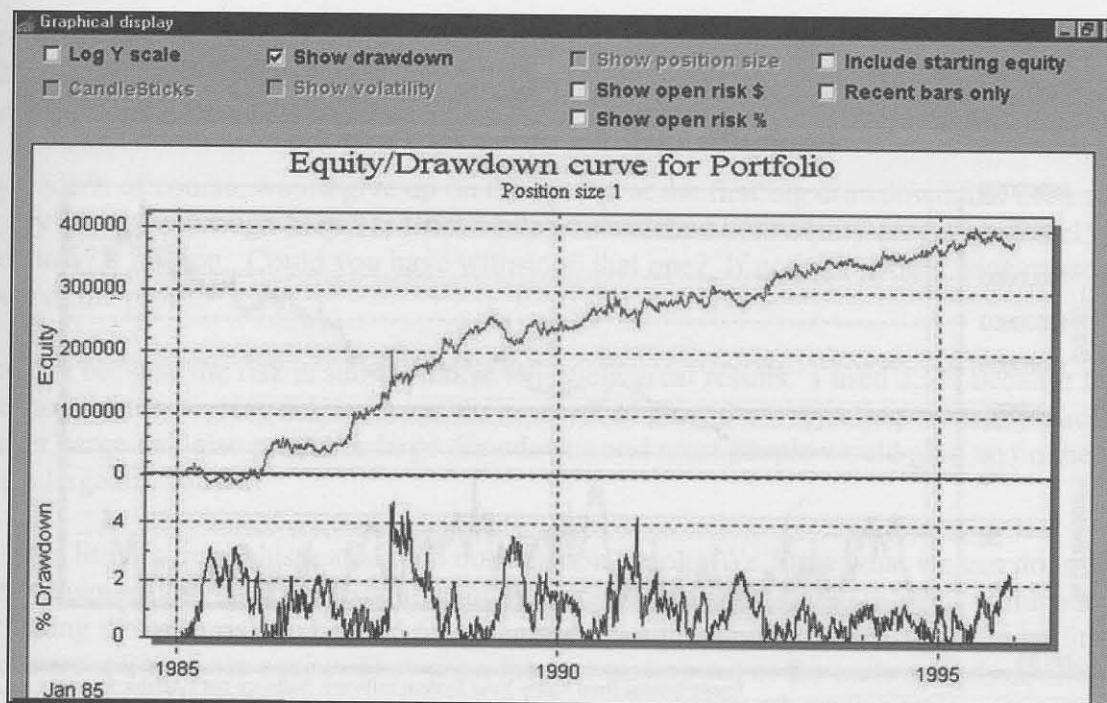


Image created from Know Your System software. Software not available for sale.

Figure 10-1: Equity Curve for Position Size Equals 1

Now let's see what happens when you use some simple position sizing models. Let's do the simple model of using one contract per so much equity. Figure 10-2 shows the equity curve for this position sizing algorithm. Notice that this adjustment magnifies the return dramatically. You now have a final equity of \$23,762,693 with a maximum drawdown of 39.30%. This gives you a return-retracement ratio of 2.17. It takes 1,302 trades, meaning that the portfolio heat requirement rejected 4 trades.

My point in showing you these illustrations is to demonstrate how much difference a simple change in position sizing makes in your final equity—even when you are only using simple position sizing models. However, you should not use this data to infer that one model is necessarily better than another. Each has its own advantages and disadvantages as discussed earlier.

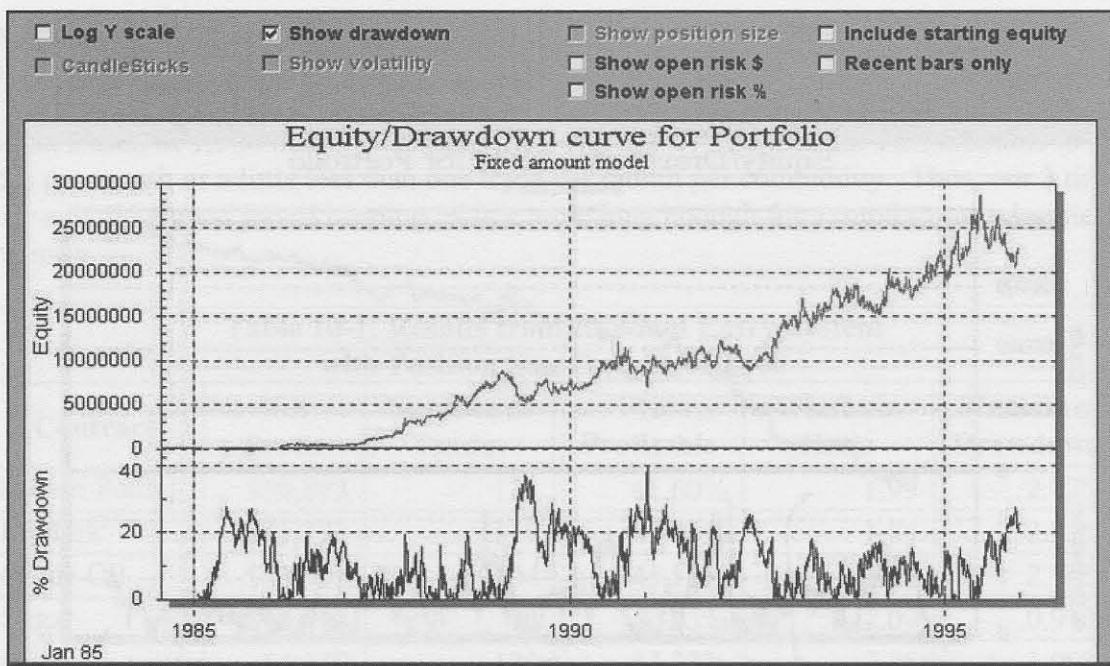


Image created from Know Your System software. Software not available for sale.

Figure 10-2: Equity Curve for One Contract per \$100,000

Let's step up the sophistication. Here we will use a position sizing algorithm that risks 2.5% of your equity per trade. This is high risk position sizing, but it is much less risky than what many (if not most) traders practice. The results are shown in Figure 10-3.

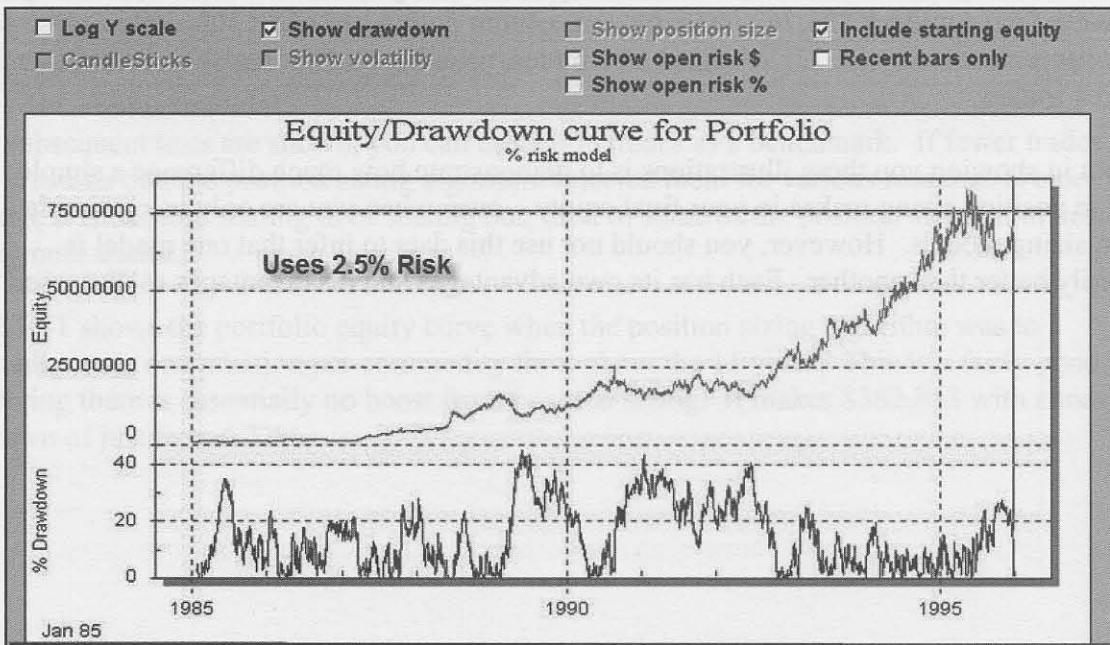


Image created from Know Your System software. Software not available for sale.

Figure 10-3: Equity Curve for 2.5% of Equity Risked Per Trade

The results now yield a final equity of \$75,741,696 while going through a maximum drawdown of 44.92%. It takes 1,303 trades; meaning only three trades were rejected. However, notice the difference in results between this and the previous model.

Many traders, of course, would give up on the system at the first big drawdown that occurred from February 10, 1989 through May 31, 1989 while you watched your equity drop from \$15.15 million to \$7.9 million. Could you have withstood that one? If not, you would have missed out on most of the profit.

Notice that because the risk is substantial, it will yield great results. I used 2.5% because I simply wanted to take the percent risk model as far as it would go without rejecting too many trades. However, large risk also produces large drawdowns and most people would give up on the system during a large drawdown

Let's get a little more sophisticated with our position sizing. We'll see what we can do to lower the drawdown and perhaps even stabilize our returns. What we'll do is scale out of the trades by never letting the open risk go beyond 6% in any one position and never letting the volatility of any market exceed 2% of our equity. They are a form of scaling out of the trade models developed by Tom Basso. Tom Basso's rules are discussed later in this book. (See Model 21).

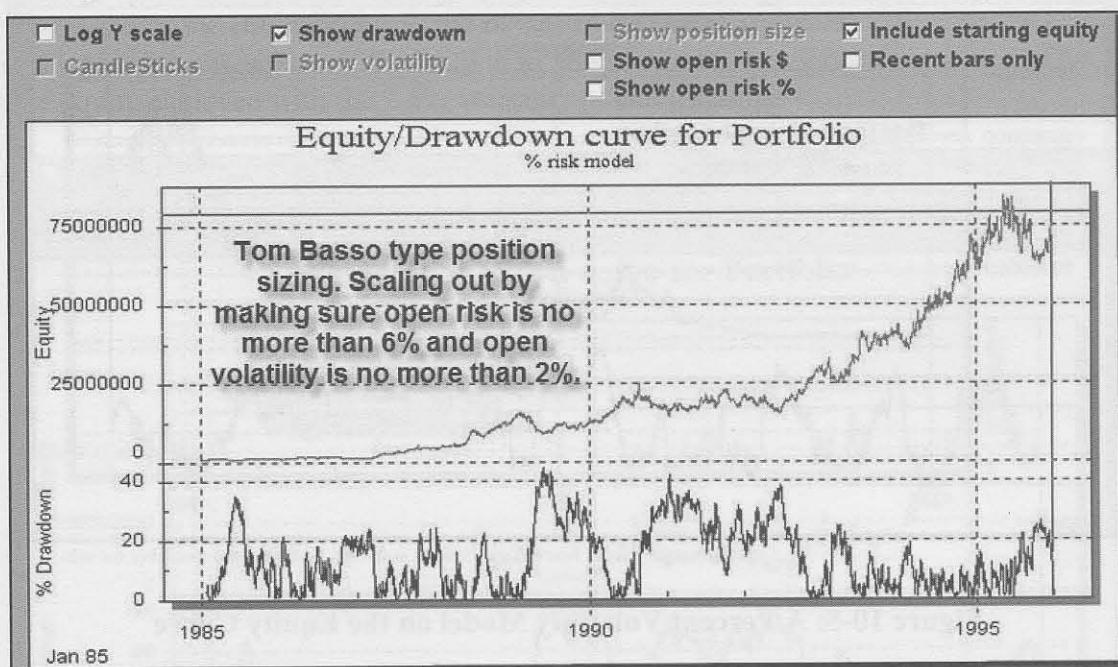


Image created from Know Your System software. Software not available for sale.

Figure 10-4 Scaling Out Adjustments on the Equity Curve

Few people use these rules because they have no way of testing out their effect in a portfolio. The position sizing software makes these calculations quite simple and the adjustment can be tested in about 15 seconds. Several of the software packages discussed in Chapter 17 can now perform this type of position sizing, but it is probably not that useful to you unless you have a portfolio of a \$1,000,000 or more.

Figure 10-4 shows the effect of performing this simple scaling out adjustment to keep risk and volatility below the levels shown. These techniques are explained in detail in Chapter 14. Even though we're scaling out of positions, our total return goes up slightly to \$78,654,232. Furthermore, the peak-to-trough drawdown goes down a little to 44.3%. We tried at least 30 versions of simple scaling out to reduce the maximum risk and volatility and 27 of them improved the performance.

I'd also like to point out that while the profit shown in Figure 10-4 seems very high, a great deal of expenses were deducted for slippage and commissions throughout the 11-year period.

The return-retracement ratio also improves. In the original study, the ratio was 2.99. When the scaling-out adjustments were added, the ratio improved to 3.11.

At this point, we've just scratched the surface with what is possible with position sizing. Now, we'll change from the percent risk model to the percent volatility model. We'll start our initial positions at 2.5%. The results are shown in Figure 10-5.

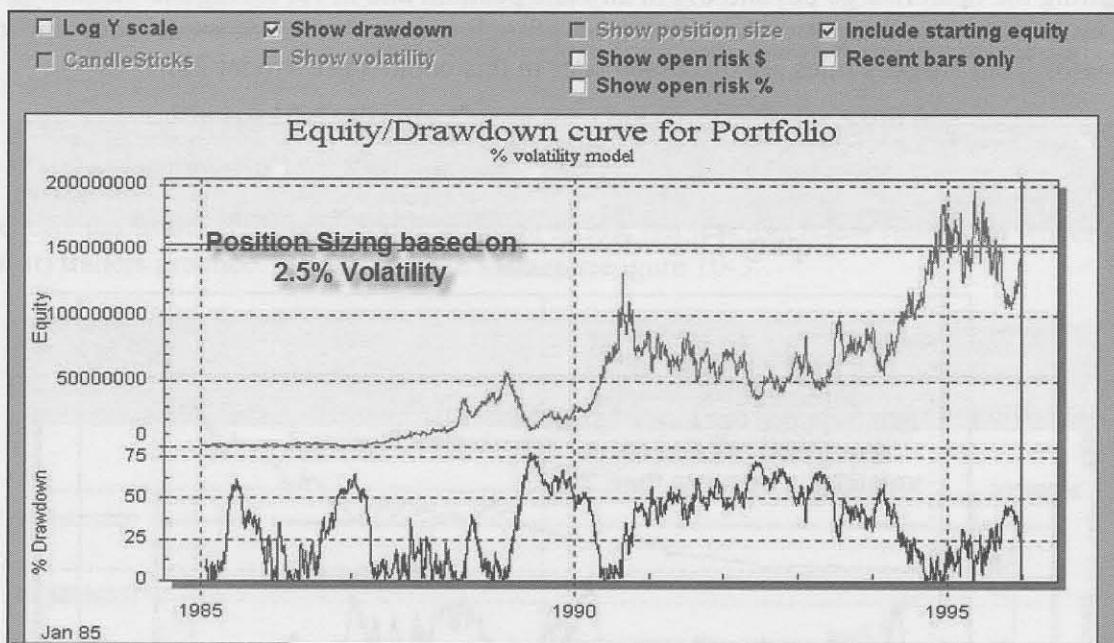


Image created from Know Your System software. Software not available for sale.

Figure 10-5: A Percent Volatility Model on the Equity Curve

The final equity now doubles again to nearly \$154 million. This time a lot of trades are rejected due to portfolio heat that is set at a very high value of 50%. Only 1,141 trades are taken, which means that the position sizing software rejects 155 trades. In addition, to double the return you now have to suffer through a 77.8% drawdown—which is intolerable according to almost everyone's criteria.

As a last exercise to show you the power of position sizing, let's see if we can design a position sizing algorithm that will increase the return much more without increasing the peak-to-trough

drawdown. The best way to do this is with some form of scaling in—the style of position sizing used by many of the Turtles.

The position sizing software I used (which is not available for sale) permitted a large number of scaling in models to be used. Scaling in makes sense in any trend-following model because once a trend starts moving in your favor, it is likely to continue moving in your favor. Thus, when you move up your stop, you should be able to add to your position. This type of model, as far as I know, was developed by William Eckhardt, which allows you to generate many scaling-in methods, is discussed in Chapter 12. (See Model 15.)

We used the following parameters to scale in the last position sizing study. We started with the original 2.5% risk position sizing parameters. Then, we said that when the original risk was reduced by 50%, the system would scale in by adding a position equal to half its original size. It was also permitted to do this up to five times.

Thus, you could end up with a final position size that was 350% larger than the original position if the market was moving up strongly. However, the system was never allowed to take a position bigger than 50% of the portfolio heat. This is actually a very logical position sizing algorithm to use with a random entry system that has no ability to pick trends, but which might capture some by chance. However, we are risking total ruin with 50% portfolio heat, so don't try that level. Figure 10-6 shows the equity and drawdown curves for the scaling-in model. The final equity, with scaling in, increases from \$78.6 million to \$640 million—an eightfold increase. This is four times the equity achieved with the 2.5% volatility position sizing.

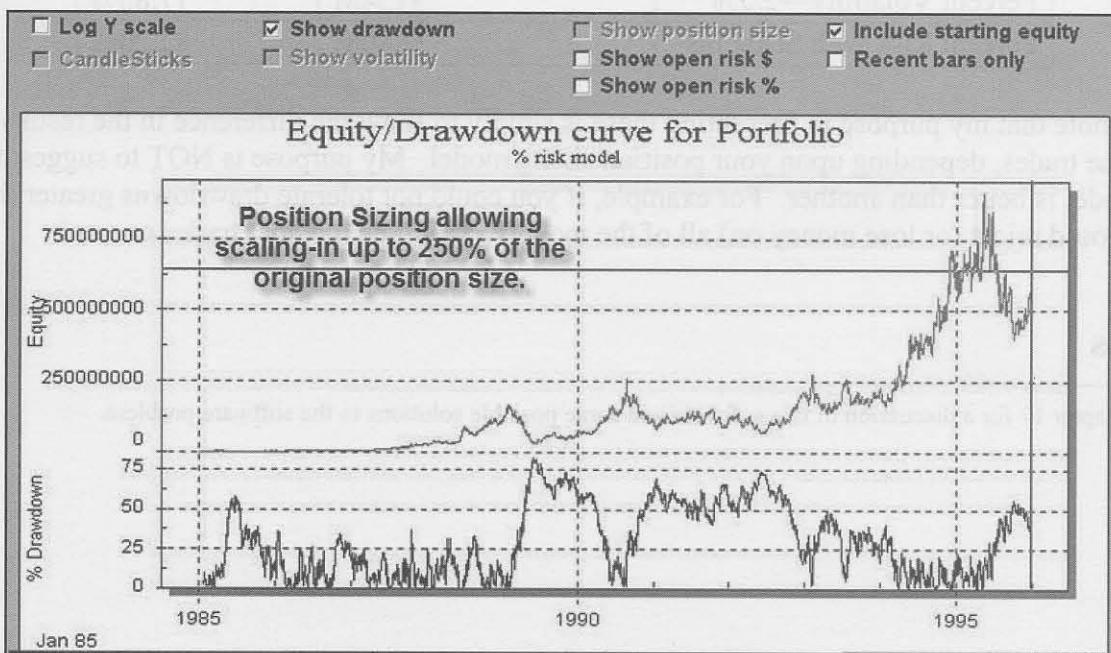


Image created from Know Your System software. Software not available for sale.

Figure 10-6: The Effect of Scaling In When You Have a Profit on the Equity Curve

However, our worst drawdown was 82.2%. The drawdown is still tremendously large, and probably unacceptable to almost everyone's standards. However, we still managed to achieve better results with a similar drawdown by implementing a simple position sizing change. Perhaps you can now begin to understand why 90% of your system results are really due to position sizing. Look at the figures again. All of them used the same "random entry" trading signals that made money only because of logically chosen exits. However, the biggest variance in trading performance was due to position sizing, which varied the final equity from \$382,853 to nearly 1,700 times that much at \$640 million.

I've shown some extreme examples in the illustrations. However, I'm not advocating that you go for extremes, nor even suggesting that they are possible. For example, none of those figures show the effect of systematic withdrawals for such routine items as paying your taxes. The extremes were merely given to illustrate how great a difference position sizing can make on your bottom line. Table 10-2 summarizes the results for the six models tested.

Table 10-2: Summary of the Six Position Sizing Models

Model	Final Equity (in millions of dollars)	Percent Drawdown
One Unit Per Trade	\$0.38M	4.72%
One Unit Per \$100,000	\$23.76M	39.30%
Per Risk—2.5% per position	\$75.74M	44.92%
Tom Basso Scale Out Rules	\$78.65M	44.30%
Percent Volatility—2.5%	\$154M	77.80%
Percent Risk with Scale Ins	\$640M	82.20%

Please note that my purpose in presenting these is simply to show the difference in the results of the same trades, depending upon your position sizing model. My purpose is NOT to suggest that one model is better than another. For example, if you could not tolerate drawdowns greater than 25%, you'd reject (or lose money on) all of the models except the one that trades one unit.

NOTES

¹ See Chapter 17 for a discussion of this software and some possible solutions to the software problem.

Part III:

Using Position SizingSM to Meet Your Objectives

Introduction to Using Position SizingSM to Meet Your Objectives

I'm always getting the question, "What do you think of what I'm doing with position sizing?" This question is then followed by some sort of explanation of what they are doing. However, the question is totally meaningless to me. Why? Because the sole purpose of position sizing is to meet your objectives. And if you do not tell me about your objectives (and your SQNSM, for that matter), then it is impossible to determine whether or not the method you are using will meet them.

What's trading all about? Isn't it about entering and exiting positions with the idea of meeting some financial objectives? And don't those objectives in some way relate to 1) capital preservation and 2) growth of some sort?

As you'll learn in this section, there are probably an infinite number of possible objectives that you could have, given that there are a large number of different sized drawdowns you might want to prevent (i.e., 10% vs. 40%), an even bigger number of gains you might aspire to make (i.e., 10% vs. 1,000,000%), and some combination of both—making even more possibilities. You must determine your objectives and then you can design a position sizing method to meet those objectives.

I've divided this section into four primary chapters. Chapter 11 specifically discusses objectives. Chapter 12 gets into methods that will help you go for large returns. Chapter 13 explores one specific method designed for large returns, called Fixed Ratio Position Sizing, and shows you the assumptions you must make in order for it to work. Chapter 14 then discusses methods that are designed to eliminate drawdowns.

Chapter 11

Meeting Your Objectives

I have long said that position sizing is the most important aspect of your trading system. People who understand position sizing and have a reasonably good system with a System Quality NumberSM above 3.0 can meet their objectives fairly easily through developing the right position sizing strategy.

At least fifty percent of system design should be involved in determining your objectives. I've developed questionnaires¹ to help people accomplish this task, but many people still refuse to spend the time necessary to accomplish it. The response is usually something like, "*Well, I know what I want. I want to make as much money as possible and I don't care about the losses that much.*" Unfortunately, statements like that are seldom true—they just reflect people who really haven't worked out their objectives. And the reason most people don't want to set objectives may be that they are afraid they might limit themselves. But objectives are not about limiting yourself. Objectives are about determining what's right for you, and that takes a lot of soul searching.

So what does optimal position sizing to meet your objectives mean? To answer that question, let's look at a sample trading system that's a little more complicated. It has 55% winners and 45% losers. You have a 2% chance of a 20R win and a 3% chance of a 10R win, but all the remaining winners are just 1R (30%) or 2R (20%). Forty percent of the trades will just be 1R losses, but 5% of them will be 5R losses.² The distribution of trades for the system is shown in Table 11-1:

Table 11-1: Sample System 11-1	
R-Multiple	Probability
20R Gain	2%
10R Gain	3%
2R Gain	20%
1R Gain	30%
1R Loss	40%
5R Loss	5%

In such a system, you can determine the expectancy of the system by multiplying each R-multiple times its probability of occurrence and totaling the answers, providing that the probabilities sum to 100%. For this system, the value is 0.75. It means that on average, you can expect to make 0.75 times the amount you risk times the number of trades. In other words, each trade is worth 0.75R to you so make a lot of them.³ Furthermore, since the expectancy divided by its standard deviation is 0.205, then this system, based upon generating 100 trades each year, has a System Quality NumberSM of 2.05. It's not a great system, but it's better than the systems most people trade.

Table 11-2: Expectancy of System 11-1		
R-Multiple	Probability	Expected Value
20	2%	0.40
10	3%	0.30
2	20%	0.40
1	30%	0.30
-1	40%	-0.40
-5	5%	-0.25
Totals	100%	0.75

If you have such a system, what is the ideal or optimal position size? That is actually the million dollar question. And it's probably the most important question you could ever ask yourself as a trader.

Many books and articles on position sizing suggest that the optimal position size is the one that gives you the largest return. I've seen a number of attempts to solve this problem of "What is optimal?" I now believe that most people who have researched how to use position sizing to meet your objectives have some major flaws in their assumptions. One such flaw is that they consciously decide what their objectives are and then they write about how you can use position sizing to meet those particular objectives—whatever they might be. But as soon as they set objectives and decide that the function of position sizing is to meet those particular objectives, they have limited the scope of their discussion about position sizing.

To get a better idea of the optimal position sizing, let's do a simulation of the above system. The simulator used to do this was made with Excel and it was a fairly easy process to run 150 simulations of 100 trades, risking from 1% to 19% in 1% increments. The simulation began with \$100,000 of equity. The minimum, the average and the maximum ending equity after 100 trades are shown in Table 11-3. The maximum average ending equity occurs with position sizes that are somewhere near 15% to 16%.

However, even this simulation calls into question what might be considered optimum. For example, the optimum bet size might be the level that gives you the maximum size for the minimum average ending equity. Based upon our simulation results, that would come from a 4% risk.

Some R-multiple distributions seem to contradict most logic about the optimal bet size. For example, consider the following game, which loses 1R 99% of the time and gains 1,000R 1% of the time. If you calculate the expectancy of that game, you end up with 9.09. This means that on average, over many trials, you will win 9.09 times your risk on each trial. That seems funny when you only win 1% of the time. Furthermore, what's the optimal bet size? Incidentally, this system, assuming it's based upon 100 trades, has a System Quality NumberSM of 0.9—so despite having a great expectancy, you probably would not want to trade it.

Table 11-3: Results of Simulation of System 11-1

Risk Percentage	Minimum Ending Equity	Average Ending Equity	Maximum Ending Equity
1%	107,307	255,498	874,831
2%	112,997	653,955	5,958,477
3%	116,779	1,692,074	33,422,772
4%	118,455	4,468,289	160,340,745
5%	117,936	12,055,933	675,692,516
6%	115,260	33,275,647	2,551,079,844
7%	110,565	91,966,426	8,759,737,131
8%	104,100	251,138,534	27,678,600,452
9%	96,193	668,795,318	81,235,352,138
10%	87,226	1,721,733,394	223,146,033,686
11%	77,607	4,263,995,175	577,283,201,300
12%	67,736	10,137,677,378	1,413,854,640,790
13%	57,985	23,130,503,654	3,292,610,598,182
14%	48,761	50,681,415,182	7,318,354,698,841
15%	40,045	106,770,550,278	15,574,327,805,977
16%	32,286	216,580,318,504	31,821,598,420,445
17%	2,048	3,745,105,676	524,525,735,297
18%	470	783,866,250	104,234,265,449
19%	317	1,230,799,755	167,017,320,662

I have looked at simulations like the one in Table 11-3 for many years. I find that the risk level to produce the largest equity was about where I expected it to be, if my goal was the average highest ending equity. Typically, I'd take the Kelly Criterion (see Chapter 15) and use 80% of that as an estimate of both portfolio heat and the risk level to produce the maximum ending equity. I no longer do that because this estimate totally falls apart in the example system given in the previous paragraph.

I was making these sorts of rough estimates because I had somewhat adopted Ralph Vince's thinking that says, "If you don't attempt to make the highest average ending equity in your trading account, you shouldn't be trading." Thus, I presumed that the risk percentage I had picked was in some way the optimal bet size. At the same time, knowing that the maximum minimum ending equity peaked at 4% in simulations such as the one in Table 11-3, I began to question what "optimal" really meant in terms of position sizing.

A Question of Assumptions: When I finally got the answer, I experienced a major paradigm shift. Suddenly, many of my questions about position sizing and objectives could be answered. At one of our simulation seminars, we had a math professor⁴ comment on our simulations. He said that my assumptions were wrong because the largest bet size you can make without the certainty of going broke should always produce the largest ending equity if you have enough simulations. In the case of the simulation shown in Table 11-3, the value should be 19% because at the next increment of 20% you would go bankrupt as soon as you hit the first 5% loss.

However, what he was saying didn't show up in our simulations and I couldn't understand why. His response was that simulations that only do several hundred runs are far from adequate to show this. You can calculate exact probabilities based upon log normal distributions,⁵ but these are based upon the assumption of a normal distribution and an infinite sample size. Thus, you might show that 19% produced the largest ending equities with thousands of simulations, but certainly not with just 150 simulations as in Table 11-3. And now that I have a much more sophisticated simulator that is capable of doing 10,000 100-trade simulations in a few seconds, we know that he was correct.

The reason that your largest risk percentage without going bankrupt will produce the largest equity is because you will eventually end up with some 100-trade groups that produce some huge gains. In the case of our game, we might eventually get one 100-trade sample with 100 20R wins. It is unlikely, but still possible, and when you do enough simulations, the improbable will show up. When these huge, improbable gains show up, the resulting ending equity will be so huge that it will totally shift the balance toward the average ending equity being largest at the biggest risk level you simulate. Thus, the results should show that 19.99% risk would produce the largest ending equity. However, what would happen if you got a few samples of huge winners that had no large losers? Under those circumstances, you might find that the largest ending equity might come from risking 30% or even 99%. You might go bankrupt (or way into the hole) 99.999% of the time, but the few winners would still be big enough to make your average ending equity huge.

Instead, it's much more meaningful to say, "What is your goal?" and "What is disaster for you?" These questions could be calculated with specific probabilities. This was the beginning of the eye opener. *The purpose of position sizing is to meet your objectives and once you've determined your objectives, you can design a position sizing algorithm that's optimal for doing just that.*

Objectives Re-examined

At a systems workshop we did some years ago, a fairly new trader remarked, "I know exactly what my objectives are. I want to shoot for the moon and get the biggest possible returns and I don't care what happens in the interim." I love statements like that because it gives me a chance to prod. And prod is what I did.

Van: Would you be willing to risk a 50% drawdown to get the maximum return?

Trader: Well, I wouldn't like it, but yes, I would.

Van: Well, what if the probability of a 50% drawdown were about 75%? Would you be willing to risk that?

Trader: No, that's too much.

Van: What probability would you be willing to tolerate?

Trader: Well, no probability of a 50% drawdown is probably the best outcome, but I'd be willing to go with a 10% chance, I think.

Van: Would you be willing to risk a 10% chance of a 50% drawdown and a 90% chance of a 25% drawdown?

Trader: When you put it that way, probably not. Maybe a 25% chance of a 25% drawdown?

The prodding certainly clarified things a bit. We went from "I want to shoot for the moon and I'm willing to risk whatever comes along" to "I'm only willing to risk a 25% chance of a 25% drawdown and only a 10% chance of a 50% drawdown. Given those restrictions, I want the highest rate of return." That's quite a shift in objectives, as we got more specific. And the response is still intellectual. What happens emotionally when real money is at stake and the trader is living through the drawdown?

I've also found that some people just cannot understand topics like expectancy, position sizing, and probabilities. These people become total slaves to the normal biases that plague the average person such as the need to be right and the lotto bias.

A Look at Optimal Bet Size

There are a number of critical elements you must determine before you answer the question "how much?" My trading simulator calculates optimal bet size in a number of ways by plugging in key elements, including

- The R-multiples involved with their respective probabilities.
- The number of trades in the period of consideration.
- Your definition of failure. (At what level would you quit?)
- Your definition of success. (What equity increase would delight you?)
- Your starting equity.
- And, your starting percent-risk and the rate at which you increase your risk.

Let's look at the results of System 11-1 after simulating the results with a more advanced simulator. We'll enter the R-multiple distribution with 100 trades at a time and do 10,000 simulations. We'll look at risk increments from 0.2% to 30%, doing 10,000 100 trade simulations at each level, incrementing in 0.2% steps. Our goal will be to make 300% over the 100 trades and our failure definition will be 25%. The simulator actually stops the simulation when it is down 25% (i.e., that becomes the ending equity) and then it goes on to do the next 100-trade simulation. These results are all given in Table 11-4.⁶

Table 11-4: Optimal Bet Size of Sample System					
Approach	Optimal Risk %	Probability of Objective	Probability of Ruin	Average Gain	Median Gain
Max. Return	30%	0.2%	99.8%	1.1E + 9%	-37.4%
Med. Return	4.2%	69.0%	28.0%	1800%	543.7%
Opt. Retire	2.4%	79.6%	10.3%	471.6%	305.4%
<1% Ruin	1.0%	47.3%	0.5%	111%	95.6%
>0% Ruin	0.8%	30.1%	0.1%	81.9%	72.7%
Retire-Ruin	1.8%	76.4%	4.9%	276.1%	206.4%

The results now give us six different definitions of what might be optimal. Let's look at each of these separately.

Definition 1: Largest Average (Mean) Return

This definition is the one that gives us the largest mean return over the entire simulation. Because a few exceptional runs will occur in every set of 10,000 simulations (and because we stop trading when we're down 25%), the largest mean return will always be the largest amount risked. In Table 11-4, this comes out to 30%, despite the fact that a 5R loss will bankrupt us as soon as we risk 20% or more. This simply proves the point that a few runs with many large gains and no big losers would probably make the percent risk, producing the largest mean return, the highest percent risk that you make in your simulations. The largest mean return, when you risk 30%, is 1,100,000,000%. Notice that at 30% you'd have a 0.2% chance of reaching your objective of a 300% return and you have a 99.8% chance of ruin. Your median return is even below our ruin level. So this should dispel any myths that you should go after the largest mean return.

Definition 2: Largest Average (Median) Return

Let's look at a different definition of average, the largest median return. This definition means that half the returns were above this number and half the returns were below this number. Table 11-4 shows the risk percentage that will give the largest median return is 4.2%. It gives you a 69% chance of reaching your objective and a 28% chance of ruin. This might seem more acceptable to you, but perhaps there are even better definitions. As discussed earlier, this level of risk might be a good guideline for your total portfolio heat with the system.

Definition 3: Greatest Probability of Reaching Your Objective

Risking 2.4% per trade gives us the optimum probability of reaching our objective of making 300%. We have a 79.6% chance of reaching our objective and only a 10.3% chance of ruin. That might be much more acceptable to many of you. Also notice that the median return at 2.4% risk still is above 300%.

Definition 4: Less Than 1% Chance of Ruin

According to Table 11-4, if we risk 1% in this system, we have less than a 1% chance of having a 25% drawdown and being forced to stop trading. Perhaps that's even more acceptable to many of

you. You only have a 47.3% chance of reaching your objective and the median return is now less than 100%. Nevertheless, when safety is of primary concern, this might be your optimal position sizing algorithm.

Definition 5: Greater than 0% Chance of Ruin

What if you want to be really, really careful? You want almost no chance of ruin. For this objective, we've looked at the risk percentage that has some chance of ruin but that chance is as small as possible. It's the first level that comes up above a 0% chance of ruin. According to Table 11-4, if you risk 0.8%, then your chance of ruin is only 0.1%. Of course, if you want a zero chance of ruin you could move down to 0.6% risk. Even at 0.8% risk, you still have a 30% chance of reaching your objective, so this might be quite acceptable to many people.

Definition 6: Greatest Difference between Objectives and Ruin

This definition is the one that appeals to me the most. I really want to reach my objectives and I don't want ruin. So what risk percentage gives me the biggest percentage difference? According to Table 11-4 that is risking 1.8%. If I used that position size, then my chances of reaching my objectives are 76.4% (which is good) and my chances of ruin are only 4.9%. And the median ending equity is 206.4%. Does that one appeal to you?

So what is optimum? Obviously, it depends upon your objectives. And only you can decide upon your objectives.

So what is optimum? Obviously, it depends upon your objectives. And only you can decide upon your objectives.

What happens when you shift a few variables, such as making the criterion for failure 50%? Table 11-5 shows the difference this makes. We are still doing 10,000 simulations of 100 trades in System 11-1.

Table 11-5: Optimal Bet Size of Sample System with 50% as Failure

Approach	Optimal Risk %	Probability of Objective	Probability of Ruin	Average Gain	Median Gain
Max. Return	30%	0.4%	99.6%	51.3E +6	-174.2% ⁷
Med. Return	7.0%	72.2%	24.2%	17,100%	1,200%
Opt. Retire	3.4%	88.0%	2.8%	1,100%	552.4%
<1% Ruin	2.6%	86.2%	0.9%	590.5%	360%
>0% Ruin	1.4%	67.7%	0.0%	184.3%	146.9%
Retire-Ruin	3.0%	87.5%	1.7%	826.7%	450.2%

Notice the dramatic difference between Table 11-5 and 11-4. Every optimal risk goes up, except for the highest mean return, which stays at 30%. You only changed one thing—the amount of risk you are willing to tolerate before you quit trading. This means that when you continue trading

after you go below 25%, you sometimes can pull yourself back out of the hole. However, when you don't, your overall loss is twice as big and often much bigger.

Now, let me ask you again, "What's the optimal bet size for a system?" Hopefully, by now, it is clear to you that the optimal position size for your system depends upon your objectives. And there are probably an infinite number of objectives because you could have each of the criteria above with different cutoff levels for ruin and different goals. For example, your goal could be to make anywhere from 10% to a million percent and each one would have a different optimal position sizing. Your idea of ruin could be anything from being down 0.1% to being down 100% and each definition would have a different optimum position sizing algorithm to avoid it. Do you understand why the number of possibilities, for all practical purposes, is infinite?

Hopefully, by now, it is clear to you that the optimal position size for your system depends upon your objective. And there are probably an infinite number of objectives because you could have each of the criteria above with different cutoff levels for ruin and different goals.

Now do you understand why I stress the importance of objectives so much when I talk about system development? It's critical that you make these decisions first, and then you can design a system that will fit your objectives.

Summary: So far, you have learned that optimal position size is a function of each of the following:

1. Your R-multiple distribution, characterized by its expectancy, standard deviation, and System Quality NumberSM.
2. The worst-case loss in that distribution.
3. The number of trades.
4. Your definition of success (what size increase you would like).
5. The probability of attaining that success.
6. Your definition of ruin (what kind of drawdown from the starting equity is intolerable at the end of X trades).
7. The probability of attaining that level of drawdown.

Since many of the variables relate to your objectives, objectives and position sizing become very closely related. Furthermore, there are probably an infinite number of possible objectives. This all leads to one of our key observations about positions sizing: *the purpose of position sizing is to meet your objectives.*

Expectancy, Win Rate, and Position Sizing

In the remainder of this chapter, we will examine five different sets of R-multiple distributions, each with an expectancy of 0.35. Although the expectancies are the same, the R-multiples and winning percentages are substantially different. The distributions are shown in Table 11-6.

**Table 11-6: Five R-Multiple Distributions
(Each with 0.35 Expectancy)**

Distribution	Winners	Losers
11-2: 15% Winners	2 30R; 2 15R; 3 10R; 2 2R; 6 1R	1 5R; 6 2R; 78 1R
11-3: 35% Winners	1 30R; 3 10R; 2 5R; 4 2R; 25 1R	3 2R; 62 1R
11-4: 55% Winners	5 10R; 50 1R	5 5R; 40 1R
11-5: 60% Winners	10 4R; 10 1.5R; 40 1R	10 3R; 30 1R
11-6: 80% Winners	70 1R; 10 2R	10 3.5R; 10 2R

Notice that the worst loss is 5R, which occurs in the 15% and 55%, groups. We believe that if you keep reasonable stops at 1R, then 5R is the worst loss you will probably ever get with slippage and gaps against you. It usually takes a major psychological mistake to have a loss of 5R or greater.

The primary difference between the systems is the win percentage and the variability of the distribution of R-multiples. However, let's use the criteria we introduced to evaluate each system before we determine the optimal position size of each system and how win-rate influences optimal position sizing.

Table 11-7: Evaluating Our Five Systems

System	Win Rate	Expectancy	Standard Deviation	System Quality Number SM
11-2	15%	0.35	5.19	0.67
11-3	35%	0.35	3.69	0.95
11-4	55%	0.35	2.67	1.31
11-5	60%	0.35	1.85	1.89
11-6	80%	0.35	1.65	2.12

Clearly, when the expectancy remains the same and the system win rate improves, the quality of the system (as measured by the SQNSM for 100 trades) also improves. So let's add one more system at a 60% win rate that only has 1R losses and thus has the lowest standard deviation (and best System Quality NumberSM) of all. This will be System 11-7 as shown in Table 11-8. System 11-7 has an expectancy of 0.35 (like the others) and a win rate of 60%, but its standard deviation is 1.19 so its System Quality NumberSM is 2.94. Thus, it is clearly the best system.

Table 11-8: System 11-7 with Only 1R Losers

Distribution	Winners	Losers
11-7: 60% Winners	10 2R; 10 1.5R; 40 1R	40 1R

Let's look at each of the six systems using 100 trades, simulated 5,000 times. In addition, we'll use a desired objective of 300% and a failure rate of 50% (i.e., that's where we'd stop trading). Incidentally, since I'm only doing 5,000 simulations, we cannot always expect the maximum mean return to be at 30%. However, that's because we simply are not doing enough simulations.

Using these criteria, let's look at the results of System 11-2, the 15% win rate system. These are given in Table 11-9.

Table 11-9: Optimal Bet Size of System 11-2					
Approach	Optimal Risk %	Probability of Objective	Probability of Ruin	Average Gain	Median Gain
Max. Return	9.2%	4.7%	91.9%	1,000%	-53.4%
Med. Return	1.4%	4.9%	9.6%	62.5%	25.0%
Opt. Retire	3.4%	15.5%	53.8%	204.7%	-50.1%
<1% Ruin	0.8%	0.4%	0.3%	32.3%	19.1%
>0% Ruin	0.8%	0.4%	0.3%	32.3%	19.1%
Retire-Ruin	0.6%	0.1%	0.0%	23.3%	15.5%

Clearly, System 11-2 is not a very good system. This is shown both by the System Quality NumberSM of 0.67 and the results of Table 11-9. And even risking 3.4% produces a negative median gain. So let's move on to System 11-3, the 35% win system.

Table 11-10: Optimal Bet Size of System 11-3					
Approach	Optimal Risk %	Probability of Objective	Probability of Ruin	Average Gain	Median Gain
Max. Return	26.0%	1.3%	98.1%	1,500.0%	-59.5%
Med. Return	3.2%	18.4%	14.6%	187.0%	64.9%
Opt. Retire	5.4%	25.1%	40.1%	441.0%	18.0%
<1% Ruin	1.6%	4.0%	0.3%	71.8%	43.2%
>0% Ruin	1.4%	2.1%	0.1%	60.7%	38.7%
Retire-Ruin	2.4%	12.0%	5.4%	123.4%	57.7%

The results of System 11-3 are slightly better. We are moving up to a 25.1% chance of meeting our objectives at the optimum retire risk of 5.4%, but our chances of ruin are still greater than our chances of retiring at this level. However, at 2.4% risk we actually have a slightly better chance of making our goal of 300% (12%) than we do of drawing down 50% (5.4%).

Again, we don't have a very good system in System 11-3, so let's move on to the next one, System 11-4. The simulation results for this system are shown in Table 11-11. Clearly, our results are improving. While the optimal retire position size of 5.8% produces almost an identical probability of reaching our objectives as it does ruin, the best "retire-less-ruin" position size of 3.4% shows a clear separation between the probability of reaching our objective (23.4%) and the probability of ruin (10.7%).

Notice that this is the first system with a System Quality NumberSM above 1, suggesting that you probably need a score of one or better to have any chance of success with your system. Remember that I've already given you some guidelines for how to rate your system, using the System Quality NumberSM, in Chapter 3. You need a System Quality NumberSM of about 1.7 just to make the assumption that your system is statistically significant in making money. And so far, none of our 0.35 expectancy systems have reached that level yet.

Table 11-11: Optimal Bet Size of System 11-4

Approach	Optimal Risk %	Probability of Objective	Probability of Ruin	Average Gain	Median Gain
Max. Return	17.8%	4.7%	94.1%	12,800%	-80.4%
Med. Return	4.6%	32.0%	22.1%	358.1%	128.4%
Opt. Retire	5.8%	34.3%	34.2%	560.7%	102.1%
<1% Ruin	1.8%	3%	0.6%	84.8%	63.2%
>0% Ruin	1.2%	0.1%	0.0%	50.7%	42%
Retire-Ruin	3.4%	23.5%	10.7%	213.6%	114.8%

Remember that System 11-4 has a System Quality NumberSM of 1.31. It probably represents an average trading system, but it is not very good. As a result, let's move on to our 60% system, System 11-5. This is the first system that is at least "statistically significant" in terms of being able to make money. The results show a dramatic improvement as shown in Table 11-12.

Table 11-12: Optimal Bet Size of System 11-5

Approach	Optimal Risk %	Probability of Objective	Probability of Ruin	Average Gain	Median Gain
Max. Return	26.5%	5.3%	94.4%	8,920%	-70.9%
Med. Return	7.5%	68.1%	22.0%	1,100%	369.6%
Opt. Retire	5.0%	74.0%	7.7%	446%	268.2%
<1% Ruin	3.0%	64.3%	0.8%	180.7%	142.5%
>0% Ruin	1.5%	21.8%	0.0%	67.9%	61.6%
Retire-Ruin	4.0%	72.0%	3.5%	292.7%	205%

Notice that even though the expectancy has not changed, we are clearly able to risk more and come closer to meeting our objectives. Now, the best "retire-less-ruin" criterion shows nearly a 70% difference between the probability of meeting our objectives and the probability of ruin. And we can risk well over 1% now and still not risk ruin. Now you can begin to understand why you really need a System Quality NumberSM of at least 1.7 to have a tradable system.

So let's move on to our 80% system, System 11-6. Based on the trend, this should be the best system of the original five because it has the best System Quality NumberSM. The results are shown in Table 11-13. As you can see from the table, we now have a dramatic improvement. At 5% risk, we would have a 78% chance of reaching out objectives and only a 7.9% chance of ruin. Or better yet, at 2.5% risk we would have only a 0.4% chance of ruin and nearly a 60% chance of reaching our objectives.

However, don't get too excited about this. Remember some of the assumptions of our simulator. First, we only take one trade at a time, so we assume that our trades are independent. Real trades are not necessarily independent. Second, we are assuming that our R-multiple distribution is accurate. But in real trading, you've probably not seen your worst R-multiple.

The maximum median return for System 11-6 (which is at 8%) in reality is probably what we should use for portfolio heat for this system. Thus, we still are nowhere near what is possible for a really good trading system.

Table 11-13: Optimal Bet Size of System 11-6

Approach	Optimal Risk %	Probability of Objective	Probability of Ruin	Average Gain	Median Gain
Max. Return	30%	0.0%	100%	416,300%	-110.4%
Med. Return	8.0%	69.2%	23.8%	1,400%	475.6%
Opt. Retire	5.0%	78.0%	7.9%	462.7%	310.3%
<1% Ruin	2.5%	59.8%	0.4%	139.6%	122.6%
>0% Ruin	2.0%	45.7%	0.1%	101.3%	92.4%
Retire-Ruin	4.0%	75.8%	3.6%	301.4%	229.8%

So far, our win rate and our System Quality NumberSM are somewhat correlated. So let's look at a 60% system, System 11-7, which has an even better System Quality NumberSM than any of the other systems. Will this improve the results?

The results are shown in Table 11-14.

Table 11-14: Optimal Bet Size for System 11-7

Approach	Optimal Risk %	Probability of Objective	Probability of Ruin	Average Gain	Median Gain
Max. Return	30%	48.2%	50.2%	1,200,000%	-50.1%
Med. Return	19.4%	73.5%	23.4%	66,200%	5,300%
Opt. Retire	10.2%	87.9%	3.7%	3,300%	1,700%
<1% Ruin	7.2%	82.6%	0.9%	1,100%	776.4%
>0% Ruin	4.4%	51.8%	0.0%	363%	309.6%
Retire-Ruin	9.0%	87.2%	2.1%	2,100%	1,200%

System 11-7 has an expectancy to standard deviation ratio of 0.29, so it is a good system. It is one of the few sample systems that we've used that is actually worthy of trading.

Let's look at a summary table of all of the systems for the last six objectives. Table 11-15 gives the optimal position size (in terms of percentage risk) for the median average gain (objective 1), the optimum probability of reaching the goal, the optimum probability (less than 1%) of ruin, the optimum probability (greater than zero) of ruin, and the largest difference between the probability of reaching one's goal and the probability of ruin. The systems are ranked according to their System Quality NumbersSM.

Notice that as the system improves, there is a dramatic rise in the risk you can use for almost every objective, and the largest jump occurs in System 11-7, which had a System Quality NumberSM that was nearly 50% bigger than System 11-6.

Table 11-15: Summary of the Six Systems for the Five Primary Objectives

System	Median Gain	Optimum Goal	Optimum Ruin (<1)	Optimum Ruin (>0)	Retire Less Ruin
11-2	1.4%	3.4%	0.8%	0.8%	0.6%
11-3	3.2%	5.4%	1.6%	1.4%	2.4%
11-4	4.6%	5.8%	1.8%	1.2%	3.4%
11-5	7.5%	5.0%	3.0%	1.5%	4.0%
11-6	8.0%	5.0%	2.5%	2.0%	4.0%
11-7	19.4%	10.2%	7.2%	4.4%	9.0%

For some reason, there is not a large jump between System 11-5 (System Quality NumberSM = 1.89) and System 11-6 (System Quality NumberSM = 2.12). I suspect it is because both have zero variability in the losses (i.e., all the losses in both systems are 1R).

Warning: If you have an acceptable trading system, like System 11-7, you may not have seen the largest loss. For example, you may have the possibility of a 5R psychological loss. And if that loss occurs you will have seriously overestimated the position sizing of the system and this could result in a drawdown much bigger than you ever anticipated. Furthermore, simulation software assumes that only one trade is made at a time and that trades are all independent. Thus, you could clearly overestimate your position sizing when you have multiple correlated positions.

All of our distributions have the same expectancy of 0.35. When you look at the various tables, it becomes clear that *the more winners you have in a distribution, the more you can risk and the lower your chances will be of having such a drawdown*. And this typically occurs because the standard deviation of your R-multiple distribution becomes smaller and our criterion for indicating the quality of your system improves dramatically. In addition, one other factor becomes clear—when you don't have any bad losses in your distribution, you can risk a lot more. In system 11-7, the worst loss you have is 1R. Having zero variability in your losses allows you to more than double the risk of the next best system (i.e., System 11-6) and still have almost no risk of ruin. Five R losses, which are contained in two of the groups, are deadly to your trading.

Some people argue that you should only be concerned about the variability of your losses in determining the quality of your system. **However, these results show that the variability in your overall R-multiple distribution is the real key.** If the standard deviation is high, which might occur when you have a few large R-multiples producing much of your results, then your System Quality NumberSM will be lower and it will be more difficult to use position sizing to meet your objectives.

Conclusion

Expectancy, R-multiple distribution, worst-case loss, your System Quality NumberSM, and percentage of winners all go into determining the optimal position size. When the expectancy was

held constant at 0.35, then the most important factors were winning percentage and the System Quality NumberSM.

In the past, I've tended to steer people toward lower-probability systems with high R-multiples. This chapter might suggest that I'm suddenly recommending the opposite. Perhaps that would be the case if I were willing to recommend position sizes of 10% or bigger. I'm not! You probably have not seen your worst-case loss, no matter how many R-multiples you have collected. And since that is the case, large bet sizes always tend to lead to disaster. In addition, you can strongly outperform the market with bet sizes of 0.5%, so such large bet sizes are not even necessary. Nevertheless, I am recommending that you find a system with a strong System Quality NumberSM and we have seen that adding big R-multiples can actually lower the SQNSM.

I believe the key lesson in this chapter is the importance of the System Quality NumberSM in determining how easy you can use position sizing to meet your objectives. When the System Quality NumberSM is above 2.5, you have a tradable system and it is easier to use position sizing to meet your objectives. But when the system quality declines, it becomes harder and harder to meet your objectives with position sizing—even when your expectancy is quite high. For example, remember the illustration of the system with 99 1R losers and one 1,000R winner. It had an expectancy of 9.09, but its System Quality NumberSM was only 0.9.

NOTES

¹ One such questionnaire is given in *Trade Your Way to Financial Freedom* and that book also includes answers by a Market Wizard, Tom Basso.

² These values are usually derived from a sample of actual trades or historical testing. They are only samples of what the system can do and any calculations of "what is optimal" need to take that into account. You almost definitely have not seen your biggest winners or your worst losers.

³ You could also add all of the R-multiples and divide by the number of trades to get the same answer as we suggested in Part I.

⁴ I'm deeply grateful to Mahesh Johari for questioning my assumptions and coming up with the first form of the spreadsheet that calculates optimal bet size for us. The software has gone through a number of transformations since his original development, but we could not have done it without his original spreadsheet.

⁵ I'm not going to get into the mathematics of bet sizing because it involves high-level calculus and is beyond both me and most of my readers. However, you can find much of this information in a web site entitled www.bjmath.com.

⁶ The E notation in the table merely indicates the number of zeros to add or subtract from the decimal point. For example, 1.1E +9 = 1,100,000,000%.

⁷ Obviously, even though the simulator stops when it is down 50%, there were many times when the trade that produced this drawdown took the equity way into negative territory. For example, if you are down 40% and you hit a -5R risking 30%, you'd now be down about 190%. Notice that the median gain is much worse than our acceptable level of ruin.

Chapter 12

Position SizingSM Methods to Meet Your Target Profit Objective

Let's say your goal is to make 200% in your account this year. You have a system, very similar to System 11-5, with a similar System Quality NumberSM of 1.89. Even though your system isn't great, you feel that it is right for you and you can trade it. You have a business plan prepared. You have your personal psychology together and you do the ten tasks of trading.¹ Now your task is to use position sizing to meet your goal of making 200% this year. And let's say that you are really going to go for it. What should you do to meet your goal?

The purpose of this chapter is to show you various methods that you can use to achieve those objectives and improve your chances of meeting that goal.

Before starting this section, I would like to caution readers that the techniques suggested are quite dangerous unless you feel very confident about your discipline, your own psychological make-up, and how well your system results (i.e., its R-multiple distribution) really represent your system. If you use some of the techniques suggested and forget about your discipline, then your capital could disappear very quickly. If your sample of trades is much better than your system actually generates, your capital could disappear very quickly. If you make psychological mistakes, your capital could disappear very quickly. And even a streak of bad trades (i.e., plain bad luck) could potentially wipe you out.

The techniques given in this chapter are especially risky 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 only hope you have to keep you from sure ruin.*

There are four ways to approach this task. First, you can determine an optimal bet size for reaching your goals based upon your System Quality NumberSM. You must then determine how many trades you could have on at one time and divide that optimal number by the maximum number of likely trades. This approach may be optimal for reaching your goals, but it will also cause big drawdowns.

Second, you use some sort of market's money approach to position sizing. This means that you would use a conservative position sizing on your core equity, but use optimal position sizing when you have profits that you are willing to give back. Ed Seykota first explained this basic technique to me and I believe that there are thousands of variations to it—all based upon how you determine when or how your profits become the market's money.

Third, you can use some sort of scaling in approach to position sizing. This has long been known as pyramiding. I credit the formalization of this technique to William Eckhardt, as the general

method for doing it first became clear to me after studying the “Turtles” system. All of these methods are presented in detail in this chapter.

The last method of meeting your target goals is through fixed ratio position sizing. I wasn’t sure if this was a viable approach to position sizing until I had done extensive simulation research on this topic. As a result, I’ve devoted a separate chapter to fixed ratio position sizing (Chapter 13). That chapter will show you what assumptions you must make to use fixed ratio position sizing safely. We will also show you why we believe that fixed ratio position sizing, using these assumptions, is a viable approach to meeting your target objectives. And, most importantly, we will show you how to do it in Chapter 13.

The models in this chapter and in Chapter 13 have an above average potential to produce ruin. At minimum, if you use them, you risk giving back a substantial portion of your capital. Nevertheless, there are much more dangerous methods, and I have included them in Chapter 15 for the sake of completeness. These methods include optimal f (as originally proposed by Ralph Vince), the Kelly Criterion, and various Martingale strategies most often discussed by Larry Williams.

Model 13: Using Your Optimal Target Risk Percentage

Probably the simplest and most direct way to reach your target goal is to find the position sizing algorithm that will give you the highest probability of reaching your desired goals. This would be easy to determine if you had access to a sophisticated simulator. The results of the simulator would tell you the optimal percentage of your equity to risk per trade 1) if you were absolutely positive that your sample of R-multiples adequately represented the entire population of trades that your system will generate and 2) if you were only making one trade at a time. However, we cannot assume that either of these is true.

As a result, we are going to recommend that you begin with a portfolio heat that is appropriate for the System Quality NumberSM of your system. You must then determine how many simultaneous trades you are likely to have on at any one time. The last step is to divide the recommended portfolio heat by the number of trades and use that as the risk percentage per trade to meet your goals.

Optimal Portfolio Heat. We explained this method in Chapter 9, but I want to repeat it here because it forms the basis of determining your optimal risk for many of the other methods. First, let’s look at Table 9-3 again, which gives the optimal portfolio heat for various System Quality NumbersSM. In addition to using the table, also look at the largest possible loss in your R-multiple distribution and make sure that your maximum portfolio heat is less than the 100% divided by the largest negative R-multiple. Thus, if you have a potential 5R loss, then your maximum portfolio heat should be less than 20%.

Table 9-3 (reprinted): Some Rough Guidelines for Your Maximum Portfolio Heat Based Upon Your System Quality NumberSM

System Quality Number SM	Maximum Portfolio Heat
5.0 or higher	25% (20% if highly leveraged)
4.0 to 4.99	20% (15% if highly leveraged)
3.0 to 3.99	15%
2.5 to 2.99	12%
1.7 to 2.49	8%
1.3 to 1.69	4%
Below 1.3	1% if you trade it at all

To determine the individual risk on any given position, first look up the maximum portfolio heat from the table and then work backwards. 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.

Let's say that you trade no more than ten positions at a time. With a System Quality NumberSM of 5.0 or higher, you could probably have a maximum of 2.5% risk in each position if you are not highly leveraged. With only five maximum positions, you could go up to 5% risk if you are not highly leveraged. But both of these estimates still give you an exceptionally high probability of ruin. And even with an exceptional system, you are still flirting with disaster with these numbers.

If you have a weak, but tradable system (i.e., System Quality NumberSM between 1.7 and 2.49) then your maximum risk per position with 10 positions should be no more than 1% per position. And if your system falls below that, and you are willing to trade it, then I would suggest that you trade no more than a few positions at 1% risk or less. That way, your portfolio under terrible conditions will not damage you extensively.

You can combine this method with the idea that long and short positions cancel each other. Thus, you might decide that you can have up to ten simultaneous positions but that a long position and a short position only count as one. As a result, you could theoretically have 10 long positions and 10 short positions and still consider yourself as only having 10 total positions.

Throughout the rest of this book I'm going to refer to this number (i.e., the optimal portfolio heat divided by the number of trades you're likely to have on) as the **optimal target risk percentage**.

Model 14: Market's Money Methods

Perhaps the best way to go for top returns is to distinguish between your starting equity and your profits, which we will call the market's money. You can't do this if you are trading with other people's money because they typically get upset—especially when you give back open profits. For example, if your investors know you are up by \$20,000 and those are all open (i.e., not closed out) profits, they would typically get very upset if you only kept \$5,000 of those profits. They

would not think that you made \$5,000. They would think that you lost \$15,000 of their money. Thus, it is very difficult to use the concept of “market’s money” when you are trading other people’s money.

However, if you are willing to take the mental step of calling your own profits “market’s money,” then you personally can apply these great money-making techniques. For example, suppose your objective is to achieve a maximum equity level by some future date. You’re willing to do whatever it takes to increase that equity as long as you don’t lose your starting capital. On that assumption, you can design a special system that risks very little of your starting capital, but risks the market’s money at the optimal target risk percentage.

Let’s look at some specific numbers. 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: First, let’s say that you determine that if you risk 1%, you have very little chance of reaching your worst-case drawdown (i.e., ruin). Thus, you begin by risking only 1% of your starting equity. *We’ll be discussing risk percentages to use when focusing on limiting drawdowns in Chapter 14.*

Second, you’ve decided that you are not too concerned about drawdowns once your system is profitable. For example, you don’t mind making 150% and then giving back half of it. Thus, you can really go for it with your profits. As a result, you determine the optimal target risk percentage with your profits. You have a System Quality NumberSM of 4.2 with 4R being your largest loss, so Table 9-3 suggests that your maximum portfolio heat can be 20%. You’ve also 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 profitability, your ability to make more 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. After three months, 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 (i.e., your ability to profit) has now doubled even though your equity has only gone up by 25%.

Most of the differences in market’s money techniques involve determining when the market’s money becomes your money and thus is traded at a lower risk level. Below is a list of five methods you can use.

1. Percentage Gain

Suppose your objective is to make 100% each year. If that’s the case, when you reach your objective, then you might want to reset the market’s money to become your money.

Similarly, you might be willing to give back a large percentage of your profit, but only up to a point. Suppose your goal is to make 100% each year. However, once you are up 50%, you don't want to give it back. Thus, you might reset market's money to become your money when you reach 50%. This will make it harder to reach your objective, but it also gives you a stronger base from which to reach that objective. That is, it is much easier to make a 100% gain on the year once you are up 50% than from your baseline.

2. At Important Calendar Dates

The most obvious calendar date in which you might want to make the market's money yours is December 31st. On December 31st, you have to pay taxes on your gain for the year—regardless of whether or not you have it by April 15th. Thus, it makes sense to reset your base for market's money on December 31st. You might also have to make quarterly estimated tax payments. If that's the case, then you might want to have market's money become your money at the end of each quarter.

If you are managing other people's money, then you can actually still use this technique if you decide that the point at which you report your profits to your investors (whether weekly, monthly, or quarterly) is the date that market's money is reset. That means that every time your investors learn about profits, a market's money algorithm will not be in effect. This will at least give money managers a chance to risk a little more when they are doing well.

3. Monetary Goal Reached

Let's say you are trading to make a certain amount of money and there could be a number of reasons for that:

- You have enough money to pay off your mortgage.
- You have enough money to make a down payment on a house.
- A great investment appears that allows you to really diversify from your trading and you have enough money to do it.
- You have enough money to purchase something you've always wanted.

I don't recommend trading to reach some monetary goal because most people perform very poorly when they are concerned about a particular amount of money. However, it still might be useful to reset market's money to become core equity when one of these important levels is met.

4. After X Trades

Perhaps you've made your position sizing allocations around making a certain number of trades in a year or a month. For example, you might decide to reset it after making 1,000 trades, which you estimate will occur around the end of the year. However, you make your 1,000 trades in six months. That might be a good time to reset your market's money.

5. Based Upon Some Mathematical Formula

When you start using various mathematical formulas to determine market's money, you suddenly have numerous (perhaps infinite) possibilities for just using Model 13. I could probably work out 20 different mathematical formulas, each with numerous variables, for doing market's money and present them as additional models. I'm not sure that doing so adds that much, so I've avoided the temptation. *When you develop some sort of mathematical formula for market's money, you need to ask yourself "What's my objective and how is this formula going to make it easier to achieve that objective?"* However, if you find some formula that you particularly like, I'd be happy to know about it, provided you also tell me how it helps you meet your objectives.

So let's just look at a few examples of using a mathematical formula to determine what to do with market's money. In these examples, we'll call the equity that you want to preserve, your BASE equity. We might also call the maximum amount you want to risk in total, MAX and the minimum amount you'll risk, MIN. This might be the amount you are willing to risk of your BASE equity. You might set the MAX and MIN risk amounts, based upon your System Quality NumberSM, using the tables given in this book.

Furthermore, let's call your total equity, TOTAL and the amount you want to call market's money, MM. Normally, $MM = TOTAL - BASE$, but we could also use some mathematical formula to determine MM. Here are a few examples:

Let's start out by increasing the MM based upon a change in equity over a fixed number of days. Let's see how that would work. Let's say we are risking 10% of Market's money plus 1% of the BASE. However, our maximum risk (MAX) will be 4% of the TOTAL.

Here's one possible relationship, just as an illustration:

$$[TOTAL_{now} - TOTAL_{4 \text{ trades ago}}]/4 = BASE$$

$$MM = TOTAL GAIN - BASE$$

$$\text{Risk} = 1\% \text{ BASE} + 10\% \text{ MM or } 4\% \text{ of TOTAL, whichever is less.}$$

Tables 12-1 and 12-2 show how you would calculate this. We are starting with \$100,000 and risking 1%. The trades move across the columns at the top. The difference (BASE) is between the new equity and \$100,000 until we reach the fifth trade and then it is based upon the equity four trades ago.

Table 12-1: Six Trades (all gains) with our Algorithm						
	Trade 1	Trade 2	Trade 3	Trade 4	Trade 5	Trade 6
Total Bet	\$1,000	\$1,232.50	\$1,423.54	\$2,526.78	\$5,464.17	\$8,489.75
Gain R-Multiple	3	2	10	15	10	2
Total Gain	\$3,000	\$2,465	\$14,235.40	\$37,901.70	\$54,641.70	\$16,979.50
Old Equity	\$100,000	\$103,000	\$105,465	\$119,700.40	\$157,602.10	\$212,243.80
New Equity	\$103,000	\$105,465	\$119,700.40	\$157,602.10	\$212,243.80.	\$229,223.30
Growth over 4 trades	\$3,000	\$5,465	\$19,700.40	\$57,602.10	\$109,243.8	\$123,758.30
Gain / 4	\$750.00	\$1,366.25	\$4,925.10	\$14,400.53	\$27,310.95	\$30,939.58
Market's Money	\$2,250.00	\$4,098.75	\$14,775.30	\$43,201.58	\$81,932.85	\$92,818.73
Base	\$100,750.00	\$101,366.25	\$104,925.10	\$114,400.53	\$130,310.95	\$136,404.58
Base Bet	\$1,007.50	\$1,013.66	\$1,049.25	\$1,144.01	\$1,303.11	\$1,364.05
Market's Money Bet	\$225.00	\$409.88	\$1,477.53	\$4,320.16	\$8,193.29	\$9,281.87
Total Risk	\$1,232.50	\$1,423.54	\$2,526.78	\$5,464.17	\$9,496.40	\$10,645.92
Max Risk	\$4,120.00	\$4,218.60	\$4,788.02	\$6,304.08	\$8,489.75	\$9,168.93

Notice that beginning with trades 5 and 6, the base was based upon the difference in the equity four trades away and that difference was divided by four. Furthermore, in trades 5 and 6 the total risk exceeded the maximum risk of 4% of total equity, so maximum risk was used.

Notice how many variables could be used to change the formula for what constitutes market's money with just this simple formula:

- We could change the number of days.
- We could change the base-dividing factor.
- We could change the maximum risk allowed.
- We could even fundamentally change how market's money is calculated.

For example, instead of subtracting the change of equity between the last four days, we could take the average equity over the last 20 days and subtract that from the starting equity or from the equity 21 days ago.

There are many ways we could calculate market's money mathematically. I've called Model 14 the Market's Money; however, it really represents a whole constellation of methods based upon how you reset market's money to become core equity or your base money. If you decide to invent your own formula for market's money, then just be sure you understand what you are doing and why you are doing it (i.e., how it fits your objectives).

Model 15: Scaling In Techniques

Another equally profitable position sizing technique allows you to build your capital quickly through pyramiding and stop adjustment. For example, 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.²

You've also decided that your system is optimal for reaching your target by risking 20% of equity at a time, using a reduced total equity model.³ You plan to have as many as 5 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 position sizing 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 risk per contract of \$525. You can risk 2% of your \$100,000 (\$2,000), which amounts to 3 contracts (i.e., \$2,000/\$525 rounded down to the nearest contract).

Your pyramiding plan is to risk another 2% 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 your total exposure of your original equity is now only 2.63% because you raised your initial stop.* Also because you raised your stop, the reduced total equity is now \$97,375.

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 \$3.095—when the price had increased by the old V-value of 3.5 cents.) As, previously stated, your reduced total equity is now \$97,375 and 2% of that is \$1,947.50. 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 4% 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.

Table 12-2: Status of Your System with Corn at \$3.10

Contracts	Current Stop	Current Risk to Original Equity	Total Risk to Original Equity	Open Risk ⁴
3 at \$3.025	\$2.99	3.5 cents	10.5 cents = \$525	33 cents = \$1,650
3 at \$3.06	\$2.99	7 cents	21 cents = \$1,050	33 cents = \$1,650
3 at \$3.10	\$2.98	12 cents	36 cents = \$1,800	36 cents = \$1,800

Table 12-2 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 cents and corn now goes to \$3.14. It's now time to risk another two percent. Your reduced total equity is now \$96,625. You can risk 2% of that or \$1,932.50. Your 12-cent stop is a \$600 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 rises to \$3.025 (i.e., it was raised 3.5 cents, the original V). The stop on the last three contracts rises to \$3.02.

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?

Table 12-3: Status of Your System with Corn at \$3.14				
Contracts	Current Stop	Current Risk to Original Equity	Total Risk to Original Equity	Open Risk
3 at \$3.025	\$3.025	0	0	34.5 cents = \$1,725
3 at \$3.06	\$3.025	3.5 cents	10.5 cents = \$525	34.5 cents = \$1,725
3 at \$3.10	\$3.02	8 cents	24 cents = \$1,200	36 cents = \$1,800
3 at \$3.14	\$3.02	12 cents	36 cents = \$1,800	36 cents = \$1,800

The total risk to your original equity is now only \$3,525 or 3.53%—still under our 4% limit. However, notice that your open risk—the amount you'd lose to your current total equity should you be stopped out of everything—is now \$7,050, the total of the last column.

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 \$96,475 and 2% of that is \$1,929.50. 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. You can now move the stop on the contracts purchased at \$3.025 to \$3.06, move the stop on the second three 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 12-4.

Table 12-4: Status of Your System with Corn at \$3.20				
Contracts	Current Stop	Risk to Original Equity	Total Risk to Original Equity	Open Risk
3 at \$3.025	\$3.025	0	0	42 cents = \$2,100
3 at \$3.06	\$3.06	0	0	42 cents = \$2,100
3 at \$3.10	\$3.06	4 cents	12 cents = \$600	42 cents = \$2,100
3 at \$3.14	\$3.06	8 cents	24 cents = \$1,200	42 cents = \$2,100
2 at \$3.20	\$3.02	18 cents	36 cents = \$1,800	36 cents = \$1,800

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%. However, your total open risk if you were stopped out of everything is now \$10,200.

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 \$3.08. Your portfolio now looks like Table 12-5.

Table 12-5: Status of Your System with Corn at \$3.26				
Contracts	Current Stop	Risk to Original Equity	Total Risk to Original Equity	Open Risk
3 at \$3.025	\$3.095	0	0	49.5 cents = \$2,475
3 at \$3.06	\$3.095	0	0	49.5 cents = \$2,475
3 at \$3.10	\$3.10	0	0	48 cents = \$2,400
3 at \$3.14	\$3.10	4 cents	12 cents = \$600	48 cents = \$2,400
2 at \$3.20	\$3.10	10 cents	20 cents = \$1,000	32 cents = \$1,600
2 at \$3.26	\$3.08	18 cents	36 cents = \$1,800	36 cents = \$1,800

Notice that your original exposure is just \$3,400, but your total open risk is now \$13,150. 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, your open risk will keep getting larger and larger. Furthermore, you do run the risk of a series of limit moves against 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. You could also combine this technique with a scaling out technique, described in Chapter 14 that limits your maximum open risk. When your maximum open risk is exceeded, you stop scaling in and start scaling out as described in Model 21.

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 stops). You get out at \$3.21. 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 \$1,575 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 position sizing. This method has been proven to produce consistent and very large rates of return in trend-following systems. Furthermore, you could offset the risk with options (e.g., buying a put option against the prior contracts you buy each time you scale in), which would avoid the risk of a runaway market against you.⁵

There are a number of variables that you can vary in scaling-in position sizing. These might include your initial stop, your maximum risk per commodity, moving your stops in your favor, your equity model, or your position sizing model.

Different Scaling In Techniques

There are also many models for how you can scale in:

- In the above example, we used a three times volatility stop and scaled in when the market moved up one volatility. Thus, we basically scaled in when the market was up by 1/3 of our stop. However, we could have used 20% or 25%. Furthermore, your initial risk doesn't have to be based upon volatility. And your scale in could be based on the price increasing some percentage of R (e.g., 20%, 25% or 50%). This gives you many options for scaling into positions.
- Scale in on successive entry signals. For example, if you buy into a trend on a retracement and then a new breakout, you could scale in on each new retracement signal. You also could scale in whenever the market forms a slight consolidation and then seems to break out. Whatever your technical signal for entry might be, there are lots of possibilities for scale-in entries.
- You could scale in each time you raise your stop to breakeven. For example, let's say you buy stocks and just keep a 25% trailing stop. When the stock goes up 33.3%, a new 25% trailing stop would be at your entry point. This could be your signal to open another position.
- You could scale in whenever your position is up by a fixed dollar amount (e.g., \$500) or when your position is up by some percentage gain (e.g., 5% or 10%).

You've learned various methods for scaling in to positions, but it is also critical that you are aware of the dangers of this technique. As a result, I suggest that you consider also using one or more of the following techniques with any scaling in position sizing that you use.

- Limit the total number of scales in that you will make to 3 or 4.
- Limit your total open risk, which I will describe in Chapter 14, and scale out when that limit is exceeded.
- Consider having profit targets with scaling-in, where you eliminate positions when those targets are hit. This is especially important if you are not doing long-term trending following with the major trend of the market.

Furthermore, be very certain that the procedure you've developed totally fits with your objectives and that you've thought about your objectives very carefully.

NOTES

¹ I've deliberately selected a borderline system because the most important thing you can do to improve your trading is to improve yourself. Why? Trading reflects your performance. It reflects your beliefs and attitudes. It reflects your commitment and need for self-sabotage. And most importantly, it reflects your personal evolution. If you've worked on yourself to the extent that you have a lot of personal power, then you could do very well as a trader.

² A copy of the random entry system (Course Update 23a) can be ordered from www.iitm.com.

³ I'm sure some of you will be asking, "How did you get 20%?" I just selected it as an example—it was "plucked from air."

⁴ Open risk is the total difference between the current price and your stops for your entire portfolio.

⁵ For example, you could buy a put option against a long position (or a call against a short position) as a form of stop. When you do so, there is a cost to the option that must be subtracted from your potential profits (i.e., it's like insurance), but it does give you protection against a disastrous drop in price.

Chapter 13

Using Fixed Ratio Position Sizing to Meet Your Profit Target

Imagine that you have a position sizing algorithm that is so good that you can add huge percentage gains to your equity—even if you are only starting out with a small account like \$10,000 to \$25,000. And you can do this without too much risk of losing your entire account quickly. Does that sound interesting to you? That's what the Fixed Ratio¹ model claims to do.

Models like this that seem too good to be true often are too good to be true. In fact, I've had the goal of reviewing the Fixed Ratio Position Sizing (FRPS) model for some time. However, I didn't believe that I could do justice to such a review until we were able to do some Monte Carlo simulations of FRPS. Yet FRPS has so many loose assumptions that it is almost impossible to simulate. Fortunately, we've now been able to do these simulations.²

In this chapter, I'm going to review some of the basic assumptions of FRPS as I understand them. My source here will be Ryan Jones' book *The Trading Game*.³ Next, we'll make some assumptions about risk that make sense and show you the results on numerous fixed ratio simulations. This involves six different trading systems—ranging from two losing systems to one very good system. We'll show you our findings, some of which were certainly surprising to me. Lastly, I'll show you how FRPS can be used as a method to help you meet your profit objective.

Fixed Ratio Position Sizing Explored

Ryan Jones' biggest objection to most forms of position sizing is that it's not easy for a small account to practice adequate position sizing. I've raised the same objection about the method most people use of one contract (or 100 shares) per X dollars in your system. For example, if you have a \$25,000 account and you trade one contract per \$25,000, your account has to go up 100% before you can trade two contracts. However, a million-dollar account only has to go up by 2.5% (i.e., \$25,000) to add an additional contract. Jones would argue that percent risk position sizing suffers from the same problem. Let's say you have a \$25,000 account and the risk of a single unit is \$1,000. This puts you at 4% risk.⁴ And even if you were willing to keep your risk at such a lofty level, your account would still have to double to be able to purchase the second contract (i.e., \$2,000 is 4% of \$50,000).

Instead, FRPS says we will increase our position size by one unit as a function of some fixed ratio of the account, which Jones calls *delta*. Thus, if you were to set delta at \$2,500, you could increase to two units with only a 10% increase in your \$25,000 account. That's much more effective than increasing when you double the account.

So let's look at how FRPS increases the bet size. It basically goes by the formula that you increase position size when your equity increases by the number of current units multiplied by delta. Table 13-1 shows how this might work on a \$25,000 account with delta equal to \$2,500. Notice that you initially increment very rapidly and then the process slows down. Thus, you start with 1 unit and then move to two units when your account goes up by \$2,500. You then move to three units when your account goes up by \$5,000 ($2 \text{ current units} \times \$2,500 = \$5,000$). You move to four units when your account goes up by \$7,500 (i.e., three units times \$2,500 = \$7,500). And this continues until you decide that percentage risk position sizing is a better way to go. (Table 13-1 is FRPS only; no percentage risk position sizing is used.) In other words, you add one extra unit when your equity increases by \$2,500 to \$5,000, \$7,500, \$10,000, and so on. Once you pass the peak risk level, FRPS has less and less risk. In fact, it will eventually produce less risk than a percent risk model at the same initial starting risk. And at this point, one probably should switch to the simple percent risk model. Please notice that in this example, which is typical of examples I've seen of FRPS, you are starting with 4% risk and going up. Thus, you are starting at a risk level that is super aggressive and getting even more aggressive from there.⁵

Assumption 1: Fixed Risk per Unit. In Table 13-1, I've already made the first change that Ryan Jones might disagree with. I've assumed that each unit carries \$1,000 risk. When you do that, your maximum risk comes between \$40,000 and \$50,000 at 10%. Then the risk goes back down at \$137,500. Now you have the same risk you had at the second increment. However, we don't get down to the base risk of 4% until we reach 20 units with a \$500,000 account.

**Table 13-1: Fixed Ratio Increments for
a \$25,000 Account with Delta of \$2,500**

Equity	Delta	Number of Units Traded	% Risk based on \$1,000 risk per unit
\$25,000	\$0	1	4.0%
\$27,500	\$2,500	2	7.3%
\$32,500	\$5,000	3	9.2%
\$40,000	\$7,500	4	10.0%
\$50,000	\$10,000	5	10.0%
\$62,500	\$12,500	6	9.6%
\$77,500	\$15,000	7	9.0%
\$95,000	\$17,500	8	8.4%
\$115,000	\$20,000	9	7.8%
\$137,500	\$22,500	10	7.3%
\$162,500	\$25,000	11	6.8%
\$190,000	\$27,500	12	6.3%
\$220,000	\$30,000	13	5.9%
\$252,500	\$32,500	14	5.5%
\$287,500	\$35,000	15	5.2%
\$325,000	\$37,500	16	4.9%
\$365,000	\$40,000	17	4.7%
\$407,500	\$42,500	18	4.4%
\$452,500	\$45,000	19	4.2%
\$500,000	\$47,500	20	4.0%

Ryan Jones argues that the risk per contract is not relevant. You could trade one corn contract and one S&P contract and it doesn't matter. The way I read it, your first contract might be a corn contract, but when your account goes up to the second level, you could theoretically buy 2 S&P 500 contracts if you had enough margin in your account.⁶ I strongly disagree with this point, so we will always be assuming a fixed risk per unit of \$1,000 in this chapter unless otherwise stated.

Assumption 2: Dampening Factor Limits Risk of Ruin. The next assumption that Ryan Jones makes with his FRPS is that your loss potential is limited because when you start to lose, you scale back your trading size dramatically. Adding a *dampening factor* to the equation does this. For example, when your account drops by the prior increment level, you could drop down one unit.

Thus, if you reached \$50,000 and were trading five units (as shown in the table) when your account drops \$10,000, you'd go back to trading four units. However, this dampening factor can be much steeper than the climbing factor. For example, you could have a 50% dampening factor. This would mean that if your account dropped by half the amount it took you to increase to the next level, you'd drop back down to four units. In other words, in our example, since you increased from 4 units to 5 units on an increase of \$10,000, you'd decrease back to 4 units if your account dropped down by \$5,000 or half the increment amount. A dampening factor of 25% would mean that you would drop back to 4 units if your account dropped by 25% of the prior increment level or \$2,500. Throughout most of the simulations, we made the dampening factor equal to the increment factor, but of course, it could have been anything.

Since many of Ryan Jones' examples involve risk levels of 10% or more, many people read it over and think "way too risky...this is ridiculous." That was certainly my impression for many years. However, it was difficult to debate anything with him because he could always look at one of the assumptions made (i.e., as we just stated) and say, "You were wrong to make that assumption."

So given that it's a sin to make assumptions, we decided to commit a few sins. Why? Because it is the only way we could simulate FRPS. Furthermore, a number of the assumptions we will make later in the chapter give a big boost to FRPS.

Assumptions Necessary to Simulate FRPS

In Table 13-1, we have four variables that must be controlled—the initial risk size (i.e., bet size), delta, the dampening factor, and the number of units traded. We must make assumptions about these variables in order to do any sort of simulation.

Our initial assumption has to do with the initial bet size or risk. We will start our simulations with \$100,000 and have initial bet sizes of \$500, \$1,000, and \$2,000. This is equivalent to starting with 0.5%, 1%, and 2% risk levels. Notice that we are at least starting with common sense risk levels. Had we used risk levels of 3-5% to start, FRPS would probably have no chance of success.

Our second assumption has to do with delta. We simply picked delta levels of \$1,000, \$2,000, and \$5,000. There was no logical reason for these selections except that they refer to the kind of delta levels that Ryan Jones uses in his own illustrations. As a result of this assumption, we will

be trading much larger risk levels than the percent risk model would allow as soon as a one delta increase in equity is reached. If we are using a beginning equity of \$100,000, these delta units correspond to 1%, 2%, and 5%, respectively.

Our third assumption has to do with delta in the case of declining equity. In our initial simulations, delta for increasing the unit size and the delta for decreasing the unit size will be equivalent. However, we will not stop trading when we are down one delta level from our baseline. It seems logical that one might stop trading when one was down by one delta, but we cannot find that assumption explicitly stated in the book, *The Trading Game*. Thus, bet size will continue to get proportionally bigger as the equity draws down, since our minimum bet will still be \$500, \$1,000, or \$2,000. This also differs from the percent risk models (which also do not stop trading) in that risk would be a constant percentage throughout the drawdown.

Our fourth assumption has to do with the number of units to use. We will basically start trading with one unit and increment up as delta levels are reached. Of course, we could start with three units as the basic unit and increment by three units whenever a new delta level is reached.

Our fifth and final assumption is not specific to FRPS but is just a good general practice of setting a stopping point after which trading results are clearly bad and trading of this system should be stopped. For our assumed \$100,000 account, we used a 40% initial capital loss as the stopping point, which was considered a ruin point after which no new trades were taken.

We developed six theoretical R-multiple distributions to run on our simulator. These ranged from negative to just positive to very good. Notice that two systems, 13-1 and 13-3 are probably not acceptable to most people; one system is okay (i.e., 13-2); one system is very good with a System Quality NumberSM of 4.51 (i.e., 13-4); and two of them are negative, 13-5 and 13-6. The System Quality NumbersSM in Table 13-2 are based upon 100 trades for ease of computation.

Table 13-2: R-Multiple Distributions Used in the Simulations

System Description	System R-Multiples	
	Winners	Losers
13-1: Weak Long Term System Expectancy = 0.15 Win Rate = 27% $SQN^{SM} = 0.42$	18 3R; 8 7R; 1 20R	55 1R; 10 2R; 8 5R;
13-2: Strong Balanced System Expectancy = 1.25 Win Rate = 31.25% $SQN^{SM} = 1.72$	3 10R; 1 20R; 1 5R	10 3R; 1 5R;
13-3: Weak System Expectancy = 0.04 Win Rate = 80% $SQN^{SM} = 0.20$	20 1R	3 3R; 2 5R;
13-4: Very Strong System Expectancy = 1.2 Win Rate = 75% $SQN^{SM} = 5.04$	20 1R; 20 2R; 3 5R; 2 10R	10 1R; 4 2R; 1 5R;
13-5: Neg System with probability in our favor Expectancy = -0.08 Win Rate = 77% $SQN^{SM} = -0.40$	20 1R	4 3R; 2 5R
13-6: Neg System with probability against us Expectancy = -0.07 Win Rate = 30.6% $SQN^{SM} = -0.18$	18 3R; 7 7R; 1 20R	31 1R; 15 2R; 12 5R; 1 8R

These R-multiple distributions are given in Table 13-2. Each run consisted of 200 trades with that distribution simulated 5,000 times. A detailed evaluation of the systems is given in Appendix I.

Position Sizing Evaluation

Our goal is to evaluate the results of these simulations as effectively as possible. Does FRPS work effectively given the assumptions we've made? Is it a reasonable position sizing algorithm? How does FRPS compare with comparable percent risk paradigms?

In order to make this evaluation, we are going to compare the following statistics:

- Average ending equity
- Ratio of equity gain/standard deviation of ending equity
- Probability of ruin (down 40%). If this happened on 25% or more of the simulations, the model was considered a failure.

- Average % Maximum Drawdown
- % Gain / % Drawdown

Simulation 1: Three Models of Percent Risk. Our first goal was to simply establish a baseline by comparing three models with the following percent risk: 0.5%, 1%, and 2%. Our initial bet sizes were \$500, \$1,000, and \$2,000, respectively. Tables 13-3 through 13-5 shows the results of 0.5%, 1%, and 2% risk across the six models. In Tables 13-3 through 13-5, the probability of ruin (down 40%) is in bold type. When ruin occurs in more than 25% of the simulations, we are considering that system failure.

**Table 13-3: 0.5% Risk Model
Compared Across Systems: Model 1**

System	Avg. Equity	Ratio of Gain/SD	Prob. of Ruin	Avg. Max DD	%Gain/% DD
13-1	\$115,294	1.9	0.9%	20.3%	0.8
13-2	\$161,109	0.4	0.00%	9.3%	6.6
13-3	\$104,116	3.6	0.1%	14.3%	0.3
13-4	\$332,321	0.2	0.00%	3.9%	59.6
13-5	\$92,758	-1.9	0.4%	18.6%	-0.4
13-6	\$93,631	-4.2	11.5%	29.5%	-0.2

Table 13-4 shows the same results for the 1% risk model.

**Table 13-4: 1.0% Risk Model
Compared Across Systems: Model 2**

System	Avg. Equity	Ratio of Gain/SD	Prob. of Ruin	Avg. Max DD	%Gain/% DD
13-1	\$131,886	2.2	16.7%	35.3%	0.9
13-2	\$258,906	0.5	0.1%	18.0%	8.8
13-3	\$108,430	3.7	6.0%	26.5%	0.3
13-4	\$1,098,330	0.4	0.00%	7.8%	128.4
13-5	\$86,695	-1.8	21.1%	32.6%	-0.4
13-6	\$89,617	-5.0	51.6%	44.1%	-0.2

Table 13-5 shows the same results for the 2% risk model.

**Table 13-5: 2.0% Risk Model
Compared Across Systems: Model 3**

System	Avg. Equity	Ratio of Gain/SD	Prob. of Ruin	Avg. Max DD	%Gain/% DD
13-1	\$163,603	3.5	51.2%	51.6%	1.2
13-2	\$658,036	0.9	2.8%	33.4%	16.7
13-3	\$115,919	4.4	35.5%	43.1%	0.4
13-4	\$11,800,272	0.8	0.00%	15.2%	769.8
13-5	\$79,792	-2.0	63.4%	46.4%	-0.4
13-6	\$85,822	-12.0	83.1%	54.3%	-0.3

It's clear from all three models of percent risk that there is a definite ranking to the quality of the systems. The best systems are clearly 13-4 and 13-2, with 13-4 being the clear winner. The next

best systems are 13-1 and 13-3, with 13-1 (higher expectancy) being better in terms of average ending equity and 13-3 (higher win rate) being better in terms of drawdowns. Finally, the negative expectancy systems, 13-5 and 13-6, are the worst. System 13-5 (high win percentage) is the better in terms of drawdowns. System 13-6 (better expectancy) is better in terms of final equity. These results are no surprise given the System Quality NumbersSM of each system, and they confirm the validity of our system quality rating.

If we define a system failure as a probability of ruin of 25% or more, then we find that the 0.5% risk model does not achieve that criterion with any system, including the negative expectancy systems. With 1% risk we get failure only on System 13-6—one of the negative expectancy systems. With the 0.5% and 1% risk models we only get one failure out of 12 possibilities—that's an 8.3% failure rate. And with 2% risk, we get failure on the two borderline systems, as well as with the two weakest trading systems.

Simulation 2: The Fixed Ratio with Our Limited Assumptions. The next six tables show the results for six different fixed ratio simulations across the six systems. Table 13-6 shows the results for the first model—with an initial risk of \$500 and a delta equal to \$1,000. Remember that these are run over 200 trades 5,000 times to get the results shown in the tables.

**Table 13-6: Fixed Ratio, \$500 initial bet with delta = \$1,000
Compared Across Systems: Model 4**

System	Avg. Equity	Ratio of Gain/SD	Prob. of Ruin	Avg. Max DD	%Gain/% DD
13-1	\$108,686	7.2	1.4%	14.1%	0.6
13-2	\$867,000	0.7	8.5%	42.0%	18.3
13-3	\$128,375	7.1	82.0%	63.2%	0.4
13-4	\$4,486,795	0.3	0.00%	15.3%	286.7
13-5	\$70,435	-2.8	90.4%	57.9%	-0.5
13-6	\$96,938	-17.2	7.8%	18.9%	-0.2

The first thing that becomes very clear from these results is that FRPS with minimal assumptions can be a great boost with good systems. For example, it outperforms, by far, the simple 0.5% risk position sizing on Systems 13-2 and 13-4. However, FRPS is a disaster with Systems 13-3 and 13-5, having probabilities of ruin of 82% and 90%, respectively. These are both low (i.e., negative) expectancy systems with a very high probability of winning. The \$1,000 delta is the most extreme value, as it will cause the fastest increase in the units traded.

Let's see if the same observation holds up when we increase delta to \$2,000. These results are shown in Table 13-7.

**Table 13-7: Fixed Ratio, \$500 initial bet with delta = \$2,000
Compared Across Systems: Model 5**

System	Avg. Equity	Ratio of Gain/SD	Prob. of Ruin	Avg. Max DD	%Gain/% DD
13-1	\$111,186	5.5	0.6%	16.4%	0.7
13-2	\$613,762	0.7	2.5%	35.1%	14.6
13-3	\$111,252	6.1	17.5%	36.3%	0.3
13-4	\$2,665,179	0.3	0.0%	12.4%	206.9
13-5	\$87,635	-2.5	15.4%	28.2%	-0.4
13-6	\$97,730	-15.5	2.2%	15.1%	-0.2

The results from Table 13-7 suggest that increasing delta with fixed ratio position sizing moderates all the results, both gains and drawdowns. None of the models achieved failure.

So let's increment our delta factor again to \$5,000. These results are shown in Table 13-8.

**Table 13-8: Fixed Ratio, \$500 initial bet with delta = \$5,000
Compared Across Systems: Model 6**

System	Avg. Equity	Ratio of Gain/SD	Prob. Of Ruin	Avg. Max DD	%Gain/% DD
13-1	\$118,149	3.7	0.3%	22.2%	0.8
13-2	\$326,658	0.7	0.0%	23.2%	9.8
13-3	\$104,268	6.4	0.0%	17.6%	0.2
13-4	\$1,417,924	0.3	0.0%	9.6%	137.3
13-5	\$95,051	-2.4	0.0%	13.4%	-0.4
13-6	\$96,420	-9.4	1.3%	19.5%	-0.2

Again, the results indicate that increasing delta moderates the results across the board and across systems. The good systems make good money, but show a significantly smaller probability of ruin. And the poor systems actually make more money. None of the models achieved failure as defined by a probability of ruin greater than 25%.

Let's see what happens when we increase the initial bet size from \$500 to \$1,000 and then repeat the three FRPS models. We would expect this to produce more extreme results than the \$500 initial bet.

Table 13-9 shows the results we might expect. Gains go up and so does the probability of ruin when we double the bet size. In fact, one of the positive expectancy systems, System 13-3, shows a 95.9% probability of ruin with this position sizing algorithm. Every system, except 13-4, fails.

**Table 13-9: Fixed Ratio, \$1,000 initial bet with delta = \$1,000
Compared Across Systems: Model 7**

System	Avg. Equity	Ratio of Gain/SD	Prob. of Ruin	Avg. Max DD	%Gain/% DD
13-1	\$123,056	13.5	29.8%	31.8%	0.7
13-2	\$2,638,125	1.2	51.3%	63.9%	39.7
13-3	\$135,128	17.1	95.9%	74.6%	0.5
13-4	\$12,176,158	0.3	0.5%	22.4%	539.1
13-5	\$55,246	-5.3	98.5%	70.2%	-0.6
13-6	\$95,395	-44.5	26.6%	30.7%	-0.2

Tables 13-10 and 13-11 show what happens when we increase delta to \$2,000 and \$5,000, respectively. We would expect the results to improve because we are not incrementing our position sizing as rapidly.

**Table 13-10: Fixed Ratio, \$1,000 initial bet with delta = \$2,000
Compared Across Systems Model 8**

System	Avg. Equity	Ratio of Gain/SD	Prob. of Ruin	Avg. Max DD	%Gain/% DD
13-1	\$135,657	7.0	28.9%	35.5%	1.0
13-2	\$1,436,990	0.9	24.75	51.5%	26.0
13-3	\$130,692	10.2	86.2%	65.7%	0.5
13-4	\$8,868,202	0.3	0.1%	19.7%	445.1
13-5	\$66,085	-3.3	87.2%	58.9%	-0.6
13-6	\$92,082	-17.8	33.9%	34.8%	-0.2

In Table 13-10, almost every system achieves failure as defined by a probability of ruin greater than 25%. Only System 13-4 and System 13-2 (barely) do not fail. Since one of these systems is much better than you are likely to have, we can begin to see the upper limits to FRPS.

**Table 13-11: Fixed Ratio, \$1,000 initial bet with delta = \$5,000
Compared Across Systems: Model 9**

System	Avg. Equity	Ratio of Gain/SD	Prob. of Ruin	Avg. Max DD	%Gain/% DD
13-1	\$137,737	4.7	22.5%	36.6%	1.0
13-2	\$775,613	0.8	4.8%	38.7%	17.5
13-3	\$108,997	8.5	11.7%	32.8%	0.3
13-4	\$4,402,428	0.3	0.0%	15.1%	284.9
13-5	\$89,565	-3.1	7.8%	25.1%	-0.4
13-6	\$93,719	-14.1	23.9%	31.6%	-0.2

In Table 13-11 with the large delta, no system achieves failure with the 1% bet size.

What conclusions can we draw from these preliminary observations? First, fixed ratio trading can be dangerous with 40% of our fixed ratio models achieving failure, compared with 8.3% for our percent risk models of 0.5% or 1%.

Second, fixed ratio trading can clearly outshine a simple percent risk model both in good systems and when the delta value is large enough (i.e., \$2,000 or higher). However, remember that system

13-4 is a very good system and the risk percentages we used as a baseline did not show what one could do with this model. For example, we discovered that 5% risk with system 13-4 would give you a median ending gain of 1,600,000% after 300 trades, with only a 5% chance of a 25% drawdown.⁷

Third, the best measures of the performance of these position sizing models appear to be 1) percent gain divided by the average maximum percent drawdown and 2) the probability of ruin. Consequently, we will do our next set of comparisons just on these two variables.

The Models Compared

Let's look at Systems 13-2, 13-3, and 13-5 across models on these two measures and see what we learn. We'll look at both the percent gain divided by the percent drawdown and the probability of ruin. The comparisons are given in Table 13-12.

We've also added two additional fixed ratio models 10 and 11. These models both start out with an initial bet of \$2,000. Model 10 has a delta of \$1,000 and model 11 has a delta of \$2,000.

Table 13-12: % Gain/% Drawdown for Systems 13-2, 13-3, and 13-5

Model	Initial Bet	System 13-2		System 13-3		System 13-5	
		G/DD	Ruin %	G/DD	Ruin %	G/DD	Ruin %
1	\$500	6.6	0.0%	0.3	0.1%	-0.4	0.4%
2	\$1,000	8.8	0.1%	0.3	6.0%	-0.4	21.1%
3	\$2,000	16.7	2.8%	0.4	35.5%	-0.4	63.4%
4	\$500	18.3	8.5%	0.4	82.0%	-0.5	90.4%
5	\$500	23.1	2.5%	0.3	17.5%	-0.4	15.4%
6	\$500	9.8	0.0%	0.2	0.0%	-0.4	0.0%
7	\$1,000	39.7	51.3%	0.5	95.9%	-0.6	98.5%
8	\$1,000	26.0	24.7%	0.5	86.2%	-0.6	87.2%
9	\$1,000	17.5	4.8%	0.3	11.7%	-0.4	7.8%
10	\$2,000	55.2	64.3%	0.5	95.6%	-0.7	96.7%
11	\$2,000	43.2	60.5%	0.4	93.6%	-0.6	95.4%

The conclusion that fixed ratio models can be dangerous really stands out from Table 13-12. Only model 3 (2% risk) with Systems 13-3 and 13-5 showed a ruin rate above 25% among the percent risk models. However, many of the FRPS models showed a ruin rate above 25%.

The Gain/Drawdown ratio is clearly better for the FRPS models for the same initial bet size. Thus, we see both a huge potential and a huge risk.

Let's now look at the other three systems in Table 13-13.

Model	Initial Bet	System 13-4		System 13-1		System 13-6	
		G/DD	Ruin %	G/DD	Ruin %	G/DD	Ruin %
1	\$500	59.6	0.0%	0.8	0.9%	-0.2	11.5%
2	\$1,000	128.0	0.0%	0.9	16.7%	-0.2	51.6%
3	\$2,000	769.8	0.0%	1.2	51.2%	-0.3	83.1%
4	\$500	286.7	0.0%	0.8	1.4%	-0.2	7.8%
5	\$500	206.5	0.0%	0.7	0.6%	-0.2	2.2%
6	\$500	137.8	0.0%	0.8	0.3%	-0.2	1.3%
7	\$1,000	539.3	0.5%	0.7	29.8%	-0.2	26.6%
8	\$1,000	444.2	0.1%	1.0	28.9%	-0.2	33.9%
9	\$1,000	284.1	0.0%	1.0	22.5%	-0.2	23.9%
10	\$2,000	850.5	28.8%	1.0	51.1%	-0.4	41.6%
11	\$2,000	830.1	28.7%	1.0	49.8%	-0.3	40.7%

We can generally draw the same conclusions from the other three systems. However, there is one unusual observation. The smallest bet fixed ratio model seems to protect System 13-6 from ruin. We have no idea why this occurs.

Thus, our overall conclusion is that FRPS in which the initial bet size and the delta levels are arbitrarily selected seem to make trading more dangerous, and sometimes, much more prosperous. However, this is usually the case with position sizing methodologies that tend to quickly take large positions.

How to Improve Your Performance with FRPS

The key variables in FRPS are the increment and dampening factors, delta, and the number of units traded. Furthermore, the key to success with this method of position sizing lies in how to select these key variables as a function of the system being traded and the risk tolerance of the trader.⁸ In addition, we also must address what happens when some of our original equity is lost. As we address each issue, we will highlight the assumptions that were made in our study.

First, let's address delta, which is the per unit change that must occur before the position size is incremented up or down. We maintain that delta should be selected by considering the nature of the trading system as applied to the specific type of instrument being traded. In other words, our choice of delta would be very different for a position trader in the S&P as compared to a scalper of listed stocks.

Our first assumption is that delta should be tied to the maximum expected drawdown. We will obtain delta by use of simulations. *Our belief is that you must have some way of doing some basic simulations with your trading system to determine the average maximum drawdown (MaxDD) that you will likely achieve in terms of R.* We only use 100 simulations of 300 trades each to determine the MaxDD. In addition, we use the average (not the worst) for those simulations, so we could dramatically underestimate the actual worst drawdown that we will achieve.

Our second assumption was to use delta levels based upon what percentage of the maximum drawdown we might be able to tolerate. As an example, suppose we find that our system trading the S&P produces a MaxDD of \$12,500 through historical testing with one contract at a time. If we choose to set delta equal to $0.5 \times \text{MaxDD}$, then we would use a delta of \$6,250. Thus, a model that is 50% delta up and 50% delta down simply means that delta is equal to $0.5 \times \text{MaxDD}$ for both the increment and the dampening. Similarly, a model that is 100% delta up and 75% delta down means that delta is equal to $1.0 \times \text{MaxDD}$ for the increment factor and is equal to $0.75 \times \text{MaxDD}$ for the dampening factor.

With delta selected, we must now select the increment size for the number of contracts or shares traded. In Table 13-1, the increment level (INC) is equal to 1 contract, but we could just as easily start with 3 contracts and increment by 3 (i.e., INC=3). How do we choose INC to allow maximum equity growth yet operate within the comfort zone of the trader? That leads to our third assumption.

Our third assumption is that INC should be set by considering the initial capital that the trader is comfortable risking. So for example, suppose the S&P trader above starts with a \$100,000 account and is willing to risk 25% of this capital to begin trading (i.e., \$25,000). Since the MaxDD observed to date is \$12,500, it appears that starting with 2 contracts is likely to keep the trader's initial capital loss less than \$25,000 (i.e., INC = 2 seems appropriate).

Our fourth assumption is that INC is determined by dividing the acceptable initial capital loss by MaxDD. Here is how this works. Let's say our simulations give us a MaxDD for the distribution of 40R. We are willing to allow our account to decline as much as 25% from the start of trading, so our initial risk is $25\% / 40R = 0.625\%$ risk. Thus, as the expected MaxDD changes, the risk factor also changes.

Table 13-14 shows the assumed MaxDD in terms of R for each of the systems based on the 300 trade runs each simulated 100 times. Note that assumed Max DD would be larger as the sample of trades goes up. For example, the assumed Max DD for system one might be 49% for 300 trades and 56% for 2,500 trades. Table 13-14 also shows the starting bet size for 25% equity drawdowns. Notice the huge difference in the starting bets between the systems.

Table 13-14: Assumed R Max DD and Initial Risk Amount for the Six Simulations

System Used	Simulated MaxDD in terms of R	Starting Bet for 25% Equity Drawdown
13-1	49.1 R	\$510
13-2	22.6 R	\$1,104
13-3	36.7 R	\$681
13-4	8.9 R	\$2,800
13-5	55.0 R	\$472
13-6	94.1 R	\$266

Our fifth assumption, and one that produces a large impact for protecting initial capital, is that the number of units traded can be zero (i.e., paper trading). So for the S&P trader above,

suppose that after starting to trade 2 contracts, they experience a drawdown of $0.5 \times \text{MaxDD}$ (\$6,250) or larger. Now they must reduce their current number of units by INC resulting in 0 units being traded. Thus the fixed ratio algorithm is automatically forcing a return to paper trading even though trading has not necessarily stopped! When the paper trade results produce a paper gain of \$6,250 per contract, we now increment up and return to trading 2 contracts. In the event that a poor system was chosen to trade, we may find that the gains can never reach this level and thus the trader may never again risk real dollars on this particular system.

Our sixth and final assumption is to again stop trading when our equity drops by 40% from the starting level, which is considered failure. You might ask, "How could this happen when FRPS goes to paper trading when it is down one delta?" Well, there are two ways.

First, the simulation, once down one delta, paper trades an account until it is up one delta (but the real equity is still down one delta). Thus, when it resumes real trading, being down one delta, it could easily now go down another delta and our real equity would be down two delta. It would then again go to paper trading, and not start real trading until the paper trading account was up by one delta. However, when it again resumes real trading, the real equity is down two delta, and it could now go down another delta. Thus, the process might be a little slower, but FRPS could easily go down to 40%.

The second way that FRPS could go down to 40% is by taking a look at what would happen when it is up by one delta. Suppose we expect our worst case drawdown to be around \$360 trading 200 shares. Let's say that we step at 50% of the worst-case drawdown or \$180. Thus, we start with 200 shares, increment to 400 when we get to +\$180 and go to paper at minus \$180. Now that we are at the second level (400 shares), if we get a drawdown that requires us to reduce size, then we now have lost \$360 from our equity peak and are now at minus \$180 relative to our starting capital. If we again trade 200 shares and again lose \$180, which causes us to go to paper trading, we have now lost \$360 of our starting capital. Thus, we are already way below our intended drawdown for paper trading. *Obviously, this is a good reason to have the step down function be steeper than the step up function.* However, we won't do that in the initial simulations.

We decided to simulate 100 trades 5,000 times on all of our runs; this allows us to see plenty of action. Furthermore, we will begin each level with an account of \$100,000.

It's important to remember that *we've made three large assumptions that are highly favorable to FRPS.*

First, we've determined that our initial risk will be the tolerated equity drawdown (e.g. 25%) divided by the simulated MaxDD in terms of R. Failure is assumed to be a 40% drawdown and our risk is designed so that we are very unlikely to reach that level. Thus, we expect our probability of ruin to be essentially zero. In essence, we practically know that Systems 13-5 and 13-6 are losing systems at the beginning, so our initial risk with them is only 0.44% and 0.27%, respectively.

Second, we've decided that the FRPS simulations will revert to paper trading when they drawdown by one delta from the base equity. At this point, they won't start trading again until

they go above the one delta drawdown amount in paper trading. Theoretically, since the level of ruin is usually less than the level at which FRPS switches to paper trading, ruin should never be reached.

Third, we've added the possibility of switching from FRPS to a straight percent risk when this becomes a better alternative (i.e., a larger risk amount). Essentially, we set some switch up (i.e., up 100%) at which we either tell the simulation to switch to a percent risk model using the initial risk amount or keep using FRPS, depending on which has the larger bet size. This assumption gives FRPS a huge advantage when we have a good system.

Our goal is to evaluate the results of these simulations as effectively as possible. Does FRPS work even more effectively given the assumptions we've made? Is it a reasonable position sizing algorithm? In order to make this evaluation, we are going to focus on the statistics that were the most meaningful in part one:

- Average ending equity
- Probability of ruin (down 40%)
- % Gain / % Drawdown

In the new simulations, we will compare the percent risk models that have an initial bet size that is equal to the initial bet size of the FRPS model. As mentioned earlier, the initial bet size of the FRPS model depended upon the projected drawdown of the system. Thus, we will use a percent risk model as a comparison with the same initial percent risk as the comparable FRPS model.

As we looked at the data, it became clear that many of the variables we were manipulating to determine the best way to do FRPS were insignificant. Instead, the most important variables were the initial bet size (initial percent risk) and the nature of the system (System Quality NumberSM). With that in mind, we will sort our results according to the system, looking at the overall effect of five different data sets.

Data Set 1: The purpose of Data Set 1 was to explore the effects of different delta up and down values. This data set switched to paper trading with a 25% drop in equity. We ran eight different models:

Models	Delta Up	Delta Down
1	50%	25%
2	50%	50%
3	50%	75%
4	75%	50%
5	75%	75%
6	75%	100%
7	100%	75%
8	100%	100%

As stated earlier, we used our simulated MaxDD to determine delta up and delta down. Let's say that we determined through our 100 simulations of 300 trades that the MaxDD was \$12,500. If we

choose to set delta equal to $0.5 \times \text{MaxDD}$, then we would use a delta of \$6,250. Thus, a model that is 50% delta up and 50% delta down simply means that delta is equal to $0.5 \times \text{MaxDD}$ for both the increment and the dampening factors. Similarly, a model that is 100% delta up and 75% delta down means that delta is equal to the MaxDD for the increment factor and equal to $0.75 \times \text{MaxDD}$ for the dampening factor.

Overall results on this data set showed very little variability between the different percentages in delta up and delta down. We got fairly good performance from model 2 (delta up 50% and delta down 50%) so we stuck with that one in the other data sets unless otherwise mentioned.

Data Set 2: Enhanced Fixed Ratio. In Data Set 2 we put a switch variable in at 100% gain. When our account doubles, the simulator will go with the model that gives us the larger risk (i.e., FRPS or the initial starting risk percentage). In this data set, we simply varied the delta up and delta down percentages. We again ran the same eight models used for Data Set 1.

Data Set 3: The purpose of Data Set 3 was to determine the effect of under calculating the maximum drawdown. Three versions of FRPS with delta = 50% were run along with three versions of FRPS with delta = 50% with the option of converting to a straight percent risk when we are up 100%. We call this conversion model, enhanced FRPS. Here are the 6 models:

- FRPS with full maximum drawdown used,
- FRPS with 75% of maximum drawdown used,
- FRPS with 50% maximum drawdown used,
- Enhanced FRPS with full maximum drawdown used,
- Enhanced FRPS with 75% of maximum drawdown used, and
- Enhanced FRPS with 50% of maximum drawdown used.

Data Set 4: The purpose of Data Set 4 was simply to give a comparison with percent risk models. We used three percent risk models as a comparison:

- a 0.5% risk model,
- a 1% risk model, and
- Percent risk with full maximum drawdown used to calculate the starting risk (which is the same starting bet as most of the FRPS models).

Evaluation of Results

Simulation 1: Exploring the Effect of FRPS on a Weak System (System 13-1): In the first set of FRPS models, we will explore the effect of having different values for increasing delta up and delta down. We'll start with Data Set 4, our baseline set. Table 13-15 shows the results for the three percent risk models on System 13-1.

Table 13-15: Baseline Comparison with System 13-1				
Model	Starting Risk	Average Ending Equity	Probability of Ruin (Down 40%)	%Gain/% DD
0.5% Risk	\$500	\$107,734	0.0%	0.5
1% Risk	\$1,000	\$115,971	6.0%	0.6
MaxDD	\$510	\$107,932	0.0%	0.5

As you can see when the starting bet doubles, it doubles the increase in the average ending equity and it increases the probability of ruin (i.e., being down 40%) from 0 to 6%. So now let's look at Table 13-16, which compares the FRPS models in the first data set on System 13-1.

Table 13-16: Data Set 1 Results with System 13-1				
Model	Starting Risk	Average Ending Equity	Probability of Ruin (Down 40%)	%Gain/% DD
Delta up 50% Delta down 25%	\$510	\$104,459	0%	0.4
Delta up 50% Delta down 50%	\$510	\$108,740	0%	0.5
Delta up 50% Delta down 75%	\$510	\$110,019	0%	0.5
Delta up 75% Delta down 50%	\$510	\$107,015	0%	0.5
Delta up 75% Delta down 75%	\$510	\$108,046	0%	0.5
Delta up 75% Delta down 100%	\$510	\$108,997	0%	0.5
Delta up 100% Delta down 75%	\$510	\$107,734	0%	0.5
Delta up 100% Delta down 100%	\$510	\$108,304	0.1%	0.5

In my opinion, there is not much variation in the results to suggest that the models are different. The average ending equity ranges from \$104,459 to \$110,019, the probability of ruin is generally zero, and the percent gain to percent drawdown ratio is 0.5.

Now let's look at Data Set 2, where we have the option to switch to the percent risk model after 100% gain if it is the larger bet. Remember that in Data Set 2 our main variable is again our delta up and delta down numbers. Table 13-17 shows the results. Again, there is not much difference in the results. The various FRPS models don't seem to add much or subtract much with a weak system.

Table 13-17: Data Set 2 Results with System 13-1

Model	Starting Risk	Average Ending Equity	Probability of Ruin (Down 40%)	%Gain/% DD
Switch at 1.0 50%/50% model	\$510	\$108,740	0%	0.5
Switch at 0.75 50%/50% model	\$510	\$108,740	0%	0.5
Switch at 0.5 50%/50% model	\$510	\$108,740	0%	0.5
Switch at 0.25 50%/50% model	\$510	\$108,741	0%	0.5
Switch at 1.0 75%/75% model	\$510	\$108,461	0%	0.5
Switch at 0.75 75%/75% model	\$510	\$108,461	0%	0.5
Switch at 0.5 75%/75% model	\$510	\$108,461	0%	0.5
Switch at 0.25 75%/75% model	\$510	\$108,461	0%	0.5

Finally, let's look at Data Set 3. This is shown in Table 13-18. The models in Data Set 3 are basically underestimating the drawdown amount. However, they use a constant delta up of 50% and delta down of 50%. Remember the first three models are with simple FRPS and the second three have the option to convert to a percent risk model after a gain of 100%.

Again, the results shown in Table 13-18 suggests that nothing happens in a weak system when you have the option to switch to a percent risk model when it becomes a larger bet size. And the reason is obvious—the equity doesn't grow enough to make the switch. The results clearly indicate the ending equity and the probability of ruin are both strongly related to the initial risk.

Table 13-18: Data Set 3 Results with System 13-1

Model	Starting Risk	Average Ending Equity	Probability of Ruin (Down 40%)	%Gain/% DD
FRPS with 100% DD	\$510	\$108,740	0%	0.5
FRPS with 75% DD	\$680	\$112,066	0.2%	0.5
FRPS with 50% DD	\$1,019	\$118,312	4.1%	0.6
Enhanced FRPS with 100% DD	\$510	\$108,740	0%	0.5
Enhanced FRPS with 75% DD	\$680	\$112,066	0.2%	0.5
Enhanced FRPS with 50% DD	\$1,019	\$118,312	4.1%	0.6

Simulation 2: Exploring the Effect of FRPS on a Losing System (System 13-6). Obviously, when we look at a losing system in Table 13-9, there is no need to look at enhanced FRPS because we are never going to gain enough to need to convert to a straight percent risk model. Thus, we'll basically just look at our baseline data and see if FRPS changes it. We expect that it might since it does switch to paper trading after a drawdown.

Table 13-19: Baseline Comparison with System 13-6 (Losing System)				
Model	Starting Risk	Average Ending Equity	Probability of Ruin (Down 40%)	%Gain/% DD
0.5% Risk	\$500	\$96,113	1.3%	-0.2
1% Risk	\$1,000	\$92,625	25.6%	-0.2
Max DD	\$264	\$97,979	0%	-0.2

Clearly, the model, which already knows the maximum drawdown of the system, should protect us from ruin.

Data Set 1: When we looked at Data Set 1, there was little variability in the data. The average ending equity ranged from \$97,998 to \$98,815. The probability of ruin was zero for all eight models. And the percent gain divided by the percent drawdown was negative 0.2. Thus, we appear to gain the most by basing our starting equity on the maximum drawdown. And, of course, there is no reason for FRPS to switch to a percent risk model when trading a losing system because the straight percent risk will never become a larger bet size.

Data Set 2: Data Set 2 involves the option of converting to a percent risk after a 100% gain, which again will seldom⁹ happen in a losing system. Thus, we will now look at Data Set 3 to determine the effect of underestimating the drawdown. Obviously, this is not a good practice with a losing system or any system for that matter.

Data Set 3: Table 13-20 shows the results that occur when we underestimate our worst-case drawdown with a losing system. We only show the first three models because the performance was not good enough to convert to percent risk in System 13-6.

Table 13-20: Data Set 3 Results with System 13-6 (Losing System)				
Model	Starting Risk	Average Ending Equity	Probability of Ruin (Down 40%)	%Gain/% DD
FRPS with 100% DD	\$264	\$98,045	0.0%	-0.2
FRPS with 75% DD	\$352	\$97,438	0.0%	-0.2
FRPS with 50% DD	\$528	\$92,284	0.2%	-0.2

Obviously, with a losing system we are better off using a 100% drawdown estimate to minimize the initial risk. It doesn't stop the losses, but it minimizes them.

Simulation 3: Exploring the Effect of FRPS on a Great System (System 13-4). Since System 13-4 is a great system with a System Quality NumberSM over 4, we can expect to make a lot of money. Let's see what happens when we apply FRPS to this system. And, since we can expect good gains, we'll also need to look at what happens when we convert back to a straight percent risk position sizing (i.e., enhanced position sizing).

Our baseline data is given in Table 13-21.

Table 13-21: Baseline Comparison with System 13-4 (Great System)				
Model	Starting Risk	Average Ending Equity	Probability of Ruin (Down 40%)	%Gain/% DD
0.5% Risk	\$500	\$181,353	0.0%	24.5
1% Risk	\$1,000	\$327,758	0.0%	34.5
Max DD	\$2,800	\$2,684,676	0.0%	143.7

Now let's look at the results of the eight models in Data Set 1 on our great system. These are shown in Table 13-22. Notice that the results of these eight models are not very different from the baseline model based upon the maximum drawdown, which uses the same starting equity.

Table 13-22: Data Set 1 Results with System 13-4				
Model	Starting Risk	Average Ending Equity	Probability of Ruin (Down 40%)	%Gain/% DD
Delta up 50% Delta down 25%	\$2,800	\$2,932,492	0.1%	130.2
Delta up 50% Delta down 50%	\$2,800	\$3,212,064	0.1%	138.1
Delta up 50% Delta down 75%	\$2,800	\$3,326,888	0.4%	140.6
Delta up 75% Delta down 50%	\$2,800	\$2,410,865	0.0%	114.8
Delta up 75% Delta down 75%	\$2,800	\$2,568,502	0.1%	119.2
Delta up 75% Delta down 100%	\$2,800	\$2,596,890	0.1%	119.6
Delta up 100% Delta down 75%	\$2,800	\$2,132,965	0.1%	115.7
Delta up 100% Delta down 100%	\$2,800	\$2,172,086	0.1%	106.8

Now let's look at Data Set 2. Here we have the option of switching to a percent risk after our equity moves up 100% if percent risk (based upon the initial starting risk percentage) becomes a larger risk. Besides that option, the primary variable we are looking at is the various increases in delta up and delta down. These results are shown in Table 13-23.

Table 13-23: Data Set 2 Results with System 13-4 (Great System)

Model	Starting Risk	Average Ending Equity	Probability of Ruin (Down 40%)	%Gain/% DD
Delta up 50% Delta down 25%	\$2,800	\$4,762,369	0.1%	203.9
Delta up 50% Delta down 50%	\$2,800	\$5,148,650	0.1%	214.4
Delta up 50% Delta down 75%	\$2,800	\$5,318,031	0.1%	217.8
Delta up 75% Delta down 50%	\$2,800	\$4,030,441	0.1%	183.1
Delta up 75% Delta down 75%	\$2,800	\$4,248,761	0.1%	188.7
Delta up 75% Delta down 100%	\$2,800	\$4,292,895	0.1%	189.5
Delta up 100% Delta down 75%	\$2,800	\$3,654,680	0.1%	171.4
Delta up 100% Delta down 100%	\$2,800	\$3,712,296	0.1%	173.0

These results suggest that when you do have a good system, the delta level can make some difference. It further suggests that a 50% delta (at 50% of the maximum drawdown) is much better than a delta based upon a larger percentage of the maximum drawdown.

And finally, let's look at what happens when you underestimate the drawdown with a good system. This basically means you will be risking more per trade (since you expect the drawdown to be less). These results are shown in Table 13-24. We are seeing two key principles in this data.

- First, the more you risk in your starting bet the better your final equity and the greater the probability of ruin.
- Second, we also see that, given the FRPS, the option of switching to a straight percent risk, after we are up 100% and percent risk becomes the larger bet, clearly increases this effect. Basically, the higher the starting risk (which occurs when we underestimate the drawdown), the bigger the average ending equity. Furthermore, giving the system the option to switch to the method with the larger bet size clearly increases the system's performance.

Table 13-24: Data Set Three Results with System 13-4 (Great System)

Model	Starting Risk	Average Ending Equity	Probability of Ruin (Down 40%)	%Gain/% DD
FRPS with 100% DD	\$2,800	\$3,212,084	0.1%	138.1
FRPS with 75% DD	\$3,733	\$4,919,918	1.1%	179.9
FRPS with 50% DD	\$5,599	\$7,935,891	4.6%	236.8
Enhanced FRPS with 100% DD	\$2,800	\$5,148,650	0.1%	214.4
Enhanced FRPS with 75% DD	\$3,733	\$7,735,711	1.1%	277.9
Enhanced FRPS with 50% DD	\$5,599	\$12,873,012	4.6%	380.9

Simulation 4: When to Switch Back to a Straight Percent Risk. In our results to date, we have reverted to a percent risk model when that became the larger bet size. However, as Table 13-1 shows that might not happen until one's equity has increased by a very large amount. To test this out, we ran one last simulation.

Each model started out with \$100,000 and an initial bet size of \$2,800 on the great system (i.e., System 13-4). The primary difference between the models was the switch point—where does the model switch to a straight percent risk? We compared eight different switch levels with a mandatory switch and the option to switch at that level once the percent risk model became the larger bet. These results, giving the system's average ending equity, are shown in Table 13-25.

When you look at the data in Table 13-25, you can clearly see that with a good system, the later the switch, the better the results. In addition, the optional switch also shows much higher average ending equities. Thus, when you have a good system, the results suggest that risking the most will give the best results. Furthermore, switching to a fixed percentage only when it is a larger risk than the percentage at which you were risking with FRPS, clearly gives better results.

Table 13-25: The Effect of Various Switch Percentages on Ending Equities with Mandatory and Optional Switches

Switch Level	Mandatory Switch	Optional Switch
50%	\$3,074,694	\$5,330,033
100%	\$3,491,680	\$5,328,540
200%	\$4,098,602	\$5,326,623
300%	\$4,529,363	\$5,325,726
400%	\$4,828,393	\$5,325,411
500%	\$5,038,715	\$5,324,869
600%	\$5,182,660	\$5,324,066

The same results also occur when we look at the percent gain divided by the percent drawdown. The best results with a great system occur when you switch at higher numbers. And the best results occur when you don't switch until the percent risk model gives you a higher risk amount. These are shown in Table 13-26.

Table 13-26: The Effect of Various Switch Percentages on %Gain/%Drawdown Mandatory and Optional Switches		
Switch Level	Mandatory Switch	Optional Switch
50%	155.5	222.9
100%	166.5	222.9
200%	182.9	222.9
300%	195.9	222.9
400%	205.4	222.9
500%	212.6	222.9
600%	217.4	222.9

Once again, we want to point out that these results will only occur with a great system. If you have a poor system or a marginal system, high risk will generally produce bigger losses. Furthermore, we'd also like to point out that we have not looked at how smooth our equity curves are. Generally, high risk, even in good systems, produces very rough equity curves with some nasty drawdowns that many people would not be happy with.

Conclusion

Fixed Ratio Position Sizing is very complex. There are many variables involved and it takes some work to understand it. However, if you are willing to put in the work, then there are some major benefits to using it based upon our conclusions.

Remember that our conclusions were based on many simulations, not just one or two tests of historical data. However, *simulations assume that one trade is taken at a time and that we have no possibility of multiple correlated trades*. We also assumed a fixed maximum risk based upon the estimated MaxDD. This is a lot different from taking one contract, be it corn (which could be much less than the assumed risk level) or a full S&P 500 contract (which could be much greater than the assumed risk level).

In our exploration on FRPS, we concluded that using delta levels randomly without regard to our drawdowns was quite dangerous. Approximately, 40% of our fixed ratio models resulted in total failure, meaning a probability of ruin greater than 25%. However, when we use our estimated maximum drawdown to calculate our initial risk, that problem totally disappears. This still doesn't give us much of an advantage over a percent risk model doing the same thing.

Our second conclusion is that with poor systems or weak systems, FRPS shows very little difference from a straight percent risk. *However, both position sizing methods show zero failure because the initial bet size was based upon a pre-simulation of the maximum drawdown.*

Third, when we have a great system, fixed ratio position sizing still doesn't outperform a percent risk model when we calculate the initial bet size based upon the maximum drawdown. *Clearly, our main lesson here is how important it is to simulate the maximum drawdown and use that information to calculate an optimum bet size.*

Fourth, FRPS will clearly outperform a straight percent risk when it is used to jump-start a good system and then switch to a straight percent risk model when the percent risk becomes the larger bet size. However, we have compared FRPS only with a straight percent risk position sizing model. My guess is that market's money position sizing models would perform at a comparable level and they are much easier to understand.

Lastly, I've seen another version of FRPS, called Generalized Ratio Position Sizing (GRPS); in this method you simply adjust the speed at which position sizing increases with FRPS. I have elected not to discuss this method here because 1) I have not tested it and 2) numerous assumptions are necessary to make FRPS work and I'm not sure how they would apply to GRPS.

Model 16: Using Fixed Ratio Position Sizing

I still feel apprehensive talking about actually using FRPS for three reasons: 1) It doesn't feel intuitively logical to me. 2) It is complex and I think you can accomplish the same result with some of the other methods given earlier. 3) I still believe that the probability of ruin during a price shock is very high. Nevertheless, I know people who are trading it successfully.

In order to trade this method and reach your objectives, I believe you need to go through the following checklist.

Checklist to Trade FRPS

First, ask yourself, "Is my system good enough?" Don't use FRPS if you don't have a System Quality NumberSM of at least 2.5. Otherwise, your potential risk of ruin is just too high.

Second, through historical testing, you must determine what your worst-case drawdown would be in terms of dollars on your most expensive contract. In addition, you must simulate your system through 100 trades several hundred times and determine the worst maximum drawdown in terms of R (of the several hundred simulations) and the average maximum drawdown in terms of R (over the several hundred simulations). You have three choices of how you might do the simulations:

- Simulate your R-multiple distribution in a bag of marbles and then pull out 100 marbles, replacing it in each case, while keeping track of your worst drawdown during the 100 trades. At the end of the 100 trades, write down your worst-case drawdown in terms of R. Repeat this process 200-300 times.

- Use the simulation feature in the *Secrets of the Masters™ Trading Game* to do the same thing. Version 4.0 of the game will actually keep track of the R-multiple drawdowns for you.
- If your programming skills are good enough, develop a simulator in Excel to do this task for you.

You could use your average maximum drawdown, but I recommend that you use the peak maximum drawdown that you achieve out of all of your simulations. This will give you a little leeway just in case you've underestimated your worst-case losses in your R-multiple distribution.

Third, determine how much of your initial capital you are willing to lose. You decide the number based upon the objectives that you've set for yourself. Now divide the maximum drawdown that you experienced into the amount of initial capital that you are willing to lose. This will determine your INC factor. If your maximum drawdown is bigger than the amount you are willing to lose, then you cannot use FRPS.

Fourth, you must set delta to be equal to half of the maximum drawdown that you achieved during your historical testing on the most expensive contract.

Fifth, if you draw down by more than half of your maximum drawdown, you must stop real trading and revert to paper trading until you increase your paper equity by the amount of your maximum drawdown. Once you've done that you can resume trading. Our assumption is that the system is now working well again. But be careful because your system could now be ready for another drawdown and you are already at half of your maximum level. Remember that what we're trying to do is help you avoid your maximum drawdown. If you don't care about getting a drawdown that was bigger than your past drawdown in your simulations, then you may skip this step.

We are not going to stop trading if we reach a certain drawdown level because we are assuming that your objective is to reach a maximum profit objective at all costs. However, if you have a drawdown that you would consider ruin, then you must also stop trading at this level.

Even with these guidelines there are still questions you must answer for yourself. My belief is that you can only answer the questions for yourself once you have extensive experience using this method.

What sort of dampening factor will you use? Will you reduce your size at the same speed that you increased it? Or will you reduce your size at twice the speed that you increased it? My recommendation would be to use the same speed for reducing contracts as you did for increasing them, at least until you become much more familiar with the method.

What is the maximum “bet level” that you will use per unit? Remember in our examples, we used \$500 to \$2,000. You might begin by using 0.5% of your account as the smallest unit until you are very familiar with FRPS. This really means that you CANNOT take a position if the risk in that position is more than 0.5%. This assumption totally defeats Ryan Jones' use of the method,

but to do otherwise could be dangerous to your financial health until you are familiar and very comfortable with the method.

How you will handle multiple correlated positions? We cannot simulate this variable, but it could be very important. Here is my best estimate of how you should handle the issue: When you decide that you are 1) comfortable with the method and 2) willing to take on multiple, simultaneous positions, then I'd suggest that you use the System Quality NumberSM guidelines given in the previous chapter for determining your total portfolio heat. Use the guidelines from the previous chapter to determine your optimal target risk percentage. You can then divide that percentage by the maximum possible number of positions that you might have at one time to determine the risk per position that you can take on with FRPS. This will be your maximum bet size per unit that you will use throughout this method.

When will you revert back to a straight position sizing model? At some point as your equity grows, as shown in Table 13-1, your total risk with FRPS will be smaller than a straight percent risk model and it is logical to simply switch. However, you could use all of the criteria that I suggested, in the previous chapter, for when the market's money reverts back to core equity in your decision making with this method.

Advantages and Disadvantages of FRPS

As I mentioned before, I consider FRPS to be the most complex of all of the position sizing models. I have worked closely with many traders in their position sizing, but have never worked with someone who was using FRPS except Chris Anderson (see Chapter 16). Furthermore, I have never used it myself. Thus, my understanding of this model comes only from the simulations that you've read about in this chapter. I don't have a good "feel" for FRPS, so if you decide to use this method you'll need to answer your own questions. However, I would love any feedback you might have if you decide that this method is right for you, once you've had a lot of experience with it.

Nevertheless, based upon the little experience I've had with simulating FRPS, I have been able to develop a list of the advantages and disadvantages. These are shown in Table 13-27. And my list might change as I develop more experience and "feel" for this method.

Table 13-27: Advantages and Disadvantages of FRPS	
Advantages	Disadvantages
Small accounts can increase their positions sizing very rapidly.	FRPS is very complex.
With delta based upon the worst drawdown you experienced in historical testing and a good system, FRPS works well.	Requires some historical testing and some simulation to determine what variables to use.
It's clearly better at achieving profit objectives than a simple percent risk (with delta > \$2,000) with a good system.	When you have a poor system, the results of FRPS can be dangerous.
A great method to jumpstart a trading system, providing precautions are taken.	Potential for bankruptcy with multiple positions when a price shock occurs.
Can jumpstart a small account.	May not have any advantage over scaling in or market's money methods.
	It is not easy to get a good feel for this methodology.
Can control the exposure based upon expected MaxDD.	Must do this or the method is very dangerous.

NOTES

¹ This model is called fixed ratio, as opposed to fixed fractional, which is what many people call the percent risk model.

² Chris Anderson had a significant role in this chapter as he did all of the actual research. See Chapter 16.

³ Jones, Ryan. *The Trading Game*, New York: Wiley, 1999.

⁴ Ryan Jones talks about 10% risk in a position like it is an everyday occurrence and that was one of my objections to his book. Most professionals would consider 3% risk per position to be gun slinging, so 10% risk could be horrendous.

⁵ Ryan Jones would make no fixed assumptions about risk. A unit could have any amount of risk. Thus, one unit could carry \$1,300 worth of risk and two units might carry \$5,000 and \$800, respectively.

⁶ The value of one corn contract is about \$15,000 while the value of a full S&P 500 contract is about \$250,000 (i.e., with the S&P 500 at 1,000). The potential risk difference between the two is huge. For example, a 1% risk on corn is \$150 versus \$2,500 for the full S&P contract.

⁷ Remember that we are making one trade at a time with these systems for both the percent risk and the FRPS models. Even with a very good system, many correlated positions, each traded at a high risk level could easily produce financial ruin.

⁸ In our opinion, Ryan Jones does not adequately address these selection issues in his discussions and we hope this study will add some new insight into how to do it.

⁹ A losing system easily can produce a sample of trades with a positive expectancy.

Chapter 14

Position SizingSM Methods to Help You Avoid Ruin

You must determine what you can tolerate in terms of ultimate losses in your account and in terms of peak-to-trough drawdowns. If you are willing to lose your entire account, then you can freely use any of the methods in Chapters 12 and 13. But if you have limits to what you can tolerate, then you must use some position sizing methods that help you limit ruin and drawdowns.

How much would you allow your account to decline before you decide it's time to stop trading? Would it be 10% or 25%? Would it be 50%? Or would it be the whole value of your account? Whatever it is, wouldn't it be a good idea to design your position sizing strategy so that didn't happen?

Also, think about how much of your profits you'd be willing to give up. Let's say you are up 120% on the year. We've been calling your profit the market's money. But how much of the market's money are you willing to give up to meet your goals? All of it? 50%? How much? Before you answer, imagine that your account has gone from \$150,000 to \$360,000 in a period of six months. How do you feel? Now imagine it is back down to \$240,000. You are profitable, but you've just lost a third of your account value. How do you feel? Remember how much you put into growing the account to \$360,000. Now, it's back down to \$150,000. You've lost all of your profit. How do you feel? Now it's down to \$70,000. All of your profit is gone and you've lost more than half your equity. How do you feel? With those feelings in mind, you can now begin to determine how much of your profits you might be willing to lose.

Here is the way most people view drawdowns in their account. Suppose you open an account for \$50,000 on August 15th with a well-known money manager. 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, your manager may still be in all of the same trading positions. But as a professional, his account is "marked to the market" at the end of the month and statements go out to you telling you that your account is now worth \$80,000 and you are thrilled.

Now, let's say that your manager's positions start to go down quickly starting around the 6th of October. Your manager closes them out around the 14th of October and your account is now worth about \$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 manager's trades were winners. It doesn't really matter as far as clients are concerned. They (i.e., you) still believe that they just lost \$20,000 (or 25%) of their money. As the money manager, you might feel pretty good about it because you are up 20% on positions you've held just a few months. You think that's pretty good performance. But as a client, you feel a distinct sense of loss.

Let's say that your manager now makes some winning and losing trades, and by August 30th of the following year, the account is now worth \$52,000. It has never gone above \$80,000, the previous peak. The account now has a peak-to-trough drawdown of \$28,000—or 35%. You are up 4%, but the account is now at the bottom of a 35% peak-to-trough drawdown. How do you feel?

How is your money manager treated for his performance? He's not treated very well. As far as the industry is concerned, he has an annual rate of return of 4% (i.e., the account is only up by \$2,000) and he's given the label of "*having a 35% peak-to-trough drawdown.*" And the ironic thing is that most of the drawdown occurred at a time in which he didn't have a losing trade—he just managed to give back some of his profits. Nevertheless, he is still considered to be a terrible money manager because he had a gain to drawdown ratio of 1 to 8.75. *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 client's viewpoint—you watched \$28,000 of your money disappear. To you it's a real loss. You could have asked for your money on the first of October and been \$28,000 richer. And you certainly don't think about those paper profits as the market's money.

Now are you beginning to see why it is also important to use position sizing strategies to limit your drawdown? Your trading system has a small role in limiting risk and drawdowns, but most of the job of limiting drawdowns falls upon your position sizing strategy.

Using Position Sizing to Limit Your Downside Potential

The procedures in this chapter are devoted to helping you (and individuals for whom preservation of capital is their most important goal) avoid disaster or your worst-case drawdown.

Model 17: Using Your System Quality NumberSM to Determine How to Limit Risk

Suppose your primary goal as a trader is to make sure you keep your money. You might be willing to lose 10% in order to make 20%, but if you lost 20% that would be a disaster. It would be much worse to lose 20% of your account than it would be to make 20%. Thus, you need to design a position sizing goal that is centered on making sure that you don't hit your ruin mark.

One way to do that would be to simulate your system for 100 trades 10,000 times at various risk levels to determine what levels you could safely trade and not reach ruin. I looked at seven systems with System Quality NumbersSM of approximately 1.0, 2.0, 3.0, 4.0, 5.0, 6.0 and 7.0 that were developed in Chapter 3. These were labeled System SQN1 through SQN7, respectively. I then did 10,000 simulations of 100 trades each with risk levels ranging from 0.2 to 10% in 0.2% increments to determine at what point the systems broke down. Breaking down was defined as when the probability of ruin given (the drawdown percentage on the left in the table) was greater than 1%, and the numbers in the table represent the risk percentages just before that breakdown.

I've defined this level as the 1% ruin level percentage. The table shows ruin levels ranging from 5% to 50% in 5% increments. This data is presented in Table 14-1.

Table 14-1: Risk Percentages and Ruin Levels (with less than a 1% chance of ruin being reached)							
Systems Used Based Upon System Quality NumberSM and Largest Loss							
	SQN 1	SQN 2	SQN 3	SQN 4	SQN 5	SQN 6	SQN 7
Ruin Level (Drawdown) ▼							
5%	0.0%	0.2%	0.4%	0.4%	0.6%	0.8%	0.8%
10%	0.0%	0.4%	0.8%	0.8%	1.2%	1.8%	1.8%
15%	0.0%	0.8%	1.2%	1.4%	1.8%	2.8%	2.8%
20%	0.2%	1.0%	1.8%	1.8%	2.6%	3.8%	3.8%
25%	0.2%	1.4%	2.2%	2.4%	3.2%	4.6%	4.8%
30%	0.2%	1.8%	2.6%	2.8%	3.8%	5.8%	5.8%
35%	0.2%	2.0%	3.0%	3.4%	4.6%	6.8%	6.8%
40%	0.4%	2.4%	3.6%	4.0%	5.6%	7.6%	7.8%
45%	0.6%	2.8%	4.2%	4.6%	6.2%	8.8%	8.8%
50%	0.6%	3.2%	4.8%	5.2%	6.8%	9.4%	9.8%

So let's look at an example from the table. Let's say we define ruin as being down 25% and we have an SQNSM of 4. What we see is that we can risk 3% just before there is a 1% chance of reaching our 25% ruin level. However, with a poor system (SQNSM = 1) we can only risk 0.2% before that happens.

I repeated this study, only this time, ruin was defined as being a probability of ruin just under 10%. The data given in Table 14-2 include the percent risk level just before a 10% probability of breakdown. These numbers will provide you with a little more leeway in your total risk should you decide to use them.

As a result of this research, you can simply look up the ruin level percentage for your System Quality NumberSM for whatever drawdown level you happen to call ruin. This will generally give you the portfolio heat that you can use if you want to avoid that level of ruin. You will then divide that portfolio heat by the maximum number of positions you are likely to have on at one time to determine your individual position size.

Table 14-2 shows that with a SQNSM of 4 and ruin defined as being down 25%, we can now risk 6.2% before we have a 10% chance of a 25% drawdown. Remember that this is the portfolio heat, and you must divide this figure by the number of simultaneous trades. With a poor system (SQNSM = 1), we can still only risk 0.4% before getting a 10% chance of ruin and again this is portfolio heat.

Table 14-2: Risk Percentages and Ruin Levels (with less than a 10% chance of ruin being reached)							
Systems Used Based Upon System Quality NumberSM and Largest Loss							
	SQN 1	SQN 2	SQN 3	SQN 4	SQN 5	SQN 6	SQN 7
Ruin Level (Drawdown) ▼							
5%	0%	0.4%	0.8%	0.8%	1.4%	2.4%	4.8%
10%	0%	1.0%	1.8%	1.8%	3.0%	4.8%	9.8%
15%	0.2%	1.6%	2.6%	2.8%	4.6%	7.4%	14.8%
20%	0.2%	2.2%	3.4%	3.8%	5.6%	9.8%	17.4%
25%	0.4%	2.8%	4.2%	4.8%	6.6%	12.4%	18.2%
30%	0.4%	3.4%	4.2%	5.8%	7.8%	14.8%	18.6%
35%	0.6%	4.0%	6.0%	6.8%	8.8%	16.6%	18.6%
40%	0.8%	4.4%	7.0%	7.4%	9.8%	17.0%	19.6%
45%	0.8%	5.0%	7.8%	8.6%	10.8%	17.6%	19.6%
50%	1.0%	5.8%	8.4%	9.7%	11.8%	18.6%	19.6%

Based upon these guidelines, there are several conclusions that we can draw from our two tables. First, a large portfolio of correlated positions can only tolerate a small amount of portfolio heat if your goal is to avoid ruin. For example, if you have a very good system, with a System Quality NumberSM of about 4 and a goal of not having a 25% drawdown with a 10% tolerance level, then you cannot have any more than 6.2% total risk in your portfolio. This means that if you have 10 correlated positions, none of them can have more than 0.62% risk. And even that risk level still gives you about a 10% chance of ruin if your positions are strongly correlated. If you needed almost no chance of a 25% drawdown, then you would have to use Table 14-1. Your portfolio heat would now become 3.0% with an individual risk of 0.3% assuming ten positions.

Second, if you have little tolerance for drawdowns at all and want something like a 1% tolerance on a 10% drawdown, then you must have 1) a superb trading system, 2) very few positions on at one time, or 3) very small risks levels of about 0.2%. In fact, my suggestion would be that if you want low drawdowns, then you must at least allow a 10% probability for those drawdowns (use Table 14-2).

Third, our level of ruin is not only influenced by the System Quality NumberSM, it is also influenced by the worst-case loss in terms of R that we could face. Systems SQN 1 through 5 all have a worst-case loss of 5R. When I repeated the study with systems with smaller worst-case losses, then the risk tolerance levels went up. However, there is always a worst-case loss you don't know about, so a conservative estimate would use these tables even if you've never seen a loss worse than 3R.

By the way, notice that having a worst-case loss of 5R puts the portfolio heat ceiling at about 20%. With a 2R, it could conceivably reach as high as 50%. Remember, however, that you will be

dividing that portfolio heat by the maximum number of positions that you could have on at one time to determine your individual position risk and won't be risking near ruin when the 5R does come up.

Because the risk percentages that we suggest for avoiding ruin are very low, they offer very little chance of making significant gains. As a result, the remaining methods are all designed to help you maintain your original capital—that is, not have a significant loss in your original capital, while at the same time using profits to allow your money to grow a little more. Market's money position sizing, model 14, also helps with this type of objective.

Model 18: Two-tier Position Sizing

Let's say your investment priorities are to achieve your desired goal, but you still want to make sure that you never achieve ruin. You are not as concerned about drawdowns once you have profits, so you are willing to push a little more, but you want to make sure that you never achieve a particular drop to your original equity. The following two-tier methods can help you accomplish this.

Using the Market's Money. There are many ways to use the market's money. For example, you could risk the less than 1% chance of ruin level on your core equity and the optimal target risk percentage to achieve your objectives on the market's money. This method was discussed in Chapter 12. However, just as there are numerous ways to calculate market's money, there are also numerous ways to do two-tier position sizing with a market's money model. Be creative.

Optimal Goal Switch at a Critical Equity Level. The optimal goal switch differs from market's money in that at some critical equity level you switch to a different percentage risk on your entire equity. So let's say your first level was 0.5% risk and your second level was 2% risk. The optimal goal switch might determine that you would switch to 2% risk when you are up 25% with the idea that a drawdown of 20% (which would get you back to breakeven) was unlikely.

Let's explore the worst-case effects of your optimal position sizing risk level. For example, suppose you use System 13-2, described in the last chapter, and you simulate 100 trades 10,000 times. In our simulation, we assumed that our goal was to make 300% in our 100 trades and we stop trading (i.e., ruin) at 25%. The results are shown in Table 14-3.

Table 14-3: Optimal Bet Size of System 13-2					
Approach	Optimal Risk %	Probability of Objective	Probability of Ruin	Average Gain	Median Gain
Max. Return	8.2%	5.0%	94.2%	181.8E+3	-42.2%
Med. Return	1.4%	38.7%	32.6%	393.2%	175.6%
Opt. Retire	1.6%	39.9%	38.5%	504.2%	157.1%
<1% Ruin	0.2%	0.0%	0.0%	28.3%	26.8%
>0% Ruin	0.4%	0.1%	1.4%	64.2%	57.5%
Retire-Ruin	1.2%	34.3%	26.7%	298%	168.3%

Based upon Table 14-3, we decide that our base level risk will be 0.4%, which only gives us a 1.4% chance of ruin, taking one trade at a time. However, what is our second tier risk and when do we start using it?

The median return comes in at 1.4% and the optimal retire comes in at 1.6% and the maximum difference between retire and ruin comes in at 1.2%, so we decide to use 1.2%. This gives us nearly a 35% chance of reaching our goal (if started at the beginning). But when do we start it?

Our simulator tells us that at 1.2% our average drawdown will be about 40%. Thus, we make the assumption that we need to be up at least 40% to make the switch. If we started out at \$100,000 and switched at \$140,000, then if we immediately went into a 40% drawdown, we'd be down to \$84,000—which is still above the ruin level.

Now you have an idea how this works, so let's compare market's money versus the two-tier approach. Table 14-4 shows the advantages and disadvantages of both approaches.

Table 14-4: Comparison of Market's Money Versus the Two-Tier Approach

Market's Money Approach		Two-Tier Approach	
Advantage	Disadvantage	Advantage	Disadvantage
Risk more when you have profits.	Most money is still risked at base level.	Conservative until you are up considerably.	Less likely to meet objectives.
Is always conservative with core equity.	No huge jumpstart to equity climb.	Big jump in risk at the second tier.	You risk a strong possibility of giving profits back.

There are two key differences in the approaches. First, market's money starts risking more as soon as you have profits. This means you have a better chance of meeting your objectives; however, most of the money is still risked at the base position sizing level. On the other hand, the two-tier approach doesn't start until you are up considerably. Once it does start, your risk level jumps considerably as you are risking your total equity at the second tier.

The second key difference is the jump. The jump in the two-tier model may never occur because you may never gain enough to reach the second tier. And when you do reach the second tier, you are risking enough that you have a distinct possibility of giving back all of your profits.

My bias is clearly in favor of the market's money approach. However, your circumstances may be unique and you might find that under certain conditions the two-tier approach is perfect for you. **Remember that if you use a simulator that assumes you are making independent trades to determine your risk levels, then the levels you are calculating are really portfolio heat levels.**

Model 19: Multiple Tier Approach

The advantages of the two-tier approach also suggest that one could use a multiple tier approach to position sizing. For example, suppose you were trading System 13-2 with the objective of making 300% and not having a 25% drawdown.

You start out risking 0.4%, which only gives you a 1.4% chance of ruin. When you are up 5%, you increment to a total risk of 0.6%. You are successful at 0.6%, so when you are up a total of 10%, you jump up to 0.8% risk. You simply continue this process, incrementing 0.2% every time you increase your equity by another 5% until you reach your maximum risk level of 1.2%.

You could also combine this approach with a dampening factor. The dampening factor could be 100%, 50%, or 25%. Here's how that would work:

We'll start out using a 100% dampening factor. If you are up 5%, then you increment to 0.6% risk. If you are up 10%, then you increment to 0.8% risk. However, if you now drawdown to where you are only up 5% (i.e., 100% of your increment factor), then you move back down to 0.6% risk.

A 50% dampening factor would simply work twice as fast. If you were up 5%, you would move to 0.6% risk. When you increase your equity to 10% above the base, you move up to 0.8% risk. However, if you move down to where you are only up 7.5% risk, you would move back down to 0.6% risk. And if your equity decreases 10%, you would move back down to the original 0.4% risk. Notice that with a 50% dampening factor, you decrease twice as fast as you increase your position sizing. A 25% dampening factor would work twice as fast as that, but probably would not be practical when you increment every 5%.

Model 20: Using the Maximum R-Drawdown

Let's use the same example of trading System 13-2 with the objective of avoiding a 25% drawdown at all costs. And here, we are talking about a drawdown at any time in the equity curve of 25%—not just a drawdown of 25% from the starting equity. To do that we'll calculate the maximum drawdowns of our system in terms of R.

Table 14-5 shows the drawdown results from simulating System 13-2 for 100 trades and doing 10,000 simulations. We are looking at the maximum drawdown in terms of R during each of the 10,000 simulations. The probability figures show the probability of a drawdown equal to or greater than the R-value shown.

The median maximum drawdown was 38R. But in 1,000 of the simulations (i.e., 10% of them) we had a maximum drawdown of 60R. Let's use this 10% level to do our calculations. Thus, we can feel with certainty that we have no more than a 10% chance of reaching these levels.

If we divide 25% by 60R, we get a risk level of 0.4%. This is pretty similar to our estimate of our initial risk size. However, if we want to only have a 10% chance of a 25% peak-to-trough drawdown in our equity curve, then we must never risk more than 0.4% with this system. And if we want to guarantee a 1% or less chance of such a drawdown, we probably shouldn't risk more than 0.27% (i.e., 25% drawdown/93R = 0.00269).

Table 14-5: Probability of Maximum R-Drawdowns in System 13-2	
Maximum Drawdown	Probability DD
-12.1R	100%
-29.1R	76.4%
-38R	50%
-48R	25%
-60R	10%
-71R	5%
-93R	1%

Do you understand how this method works? It's a 5-step process.

1. Take the worst-case peak-to-trough drawdown you'd like to avoid.
2. Simulate your system and determine the probability of various R-level maximum drawdowns. The one trade at a time simulator in the *Secrets of the MastersTM Trading Game* is probably a good idea for this because it will give you a real "feel" for what to expect.
3. Determine the maximum drawdown in terms of R at the probability level you are willing to accept.
4. Divide this level into the value you selected at Step 1 and the result should be the position sizing level as a percent risk that you should use.
5. Remember that with multiple correlated positions, the risk level you are determining is your portfolio heat and you must make adjustments for the number of positions.

Model 21: Scaling Out to Smooth Equity Curves

Consider monitoring your position sizing on a periodic basis—weekly, daily, or even hourly—to maintain a fairly constant exposure. What potential risk are you exposed to? Here you need to

calculate the difference between the current value and the stops of each position you have. This is called the **open risk** of your portfolio as discussed in Scaling-in Techniques (Model 15). What if you controlled the total open risk or limited the open risk of each position by scaling out of positions when your maximum open risk level is exceeded? Think about the potential here. You could monitor each position and make sure that your exposure was always 3% or less. This means that, except in runaway markets, your biggest risk would always be about 3% or whatever level you select.

In addition, think about the potential volatility of each of your positions. What has the volatility (based upon the *average true range*) been in the positions you hold over the last few days? Is this volatility going up? What if you limited it by scaling out of positions when a certain level of volatility has been passed? For example, you could scale out of positions whenever the volatility exposure of an open position exceeded 2% of your equity.

Your exposure could be monitored using any of the position sizing models given or any of the equity models suggested. However, I would recommend that you consider monitoring both ongoing risk and ongoing volatility with a total equity calculation. Tom Basso introduced me to this method. For Tom, the method was fully computerized. The computers were calculating open risk and open volatility at least every minute and scaling out whenever they exceeded his guidelines. However, we're going to assume that you might be using an Excel spreadsheet to monitor these variables and thus only want to do it once each day.

Monitoring Open Risk: Here's how daily monitoring for risk and volatility might work. Suppose you have a \$200,000 account and you have open positions in gold and corn. Your position sizing 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. Let's 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 multiplied by 40 points multiplied by \$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 daily 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, position sizing 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 position sizing 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 position sizing 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. You are making *a position sizing decision* to maintain a constant risk in your portfolio.

Monitoring Open Volatility. 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 is 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 \times 8 cents/bushel = \$400). You decide not to allow volatility to exceed 1% of your \$200,000 equity or \$2,000 when you purchase the corn, so you buy five contracts.

Suppose corn jumps to \$4.00 so that your five corn contracts have given you a profit of \$25,000. Let's also assume that you only scale out based upon volatility once each week. 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 \$4,500. However, corn volatility is now \$1,000 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 position sizing model that limits your total volatility exposure.

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 position sizing, you protect your open profits and prevent such large daily fluctuations in your account.

Both of these models are very useful in that they tend to smooth equity curves. They allow you to fully participate in a market move until the market stops you out. However, as your risk exposure gets bigger you peel off positions to keep the open risk constant. In addition, as the volatility exposure increases, you peel off positions to maintain and limit your volatility exposure.

I've shown examples of periodic monitoring of your position sizing 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?

One question people often ask me about these methods is "Why not buy back a position if the open risk or open volatility decrease?" Tom Basso never did this and I think I understand why. In a big trend, both open risk and open volatility dramatically increase as a big trend continues to its conclusion. If you found a sudden decrease in each of these variables and scaled back in, you'd

probably find that it was temporary and you would either 1) have to get right back out again, or 2) find that you were suddenly putting yourself in danger of a serious financial setback.

Model 22: Basso-Schwager Asset Allocation Technique Applied to Systems

When Tom Basso and I were doing seminars together, he told me about a study he was doing with multi-manager CTA groupings.¹ He looked at the performance of 720 CTAs—79 of whom were in business in 1983. A computer program was written to look over possible grouping of three managers of these original 79. There were a total of 79,079 combinations of three-manager groupings. Each manager in each group received one third of the assets at the start of trading in January, 1983. In the first group, a static asset allocation was used. Each manager kept his/her initial allocation and was allowed to either grow it or decrease it according to his/her performance. This was continued until December of 1993.

In the second grouping, the assets were rebalanced monthly (i.e., a “how much” decision) so that each manager’s assets would be one-third of the existing assets of the group of three managers at the start of each month. In other words, money is taken away from the best performing managers and given to the worst performing managers. This is a martingale asset allocation technique—you get more when you lose and less when you win.

The results of the study showed that the static group actually made a slightly larger average annual rate of return (i.e., 13.27%) than the rebalanced group (i.e., 12.62%). However, the Martingale rebalancing procedure reduced the maximum drawdown from 34.26% to 28.29%—a significant reduction. The average return to drawdown ratio was higher for the rebalanced group (at 0.53) than it was for the static group (at 0.46).

This basically means that rebalancing produces a higher System Quality NumberSM than not rebalancing. The return of the group with periodic rebalancing could be used with much higher leverage. For example, if the rebalanced group were leveraged by a factor of 1.211, their drawdown would be equivalent to the static group while their return would now be annualized at an average of 15.28%.

Jack Schwager found the following flaws with the Basso study, which he believed caused the results to be vastly understated. First, Basso tested all possible three group combinations. Many of these groupings were highly correlated, which would take away from the effect of rebalancing. Second, Basso did not make an adjustment for negative return to risk ratios. What happens here is that lower drawdowns (i.e., better ratios) have the effect of reducing the overall return to risk ratio because the denominator will make the ratio more negative.²

Schwager performed another study in which he ranked CTA managers and correlated their performance in various periods. He then selected various multi-manager groupings and looked at their performance with monthly rebalancing. Generally, Schwager found the following:

- Low correlation groupings tended to be stable over time periods.

- Low correlation groups showed a very large improvement with monthly rebalancing over the performance of the individual CTAs.
- Larger groupings of CTAs tended to reduce risk more. However, grouping of five CTAs were found to reduce risk by 38.6% (equal to 73% of the possible risk reduction). This was improved to 45.3% in a ten CTA group (equal to 85.6% of the possible risk reduction).

While the monthly rebalancing procedure in a multi-advisor fund is a little different from the position sizing strategies outlined here, it is a Martingale strategy that is worth using.

Similarly, if the strategy works with fund managers, it can also work with different systems that trade the market. Consider trading at least five multiple, non-correlated systems in the market. Each month, do a monthly rebalancing of the funds between the systems. In this case, you will be taking money away from the systems that are performing the best and giving money to the systems that are performing poorly. This probably goes against all of your natural biases, but it should give you a much better reward-to-risk ratio than 1) trading five systems without rebalancing or 2) the reward-to-risk ratio of most of the systems by themselves.

You could make some adjustments to your initial allocations based upon the SQNsSM of the systems (or of the fund managers) and rebalance based upon those allocations. For example, suppose you have the following systems with their respective SQNsSM:

- System 1: $SQN^{SM} = 2.7$
- System 2: $SQN^{SM} = 4.1$
- System 3: $SQN^{SM} = 5.7$

With such disparity among the systems, you might want to allocate 60% of your capital to system 3, 30% of your capital to system 2, and 10% of your capital to system 1. Monthly rebalancing would then be based upon the same percentages. And this would get around any objection that says you are not giving your best system (or manager) the most money.

You might also want to make adjustments for the market type, if the SQNsSM vary according to market type. For example, system 3 might be better during trending markets, but during quiet markets, system 1 might be better. When the market becomes quiet, you might want to give system 1 a majority allocation. Incidentally, notice how just a few ideas can suddenly stimulate more position sizing ideas.

Conclusion

In this chapter, I've introduced you to six methods that you could use to limit your potential for ruin or to limit large drawdowns in your account:

1. Using your System Quality NumberSM to determine your portfolio heat so that you could almost guarantee you'd never risk ruin.

2. Using two-tier position sizing in which you risk at a no-ruin level until you have sufficient profits on the year to almost guarantee no chance of ruin. At that point, you could switch to a much more aggressive position sizing algorithm.
3. Using multiple tier position sizing to gradually increase your risk as your profit increases. This would be similar to the two-tier approach, but you would increase in many stages, not just one. You could also use a dampening factor to more quickly reduce positions as your equity falls.
4. Calculating your maximum drawdown in terms of R to determine a risk level that will never produce ruin for you.
5. Scaling out based upon open risk and open volatility to reduce the potential for large drawdowns and to smooth your equity curve.
6. Using a Martingale strategy to rebalance your assets according to money managers or systems (or even newsletters if you like to trade newsletter recommendations). You could make adjustments to this based upon SQNsSM of the systems (or the managers) and/or the types of markets we are currently experiencing.

—

It's your choice which of these methods you might want to use. However, that choice should depend upon your specific objectives and your comfort level with the various methods described. Your trading success will still depend upon having a well thought out business plan, developing systems that you feel confident trading, and using a position sizing algorithm that you feel confident will help you meet your objectives.

NOTES

¹ Haun, Bruce. "Rebalancing Portfolios Lowers Volatility and Stabilizes Return." *Managed Accounts Reports* June 1994.

² Schwager, Jack. *Managed Trading: Myths and Truths*. New York, John Wiley and Sons, 1996. See Chapter 3 of Schwager's book for a detailed explanation of why this occurs.

Part IV:

Miscellaneous Position SizingSM Information

Introduction to Miscellaneous Position SizingSM Information

This book is meant to be a definitive guide to position sizing. At this point, I've covered the most important material that you need to know, but there is still a lot more to cover to really make this book truly *definitive*. As a result, I've decided to add this section to cover everything else.

There are nine more position sizing models that I have not yet covered. However, there is a reason for that. These are generally position sizing models that you should avoid. I'm covering them here because if I didn't, I'd be getting questions about what I think of them or whether or not you should use them. Thus, Chapter 15 includes four Martingale position sizing strategies that you should avoid and another five miscellaneous strategies that I do not like.

Chris Anderson has given me a lot of insights about position sizing by 1) doing the research on FRPS that was included in Chapter 13, 2) developing the simulator that I use, and 3) pointing me in the direction of the System Quality NumberSM, which has become a major addition to this book. As a result, I've included an abbreviated version of an interview that I did with Chris in Chapter 16. Although some of the discussion in this chapter is about the simulator he developed, which is not available to the public, I've included the chapter so you can understand his "business approach" to trading.

Chapter 17 is probably the only chapter in this book that is not timeless because it is about the software that is currently available (in late 2007) to help you with expectancy, simulation, and position sizing. I am not recommending any particular software, but I have included this chapter so that you can see what is available now.

I did an extensive search of all of the questions on our *Mastermind Forum*. I also looked at all the questions my staff could come up with that people have asked about position sizing. And, I generated some of my own questions after reading through this book in its entirety. Those questions fall into nine categories and I've included all of them in Chapter 18. Thus, if you have a question about position sizing, then it's probably answered in that chapter.

Lastly, I've also developed a test to help you get a thorough understanding of the material in this book given in Chapter 19. Read through the questions and answer them. If you can't answer them, then it simply suggests that you need to reread certain sections of this book.

Chapter 15

Position Sizing StrategiesSM to Avoid!

Because of the various psychological biases with position sizing, people often invent position sizing strategies that just don't work. However, because I want this book to be as complete as possible, I've decided to devote an entire chapter to methods that, in my opinion, either don't work or are dangerous. These fall into two categories. There are four Martingale models and five miscellaneous models.

Martingale Position Sizing Models

When I was 21 years old, in the Army and stationed in the Canal Zone, I developed a Martingale position sizing method that didn't work. The Panama City casinos were my first exposure to gambling. And as I visited the casinos, a thought occurred to me about how I could make a lot of money: I'd play roulette and just bet on red. Every time I lost, I would simply double my bet size. And when my losing streak stopped, I'd be ahead by \$1. I didn't know it at the time, but this is a typical example of a Martingale strategy. Your position size goes up when you are behind.

I wish I'd known about position sizing at the time, but I didn't. Professional gamblers all say "*Don't use Martingale strategies because they don't work.*" Unfortunately, I had to find out through my personal experience. The first reason these strategies don't work is because casinos have betting limits. For example, a casino table that allows you to bet \$1 as a minimum bet probably won't allow you to bet more than \$500. This really wasn't a factor for me because my Army paycheck at that time was only about \$250.

The second reason such strategies don't work is because, in a fairly random system, you can have very long streaks. Now if I were on a long winning streak, say 10 in a row, I'd basically be up \$10. But let's look at what happens when you lose.

Table 15-1 illustrates the problem perfectly. By the time I lost five in a row, I'd have lost \$127. My next bet would have to be \$128, but I'd only have \$123 left of my \$250 paycheck. Thus, I couldn't even tolerate a loss of five in a row. Five losses in a row will come fairly easily in this game. My paycheck lasted less than a half hour.

But suppose I had saved \$5,000 to "invest" in this foolish game and there weren't any betting limits. Eventually, I would hit 12 losses in a row. After the 12 losses, I would have lost a total of \$4,095. I would now be betting \$4,096 just to win a dollar. So I'm now risking over \$8,000 (including the \$4,095 I've already lost) to win a dollar. Also, at this point I would have had to win over \$3,000, prior to this streak, just to be able to stay in the game to bet the \$4,096. And when I only win \$1 each time, what do you think the odds are of me winning \$3,000, starting with only

\$5,000, before I hit a streak of 12 straight losses? Believe me; the odds are not very good. For that reason alone Martingale strategies just don't work.

Streak Size	Bet Size
1	\$2
2	\$4
3	\$8
4	\$16
5	\$32
6	\$64
7	\$128
8	\$256
9	\$512
10	\$1,024
11	\$2,048
12	\$4,096

Just as Martingale strategies are terrible at the casino, they are also terrible when you are playing any investment market. Nevertheless, many people tend to recommend Martingale strategies to play the markets. For example, Larry Williams in his *Definitive Guide to Futures Trading*¹ recommends several Martingale strategies.

Model 23: When Probability Is Out of Line, Increase Your Position Sizing

This basic strategy makes an assumption that you know the probability of your system. It is a great assumption when playing games in which the probability of your system is known—such as our trading games. With this approach you step up your commitment when the probability is out of line. For example, suppose you have a system that is correct 60% of the time. Then the market hands you 10 trades in which the accuracy is only 40%, Williams would say to increase your commitment from 1 to 2 units. You would remain at two units until you have had 10 trades that give you the expected probability.

To illustrate how this strategy would work in principle, let's go back to a marble bag. Assume you have 60 white marbles and 40 black marbles in a bag. If you draw out marbles and replace them, your chances of drawing a white marble are always 60%. It doesn't matter if you had a streak of 10 black marbles; the probability of drawing a white marble is still 60%. However, there is a statistical phenomenon called *regression towards the mean*. It basically states that when samples start to differ from the population mean, future samples will tend to make up for the difference so that the more marbles you draw out, the closer the sample will be to the population mean. In the case of our marble bag, 60% of them were white. If we draw out 20 marbles and replace them and find that only 45% of them are white, then the sample mean is much lower than the population mean. Chances are that after drawing out 50 marbles and replacing them, our

population mean will be closer to 60%. Consequently, when you know that the sample mean is much lower than the population mean, this strategy may have some merit.

Williams calls this a conservative approach to increasing your commitment, but I see the following problems with it:

- The model assumes you know the base-rate probability of your system. However, if your sample size is too small, then you might just have an over-inflated estimate of the probability. For example, you might think that the basic win rate is 65% when it's really 55%. If that were the case, you would increase your position sizing when the win rate decreases to 55%, but that's really just the normal rate. However, you would now have increased risk under normal conditions and this could be disastrous.
- You are making the assumption that your system is correct 60% of the time under all conditions. What if the market conditions under which your system was designed have now changed? If that assumption is true, then this method becomes quite risky.
- The model is based upon the Gambler's Fallacy. It assumes that the probability will change after a streak. In any game that involves replacement (and the market certainly does), the probability remains the same for each trade, regardless of the streak.

Model 23 is also just another version of the first position sizing model presented in this book, the one unit per so much money model. In my opinion, this model is one of the weakest models previously discussed. As a result, there are probably a thousand variations of the Model 23 that we can generate, based upon the many models discussed so far. A few such examples might include the following:

- When your percent correct drops by 10% over 10 trades, you might increase your risk by 0.5%.
- When your percent correct drops by 20% over 10 trades, you might increase your risk by 1%.
- When your percent correct drops by 10% over 10 trades, you might increase your percent volatility by 0.25%.
- When your percent correct drops by 10% over 10 trades, you might simply move closer to the optimal bet size for the strategy you are employing.

None of these methods have been tested in any way. They simply came out of my head to illustrate the myriad of possibilities you could come up with using this kind of Martingale thinking, with the assumption that you have regression toward the mean working in your favor. Intuitively, they might make sense to you because of your desire to be right. *However, in my opinion, they are all very dangerous* if you don't know the real population mean, which you never do in real trading.

Model 24: One Up, Back One

This particular form of position sizing is also based on the one unit per so much money model (i.e., Model 1), but it differs from the prior technique in its use. It should be used, according to Larry Williams, when you have a strategy that has a probability of winning that is much less than 50%.

In this strategy, you increase your unit size by one after every loss and you decrease your unit size by one after every win. Thus, it is very much a form of Martingale betting. Here's how it might work. If you start out trading one contract or 100 shares, then after a loss you would move to a position size of two contracts or 200 shares for the next trade. After four losses in a row you would be trading 5 contracts or 500 shares on the next trade.

When you start winning, say the fifth trade was a winner, you would decrease your position size by one unit. Thus after four losses and one win, you would trade 4 contracts (400 shares) on the sixth trade. If the sixth trade were a winner, you would again decrease by one unit. But if it were a loser, you would again increase by a unit. But when do you stop increasing and return to normal? I assume it is when you are profitable, but that's not clear, and the method seems to imply that you would keep on increasing your size.

In my opinion, this idea was never traded (and not even well thought out!) when it was presented—especially if it is traded in a system that is correct 30% of the time. Let's say you made 100 trades in a 30% system—with 30 winners and 70 losers. You would now, after the 100 trades, have a position size of 41 units (or 4,100 shares). The more you traded, the bigger your positions would become. It would be a sure road to bankruptcy unless the system had some huge R-multiple wins that really increased your equity. Of course, you could limit your position size, but even with that restriction, this technique makes no sense. The only rule that might work would be to return to one unit as soon as you make a new equity high. Otherwise, the method doesn't make sense.

You can probably come up with hundreds of possible versions of this model with your understanding of how position sizing works. Nevertheless, most of these would be disastrous. Generally, in my opinion, this is probably one of the most dangerous and fool-hardy methods of position sizing that I've ever seen presented anywhere.

Model 25: One Up, Back One Version Two

The second version of One Up, Back One is a little more serious. You do not increase your unit size until you have had three losses in a row. When you get three consecutive losses you increase by one unit. You then play the One Up, Back One strategy until you have recouped the losses from the three losers.

Table 15-2 shows how this might work. The table shows that you begin with three consecutive losses. As a result, you move up to two contracts or two units. You have another loss, so you move up to three units. You have one more loss so you move up to four units. At four units, you

have a win, but not enough to return you to the break-even point before the losing streak. As a result, you decrease to three units. You have another loss, so you increase to four units again. On the ninth trade you have a big win, which with a position size of four units, gives you a profit for the period that covers the beginning of the initial losing streak. Since you now have a profit, you go back to one unit.

Williams would say that this method has given you a profit in a situation in which you lost money on 7 of 9 trades.

Table 15-2: Williams One Up, Back One Version Two

Equity	Units	Amount Won/Lost	Total Won/Lost
\$100,000	1	(\$415)	(\$415)
\$99,585	1	(\$675)	(\$675)
\$98,910	1	(\$1,031)	(\$1,031)
\$97,978	2	(\$798)	(\$1,596)
\$96,283	3	(\$998)	(\$2,994)
\$93,289	4	\$814	\$3,256
\$96,545	3	(\$675)	(\$2,025)
\$94,520	4	\$1,631	\$6,524
\$101,044			

One might argue that the win was so much bigger than the loss, so the example was not realistic. However, most good systems, especially low-probability systems, have winning trades that are much bigger than the losers. As a result, that objection to this version is not valid.

However, one objection to this Martingale method is valid—the same objection that is valid for all Martingale methods. The method does not take into account what would happen in a long streak. Let's say, you have a trading method that has winning trades about 40% of the time. Here we will assume that you have an active system that makes about 300 trades per year.

I used a Monte Carlo System called Monte to simulate 5,000 iterations of 300 trades per year to determine the streaks likely each year. I then did 5,000 iterations of 1,500 trades to determine what kind of streaks one would be likely to get in a five-year period with a 40% system. Table 15-3 shows the result of this Monte Carlo simulation in terms of the probabilities of streaks of a given length. When the cumulative probability is greater than 1, you are almost certain to have at least one streak of that length or greater.

Table 15-3: Monte Carlo Test of a 40% System

Streak Size	300 Trades Discrete Probability	300 Trades Cumulative Probability	1,500 Trades Discrete Probability	1,500 Trades Cumulative Probability
1	29.804	73.09	144.994	360.636
2	17.425	43.286	86.547	215.642
3	10.344	24.861	51.581	129.095
4	6.361	15.517	30.759	77.514
5	3.701	9.156	18.884	46.755
6	2.284	5.455	11.105	27.906
7	1.336	3.172	6.893	16.801
8	0.674	1.835	3.973	9.908
9	0.547	1.161	2.346	5.935
10	0.291	0.613	1.467	3.589
11	0.171	0.323	0.872	2.113
12	0.075	0.15	0.489	1.241
13	0.033	0.075	0.351	0.752
14	0.017	0.043	0.193	0.401
15	0.008	0.026	0.086	0.207
17	0.018	0.018	0.020	0.070
23	0.000	0.000	0.002	0.002

When you look at Table 15-3, you'll notice that the discrete probability of a streak of 7 in a row is 1.336. This means that over the 5,000 simulations of 300 trades, a streak of 7 in a row occurred 6,680 times (i.e., 1.336 times 5,000). Thus, the chances of it occurring in any given year with this system are close to 100%.² With a streak of 7, you'd be risking from 5 to 7 units more than your baseline. You'd be risking 5 units, if the streak began with the three in a row or 7 units if the streak began after the three in a row. This might risk bankruptcy depending upon the circumstances. However, the situation is much worse because the cumulative probability tells us the likelihood of a streak of that size or bigger. Notice that for 9 in a row the number is 1.161. This means that in the 5,000 simulations there were 5,805 streaks of 9 or greater. Thus, while you have an almost certain chance of having a streak of seven in a row, you also have an almost certain chance of having a streak of nine or greater. Notice that the discrete probability of a streak of 17 was 0.018. This means that in the 5,000 simulations there were 90 streaks of 17 (i.e., 0.018 times 5,000).

While you might decide to design a Martingale system around what might happen in such a system, the situation becomes much worse when you look at what is likely in a five-year period of trading the system. Here, the cumulative probability of a streak of 12 or greater is almost certain (i.e., there were 6,205 occurrences of streaks of 12 or more in the 5,000 simulations). And there were actually 10 streaks of 23 losers in a row during the 5,000 simulations. Thus, even if you could increase your bet size through 17 losses in a row that might occur during a single year, over a five year period you could go through an even bigger streak. This is why such Martingale position sizing strategies are extremely dangerous and are likely to eventually cause you to lose your entire trading stake.

Model 26: Regression toward the Mean Position Sizing

William's models all assumed some sort of regression toward the mean position sizing. Let's look at a mathematical version that one could adapt in a lot of situations. Let's say you have a \$100,000 account. You are going to risk 1% of that amount as your core position size. But when you get behind, you are going to use a mathematical formula to help you increase your position size in order to recover your losses.

Let's say that you decide that if you are down 20R, you are statistically due for a winning streak. And this assumption is only accurate if your initial sample actually represents the real population of your trading system results.

Here's how such a system might work. You might decide that if you were down 20R, you would now risk a minimum of 10% of your remaining equity. However, in no case would you risk more than 5% of your starting equity.

You start out with \$100,000. Eventually you find yourself down a cumulative 20R over the last 50 trades. Your equity is now \$80,000. Your algorithm says risk 20% of the balance or \$16,000, but don't risk more than 5% of your starting equity (i.e., \$5,000). Thus, you'd now risk 5%.

Notice how many versions of this sort of model you could make:

- You could vary the base position size risk.
- You could vary the cumulative drawdown amount (i.e., 20R) that had to occur before you start risking the higher percentage.
- You could vary the higher percentage that you'd switch to upon hitting the drawdown.
- And you could vary the amount of your starting equity that you'd set as your maximum position size risk.

These four variables could be turned into thousands of different position sizing models. However, all of them have the following flaws:

1. What if your original sample did not represent your system adequately and vastly overestimated its performance? If that were the case, then any of these models would probably lead to ruin.
2. The odds of the next sample being a loser do not change, so you would now be accelerating your drawdown.
3. If you made incorrect judgments about any of the variables and set them too high, it would lead to ruin.

So what's the bottom line? Regression toward the mean position sizing models, like all Martingale strategies, are dangerous.

Other Dangerous Models to Avoid

Some authors recommend that people go for a position sizing algorithm that will produce the largest average ending equity. Earlier in this book, we already showed you the danger of this sort of approach. The largest average ending equity will usually occur when you risk at a level that will give you a 90%+ chance of ruin and a very low probability of even reaching your objectives. Consequently, don't use these techniques.

Several examples of such techniques include using a percent risk based upon your win rate, the Kelly Criterion, and Ralph Vince's optimal f . I've also included several other techniques, including intuitive position sizing and the Joe Ross method.

Model 27: Intuitive Position Sizing

Another risky position sizing tactic is to risk more on a trade that you think has a much bigger subjective probability of success. For example, sometimes a trader or investor will say, "I just know this is an exceptional trade. It's going to make a lot of money." And if you are certain of that, then you probably should increase your position size.

However, there is also a fundamental flaw in this strategy. *Psychological research has shown that there is no correlation between the confidence people have in a future trade and the likelihood of it being a success.* And I think this is especially true for traders with no proven system. In fact, there is probably a slight negative correlation between confidence level and the likelihood of success. In other words, the more confident you are, the more likely it is that the trade might go poorly. People are just not good at predicting success.

Psychological research has shown that there is no correlation between the confidence level that people have in a future trade and the likelihood of it being a success.

If you still believe that you can predict some trades very accurately, then I recommend that you collect some data on these trades. When you think a trade has a very high probability of success, make a note of it in a journal and then note the results. After you've collected at least 30 of these trades, then take a look at the results. What relationship is there between your confidence of success and the actual results?

If this is a strong, positive relationship, then you might try increasing your position size conservatively when you feel strongly about a trade. But be conservative about the amount of increase. If you normally risk 1%, you might increase it to 1.5% or 2%. After a year or two of doing this, if you find you are making most of your money on these trades, then you might up your position size even more.

However, most people should stay away from this sort of strategy. Your confidence level is probably not predictive of success and increasing your position size on such trades will only result in a greater chance of ruin.

Model 28: Joe Ross Method

Joe Ross has written a number of books in which he says that "you should approach trading as a business" and part of his business approach is a position sizing method that he claims eliminates extensive risk in your business. The method generally involves trading futures, and uses the following guidelines:

1. When you open up a futures position, Ross recommends you buy five contracts. (I obviously disagree with that. What if 5 contracts is too much risk or you can't afford it?). However, let's just take the generic version of this, which opens up a position with your maximum position size.
2. Joe then says to sell 3 contracts (i.e., 60% of your positions) when you can cover all of the costs of buying the five contracts. In other words, you are now up enough to cover your initial risk allocation for the entire position.
3. You now raise the stops on your remaining positions to break even and keep the normal stops that you'd use with your system.

So what's wrong with this position sizing method? In my opinion, it has many flaws. The first one is that you begin with a full position, which is the opposite of scaling in to a position that has proved itself. Obviously, the position hasn't proved itself, but you will have your maximum risk on. Furthermore, you might not be able to afford that maximum risk.

The second major flaw is that when you take a loss, let's say a 1R loss, you'll have on your full position sizing. And if you take a huge loss because the market gaps against you or you are up against a limit move, you will still have on a maximum position and be taking a huge loss.

And now look at your biggest gain. Suppose you get a huge trade that you turn into a 30R winner. As a trend follower, it is the position that makes your year. If you follow this method, you will only capture that huge gain with a 40% position while you will experience each loss with a 100% position. In my opinion, this method is the position sizing equivalent to "cut your profits short and let your losses run." And that's why I don't like it.

There is one exception to this however. D.R. Barton and Brad Martin, in our *Swing Trading Workshop*, taught some methods in which you remove part of your position when you can cover your costs on a trade. However, this tends to be fairly quick hit and run trading. You are never going to get 30R gains and you are probably going to win 60% or more. During one workshop I noticed the potential for a huge R-multiple gain in one of their examples. I thought to myself, "I can get at least a 6R trade out of this." I'll just place my stops accordingly and either take a 1R loss or let it ride to my target. I did just that and made about 5R in the position. Meanwhile Brad, in explaining the logic of his thinking, was in and out of positions a number of times. And at the conclusion of the trade, Brad had made about 11R (in many small positions) while I had made 5R

with much wider stops. Thus, for short term trading, when you really know what you are doing, taking off part of the position when you get to break even can be a viable approach.

Model 29: Percent Risk Based Upon Winning Percentage

This approach suggests that you should always risk a percentage of your equity based upon your success rate. The implicit assumption is that the average win is equal to the average loss (i.e., you always have 1R wins and 1R losses), leading to a payoff ratio of 1.

Given these assumptions, the optimal bet size should be given by the following formula:

$$F = [p - (1 - p)], \text{ where } p \text{ is the probability of winning and } (1 - p) \text{ is the probability of losing.}$$

So given these assumptions let's look at the optimal bet sizes.

Table 15-4: Percent Risk with Constant Payoff Based Upon the Win Rate of the System

Win Rate of System	Optimal Percent Risk
80%	60%
75%	50%
70%	40%
65%	30%
60%	20%
55%	10%

My presumption here is that you already understand why these numbers would lead to quick ruin. First, payoff ratios are never one in real trading. Second, you don't know the accuracy of your estimates. Third, it is possible to have a high win system with a negative expectancy, like System 3-3. And, such high percentage risk systems lead to ruin most of the time as illustrated previously.

Model 30: Kelly Criterion (Thorp's Version, which Includes Payoffs)

Edward Thorp³ adjusted the prior model to include payoffs. However, this method is probably better known as the Kelly Criterion. 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 50%. 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:

$$\begin{aligned}\text{Kelly \%} &= 0.5 - [(1 - 0.5)/2] \\ &= 0.5 - [0.5/2] \\ &= 0.5 - 0.25 \\ &= \mathbf{0.25}\end{aligned}$$

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 huge drawdowns.

Some people still like to use the Kelly Criterion to determine optimal rates of return. One example of that, which I used to teach, was to take about 80% of the Kelly Criterion—in our example above, 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. I used to believe that one could at least use this criterion to determine your maximum “portfolio heat,” but there are times (as described earlier for the system with 99 1R losses and one 1,000R winner) when this approach will lead to absolute ruin.

Generally, however, this approach is just as dangerous as many of the other approaches. If you want to go for optimal returns, use some of the techniques described in Chapter 12. Avoid the Kelly Criterion totally because 1) it was developed for use when you had two possible outcomes (i.e., a 2R win and a 1R loss) rather than the multiple outcomes you have with trading and 2) it can grossly overestimate the position sizing you should use.

Model 31: Optimal f

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.” Vince says that the Kelly Criterion should not apply to trading—it only applies to win-loss type data. However, he is a big advocate of trading for optimal profits.⁴

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, it’s possible to make large rates of return by simply adding “optimal” position size 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.” Incidentally, fixed-fractional position sizing is the same as percent risk position sizing. In Vince’s words,

"For any given independent trial situation, in 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. . . . 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. 80.⁵

I have three problems with optimal f as a guide for optimal gains.⁶ 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 worst-case loss used in the calculations is based upon a single trade, not a long succession of losers. Thus, it might protect you from the big loss, but it won't protect you from a long losing streak.

Third, the calculations require an iterative mathematical procedure that is quite complex. Ralph 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. Since I don't like this method, I'll simply use his terminology and style, rather than simplify everything and risk the possibility that you actually start using optimal f .

Here's how it works with a sample of trades:

- First, the return on each sample is divided by the drawdown on the biggest loss. Returns are expressed as a percentage gain of your equity or as the percentage loss you have in your equity. Note that this is the largest single loss, not the largest peak-to-trough drawdown in your equity curve.
- Next, this ratio is converted to a negative value and multiplied by a factor (f), which is some arbitrary fixed fractional bet size.
- The value obtained from the last step is added to 1 to arrive at a weighted holding period return (i.e., HPR).

$$\text{HPR on trade } i = 1 + [f \times (\text{return on trade } i) / (\text{return on worst losing trade})]$$

- The TWR value above is the product of the weighted holding period returns generated for all trades over the sample. In other words,

$$\text{TWR} = [(HPR1) \times (HPR2) \times (HPR3) \times \dots \times (HPRn)]$$

Essentially, what you have to do to determine optimal f is test a number of values of f between 0.01 and 1.00 until you find a value that maximizes TWR.

Let's say you have the following returns for a sample of five trades.

Trade 1 = 0.22 Trade 2 = 0.12 Trade 3 = -0.30

Trade 4 = 0.15 Trade 5 = -0.10

Table 15-5 shows the HPRs for the various returns. The worst return is trade 3 with a -0.3 return. Consequently, that's used as the denominator in the formula.

Table 15-5: Calculating the HPRs for Our Five Sample Trades

Trade Number	Holding-Period Return
1	$1 + f(-0.22/-0.3) = 1 + f(0.733)$
2	$1 + f(-0.12/-0.3) = 1 + f(0.4)$
3	$1 + f(-0.3/-0.3) = 1 + f(-1)$
4	$1 + f(-0.15/-0.3) = 1 + f(0.5)$
5	$1 + f(-0.1/-0.3) = 1 + f(-0.333)$

Now let's look at various values of f to see which produces the largest TWR. These are shown for five values in Table 15-6. You can see from the TWR calculations that it seems to peak at $f=0.15$. By the way, if this explanation of optimal f is too complex for you, then that is another reason to avoid it.

Table 15-6: Calculating the TWR for Five Different f -values

Trade	$f=0.05$	$f=0.10$	$f=0.15$	$f=0.20$	$f=0.3$
1	1.03667	1.0733	1.1100	1.1467	1.22
2	1.02	1.04	1.06	1.08	1.12
3	0.95	0.9	0.85	0.8	0.7
4	1.025	1.05	1.075	1.1	1.15
5	0.9833	0.9667	0.950	0.9333	0.900
TWR	1.0125	1.0197	1.0214	1.0171	0.99

In order to write about this data, I decided to convert the returns to R-multiples and run it through the simulator. Assuming that your average loss is 1R allows us to convert these calculations to R-multiples. In our sample, we have a 0.3 loss and a 0.1 loss. Thus, our average is 0.2 and we can make the assumption that 0.2 is a 1R loss. Our R-multiples then become 1.1R, 0.6R, -1.5R, 0.75R, and -0.5R.

When I ran that through the optimizer part of the simulator with the objective of making 100% without a 50% drawdown, I got the results shown in Table 15-7. Here we simply assumed that we'd have 50 trades to make our objective. By the way, this system has an expectancy of 0.09R, a standard deviation of 0.96R, and a System Quality NumberSM of 0.21. However, with 100 trades the System Quality NumberSM would be 0.94, if the expectancy and standard deviation were to remain the same.

Table 15-7: Optimal Bet Size of Sample System					
Approach	Optimal Risk %	Probability of Objective	Probability of Ruin	Average Gain	Median Gain
Max. Return	30%	14.3%	80.3%	225%	-55.1%
Med. Return	8.4%	20.9%	13.6%	45.9%	24.9%
Opt. Retire	13.8%	29.0%	37.9%	81.3%	3.9%

Although we didn't look at all the possible iterations for f with the optimal f calculation, the results of our five runs suggest that 15% risk is probably close. However, our simulation results indicate that with 15% risk, our average ending equity (after 50 trades) would be 89.9%, our median ending equity would be negative, our probability of ruin would be 42.5% and our probability of reaching our objective is only 28.8%.

Interestingly enough, the simulations suggest that you should probably risk about 13.8% in order to have the maximum chance of reaching your objective at 29%. However, at this level of risk you have a 38% chance of ruin.

What we're actually talking about is huge levels of risk for a trading system that is at best poor—one that you really should not trade at all. Optimal f is suggesting that you risk 15% in a system that I'd recommend you totally avoid. Perhaps you can now see why optimal f is so dangerous.

Conclusion

In this chapter we discussed various position sizing strategies that I believe you should totally avoid. These include four Martingale strategies (i.e., your bet size goes up as you lose):

1. When Probability Is Out of Line Increase Position Sizing – Model 23
2. One Up, Back One – Model 24
3. One Up, Back One Version Two – Model 35
4. Regression toward the Mean Position Sizing – Model 26

Generally with the exception of the Basso-Schwager rebalancing strategies, such Martingale strategies are position sizing methods that almost guarantee ruin.

Next, I discussed an additional five models to avoid:

1. Intuitive Position Sizing – Model 27
2. The Joe Ross Method – Model 28
3. Percent Risk Based Upon Winning Percentage – Model 29
4. Kelly Criterion – Model 30
5. Optimal f – Model 31

All of these methods, in my opinion, are very dangerous, although there may be certain short term trading methods in which the Joe Ross Method can be successfully applied.

I want to comment on other position sizing strategies that you might see as you read about trading. Most books totally avoid the topic, but occasionally one will mention position sizing and present some very strange technique to guide you. In this book, as a definitive guide, I've attempted to cover every method I've ever seen,⁷ including those I don't like. I've presented you with 31 different models and 3 different equity models. So in this book alone you have 93 different position sizing models (i.e. 31 times 3) that you can use. Furthermore, many of the methods presented have many derivative models. For example, you could probably come up with thousands of varieties of market's money alone. In fact, one could probably spend as much time on position sizing strategies as the average person does on entries. Thus, if you see a position sizing model that you don't think I've talked about, it's probably just one of these derivative models.

My recommendation to you is that you first determine your objectives for your trading. Again, I cannot overemphasize the importance of this step. Next, follow the guidelines in this book for using one of the methods to meet your objectives. Work with the methods you are attracted to until you thoroughly understand them and feel comfortable with them. Understand how the method works and develop confidence using it before you start trading with it.

NOTES

¹ Williams, Larry. *The Definitive Guide to Futures Trading: Volume II*. New York: Windsor Books, 1989.

² We cannot say that it is certain because in some years there may have been several streaks of 7 or more while in other years there may have been none.

³ Edward Thorp has no relationship to Van Tharp, but he wrote a famous book on bet size in gambling, entitled, *The Mathematics of Gambling* (Van Nuys, CA: Gambling Times Press, 1984.) The material for this method was derived from J. L. Kelly, "A New Interpretation of Information Rate," Bell System Technical Journal, Vol 35, July 1956, pp. 917-926.

⁴ To be fair to Ralph Vince, he does discuss other goals in his last book and how to adjust optimal f for other objectives. However, I'd have to include another 100 pages or so of complex formulas in this book just to explain his ideas. And why go through that when everything you need is in this volume and the math is much simpler.

⁵ Vince, Ralph. *Portfolio Money Management*. New York: John Wiley and Sons, Inc, 1995.

⁶ Ralph Vince's assumption about utility functions and much of his thinking rests on the assumptions given and they show, in my opinion, a naïve understanding of human psychology. For example, Vince doesn't understand that people are conservative when it comes to preserving a very small profit and risky when it comes to avoiding a loss.

⁷ I did consult with a hedge fund that has a position sizing method that was different from any that are presented here. However, they considered their method to be a trade secret, so I have not been able to include it in this volume.

Chapter 16

Putting It All Together: An Interview with Dr. Chris Anderson

Without the efforts of Dr. Chris Anderson, this book would not be possible. First, Chris did the research that allowed me to understand that Fixed Ratio Position Sizing, with certain assumptions, was a viable position sizing method. Out of that research came several good ideas: 1) thinking of drawdowns in terms of R, and 2) how to use the System Quality NumberSM to determine the quality of your system. In addition, Chris also developed the simulator that I used extensively in the research for this book. Chris has also been an instructor for IITM in three different workshops. As a result of Chris' immense contribution to this book and because of the way Chris thinks about trading and system development, I decided that this book would not be complete without an interview to expose you to how Chris thinks. This chapter puts together all of the pieces on 1) the importance of determining your objectives, 2) how to evaluate your system to make sure you can achieve your objectives, and finally, 3) how to use position sizing to meet your objectives. And those are the core topics of this book

Please note that this interview was originally done in 2003 between Dr. Tharp and Chris. As of this publication date, Chris has also started a very successful real estate business.

In the following interview, my questions are in bold.

Chris, tell me a little about your background.

I received my PhD in electrical engineering in 1990 from North Carolina State University. My Bachelor's and Master's degrees are also in engineering. My area of specialization was designing radar and optical systems that all have to make complex decisions in random environments. However, I've stopped working in those areas now and I'm now a full-time investor.

How did you get involved in trading?

I got involved in trading quite by accident in 1988. My brother was a stock broker with a major firm and he got involved in buying options on potential takeover targets. The brokers were getting good information about likely candidates from an analyst and several of us would buy call options. Although I had little to do with the success that this generated, it left a lasting impression about how good knowledge in the markets was very profitable.

After the takeover market dried up, I participated in the classical 401K and mutual fund activities until 2000. Again, I had little understanding of what I was doing and generated only modest success.

It wasn't until late 2000 that I really began to take trading seriously and started writing covered calls. After reading your material and others, I transitioned these activities into developing automated trading systems for my personal use using TradeStation®. My first attempts at trading systematically were reasonably painful since I didn't understand position sizing as well as I thought I did, and I didn't understand how to trade a basket of stocks. Since that time, I have refined my systems and my position sizing techniques to the point that I am happy with their performance and I am comfortable with the risk levels I am taking.

What are four or five things that you think are crucial to trading success and what made you decide that?

I view trading as learning how to deal with unknown environments in a consistent, business-like manner that is likely to result in profits. However, emotions and the random nature of the markets make it difficult to do that. I have found that traders (myself included) usually have three very large unknowns: 1) what trading results they want, 2) what is likely to happen to them from a trading system, and 3) how to deal with the fact that markets always change. This leads to what I think are the five things that are crucial to success:

1. Understand what you want out of your trading and what you are willing to put up with to get it (Objectives).
2. Understand how to pick a system that is likely to match your wants and comfort levels from item one.
3. Understand how to choose a system that you are confident will be stable enough to allow time for your edge to work.
4. Understand how to position size so that you are confident you will achieve your financial objectives without crossing over your pain threshold.
5. Understand how to determine when market conditions have changed enough that you should not trade your system.

I find it fascinating that you didn't include any psychological issues in the top five. I probably would have put at least four of the five into that category. For example, people have trouble cutting losses short and have big R losers. People have trouble letting profits run and have small gains. Thus, they cannot even get a decent R-multiple distribution that will give them a positive expectancy.

I think I see why we come at this so differently other than the engineering/psychology backgrounds. I think the differences come from who we interact with mostly. My guess is that

you see a lot of people with little to no trading experience and limited ability in backtesting. For that group, I am in 100% agreement with you.

Most of the people that I work with extensively have evolved beyond that camp, but thousands of traders/investors have been exposed to what I do and many of them have not yet become efficient at what they do. So, in that sense, you are probably right. However, we probably come from a different set of beliefs. I totally believe that we create our own lives and experiences and thus everything, at some level, is psychological in nature.

For me, I interact with a much smaller set of people that understand loss cutting, in large part because they have seen what happens via backtesting. Even with backtesting and a decent understanding of the importance of cutting losses, their trading is a disaster because of mismatches between what they want (which typically they don't know) and what their system is likely to provide.

I'd give a different reason to why their trading is a disaster. It's because everything is psychological and they haven't made themselves efficient traders yet, so you probably just proved my point. Anyway, let's get into our first interaction together. I was interested in doing simulations of Fixed Ratio Position Sizing (FRPS), and you managed to turn it into something I can recommend. We covered the research we did in Chapter 13. You did this by making a number of key assumptions that did not exist in Ryan Jones' writings as far as I can tell. One of those assumptions is that you should go to paper trading when you are down by one delta amount (and not restart again until you are back to the starting amount). But, of course, your real money is still down one delta amount even though you've made paper profits. Can you talk about that assumption?

This assumption came about probably because I read Ryan Jones' writings at a crucial time. At that point, I had done considerable system development and backtesting, and was absolutely convinced of the upside potential of trading. However, I had suffered a 23% drawdown in my start to automated trading using small percent risk (0.75%) position sizes. Most of this drawdown occurred because I didn't fully understand the implications of trading baskets of correlated systems but two things struck me in the process. 1) I was only comfortable risking small amounts of initial capital (but would happily increase risk with winnings) and 2) I was not comfortable assuming that my system would be profitable until I had seen it perform live with real money and it had made profits.

The systems that I trade have backtested well enough that I am not worried about missing out on potential gains. So, I am willing to let them prove themselves while taking minimal risk during this process. When I read *The Trading Game*, I thought FRPS was great because I could start small, but rapidly move up with wins and if I lost by 1 delta, the FRPS would require me to increment back to zero bet size ("paper trading"). If the system was just lucky at the start, then it would rapidly gain delta and I would be off to the races. If the system was bad, then I would realize that, after a small loss, at zero bet size rather than by losing more money. I later found out the book really didn't say to do that, but I guess with my biases that I had about starting up a system, I just read that into the material.

The other assumption is that you used the R-multiple distribution to simulate the average drawdown in terms of R. And then you used that average to determine how much was going to be risked. I found that fascinating because although I've been preaching how significant your R-multiple distribution was, I had never thought about drawdowns in terms of R. And I immediately saw a huge application of that information to trading. How did you come up with that idea and what have you done with it in the past?

In his book, Ryan Jones used a couple of examples that got me thinking that tying my bet size to my expected drawdown made a lot of sense. So I thought what if I know in advance, for example, that my largest drawdown is 15R. If I know that I am only comfortable risking 10% of my initial capital to just try and prove a system is valid, then I should be able to comfortably choose my risk level (either in FRPS or percent risk position sizing) based upon my knowledge of the largest drawdown.

As I began to explore this, I then came to realize that systems vary tremendously in their drawdown levels. After performing backtests, I have looked at trading systems ranging from 5R to 50R drawdowns. If the trader applies bet sizing for the 5R drawdown system to the 50R system, they will be unhappy very quickly.

Yes, but the real genius there was thinking of drawdowns in terms of R. Most people think of drawdowns in terms of dollar amounts and that depends upon position sizing.

I guess that I have to live up to a mental image that most people have that professors think in some abstract way. Once I saw the utility of using R in *Trade Your Way to Financial Freedom*, then I began to think of almost everything in terms of R because I can simply scale with position sizing.

Good, that was one of my intentions. When you begin to start thinking of a system as the R-multiple distribution it generates, all of the information about trading begins to make sense. It's really amazing. But sometimes the average guy will find all sorts of reasons not to do that. Again, it's all between the ears.

Much of the generation of small R losses (i.e., cutting losses short) and the large R gains (letting profits run) is psychological in nature. If that's the case, how can a marble bag represent trading? In other words, if a large amount of trading success is psychological, how can simulations help?

As we discussed earlier, my perspective is different as an engineer. I think in terms of how to solve a problem. In engineering, we constantly work with two different sets of design requirements: how something is supposed to work and how it will work in a worst-case scenario. Suppose an engineer designs a computer chip to operate in the environment that they know—their office. They build the chip and then test it in their office and all is well. Now their employer does a huge press announcement and starts selling chips. Deep down, the engineer knows that this chip will likely be in much more stressing environments than their office. Subconsciously, that engineer is going to have difficulty when the first failure reports start coming in because they know that they have not accounted for a wide range of real world possibilities.

Contrast this to the engineer that studies what the range of operating characteristics that is likely to be faced and then designs the chip to handle all or most. When failures start to come in, the engineer is confident that this is normal; it is not the start of a major problem.

Now compare this with trading. The trader performs a backtest of a system and gets a result they like. This is only one possible outcome that could have occurred. But suppose we convert those trades to equivalent marbles in a bag. Now we draw them at random for 50 trades. Clearly, they will not get the same result as their backtest. Now we do that 5,000 times, for example, and we see a wide range of possible outcomes and paths. Figure 16-1 shows many different paths that could have been taken with a simple marble bag that has 10 1.5R winners and 10 -1R losers.

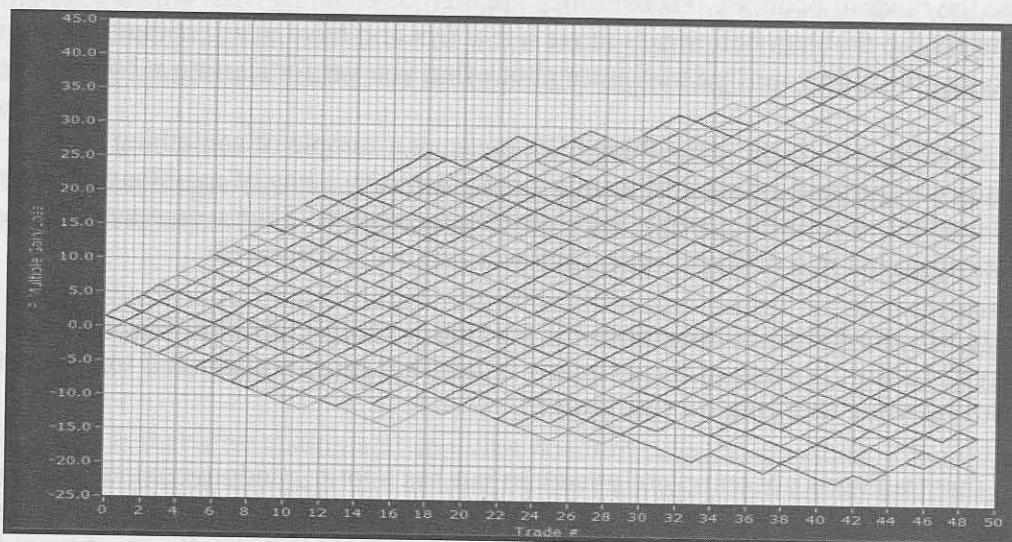


Image created from Know Your System software. Software not available for sale.

Figure 16-1: An Example of Possible Trading Outcomes

Notice that some of the paths ended at over 40R after 50 trades! That is an expectancy of nearly 1.0. Some of the paths ended at minus 20R after 50 trades! When you understand that, then the trader can prepare himself mentally and financially for the poor performing cases and, as a result, will likely do much better.

Okay, so that really gets us into the importance of simulations. Can you talk about that?

A backtest generates only one of the paths seen in the figure above. I can optimize the position sizing for that curve and create incredible results. What is going to happen when you apply that position sizing to the other curves? The results probably will not be good. By applying position sizing to the wide array of possible paths, you will end up with a much more robust system.

People cannot seem to understand that an R-multiple distribution represents a sample of the result of a trading system. To the extent that your sample represents the population of expected results from that system, you can really use it to determine what you can expect from a system. People often ask me, "How can that represent trading, you just randomly drew marbles out of a bag?" Can you answer that one from your engineering perspective?

Let's step back away from trading and look at what we do in other fields where we deal with random events. We take steps to measure samples of the random system, characterize probabilities of certain random events, and then make decisions based on those probabilities. A good example is your digital cell phone in a dense urban environment. The voice signal is sent from the cell tower where it bounces all over the place and arrives at your phone from many different directions. The end result of these random bounces is that the signal is hopelessly corrupted and you can't use your phone. When I was working on my doctorate in the late 1980s, this signal corruption made digital service impossible.

What is done now is that inside your phone, measurements are made on the incoming signal that best estimate the random bounces. Probabilities are then determined from which a best method is determined to fix the problem before you move a few feet and have to re-estimate probabilities. All this is going on inside your free miniature phone that you get for signing a 1-year contract!

In the case of trading, we do the same thing. We measure a sample of something random with our backtest. Then we "pretend" that those results were created by a bag of marbles and determine the R-value and number of specific marbles from our measurements. Then we pretend that we draw those marbles again but in a different order than was originally measured.

People like to ask the following question: "If trading is completely random, how can you make money?" I think it's one of the primary issues that most traders fail to understand. Can you address your thinking on this issue?

My belief is that trading is not completely random but has a lot of random components to it. For example, the buy and hold investor operates off the assumption that the markets increase (on average) a certain amount per year. If you tested this hypothesis statistically, most would come to the same conclusion. However, the market does randomly fluctuate tremendously around this average growth. So my belief is that there is a non-random part that I am trying to exploit and a random part that I have to live with. For buy and hold investors, one of the best ways they can deal with that random part is to keep on holding and praying.

Basically, there are huge inefficiencies in how humans react to markets. Those inefficiencies, in my opinion, make market trends and extremes and the non-random things we see in the markets.

For shorter-term trades, the same principles apply. We must operate under the assumption that the market is not completely efficient and there are non-random events that can be traded. The trader has to test to convince themselves that they are actually trading something that has a true edge. Along with this edge there are all the other random fluctuations that come with it. The trader must be prepared to deal with the wild extremes caused by these fluctuations if they are to reap the benefit of the non-random part.

Okay, then as traders, we are really dealing with randomly selected trades. And then several issues come up, which include the order in which the market presents you with your R-multiples, whether or not what you've seen in terms of R-multiples really represents your

system, and the fact that market conditions might change and thus change your system. Any comments?

This goes back to the many sets of unknowns that we have to deal with as traders. With backtesting followed by simulation, what we are doing is ASSUMING that the R-multiples we get are representative of the actual R-multiple distribution that your system generates. We then test the range of possibilities that could occur due to drawing the marbles in different orders. This begs the question, "What if the R-multiples we get from backtesting are not representative?" There are several ways to convince yourself that this is not the case.

First, during backtesting, we can help minimize this possibility by understanding what the system is doing and convincing ourselves that the edge we are exploiting is likely to be stable. Also, by backtesting a large numbers of trades, we are hopefully improving our odds that our sample will be representative.

In other words, the larger the sample, the more likely it is to be representative of the population. It certainly works with samples from a marble bag.

Yes, I agree with that but that is the statistical answer. The real answer is that if the system tests well enough, then your expected gain of trading this system for a period (let's say a year) should be much larger than your risk of trying it. In part, we can accomplish that via position sizing.

My rule of thumb is that after testing and applying position sizing to a system, I should be convinced that it would be unwise to not at least try the trading system with a small amount of money. If it proves out with real money, great; I will increase risk. If not, my total loss should be small.

Many books about designing systems and then backtesting those systems are available. From this knowledge base and experience, a trader can usually get a good feel if a system is likely to work in the future and perform approximately the same.

And how do you know if the market just changes so that your system doesn't work?

We can all count on that happening. It is just a question of when. If you trade really solid systems, they should not go from being profitable to being grossly negative. More typically, they will fail by breaking even since they have lost their edge.

In Chapter 4, I recommend that people make the assumption that there are six markets (for any system) and that you must know how the system trades in each market. There are upside, downside, and sideways markets. And each one can be volatile or quiet and that makes the six kinds of markets. You should know how your system will perform in each type of market. What's its R-multiple distribution in that market? What's its System Quality NumberSM? Typically, when a market changes, it just switches to another one of the six market types. So if you have a filter for market type, you'd be fine.

I agree, when enough data is available to accomplish testing in different market conditions. If you trade the S&P or other futures, then you can get access to enough data to do exactly that. If you are able to accomplish that level of testing, then you have a tremendous amount of confidence in your system.

If we think back to the bubble in the late 1990s, however, you cannot always accomplish that goal. For day traders on tech stocks, there was very little “intraday data” on these stocks. Many of them were new stocks, created as a result of the high tech boom, so what history existed was all wildly bullish. Somebody that would have tested a strategy that was basically “buy very near the open if the stock opened strong for the first few minutes and hold to end of day (with some logical stop value)” would probably have concluded this was a nice bull market system. They would have no idea how it would do in other market conditions nor would they know when their current bull market was going to end. This is a case where we have limited statistics but as long as the bull continues, we have reason to believe it will work. So instead of relying on the statistics, I would rely on my position sizing to allow me to risk small amounts of initial capital and then markedly increase my risk as I had winnings to work with. As I gathered more trades, I would add them to my statistics to refine my original data.

Okay, how do I create an equivalent marble bag and how do I know it is good enough? Let's say I have the R-multiple distribution of 50 trades. How do I know if that really represents what I can expect from my system or whether it's some aberration?

The first step in this is to be able to generate test results from a backtest. Preferably what I do is record my gain/loss in the trade as well as my initial risk level as determined by my stop position. So I might have something like Table 16-1 where the first column is the gain/loss and the second column is the risk level. This corresponds to the R-multiples shown in the third column.

Table 16-1: Risk vs. R-Multiples		
Gain /Loss	Risk	R-Multiple
\$225	\$100	2.25R
-\$150	\$40	-3R
\$100	\$100	1R
-\$100	\$100	-1R

With a lot of trades, we will get many trades with the same R-multiple, so we start adding them up.

That's pretty interesting because your actual trading system is quite good with a System Quality NumberSM of 4.13. What are some of the common measures of system performance and why are they difficult to interpret for most traders?

When I look at my TradeStation® backtest performance report, I have two pages of different measures of a system. These include win%, avg. win/avg. loss, maximum drawdown, profit figure, coefficient of variation, trade efficiency, etc. All of these have their place and time. I have seen people on trading bulletin boards all the time saying “Look at my test report. Should I trade this?” Boy, is that a loaded question!

Let's assume for starters that the system developer has done everything correctly and their backtest accurately reflects commissions, slippage, runaway markets, etc. I still don't know how to answer because of two unknowns:

1. What would have happened if I drew the marbles in different order?
2. What are the goals/pain thresholds for the trader?

What do you consider important to understand about a system?

I like to think about system trading as if I was sending my money off to a money manager. From the top level, I am only really concerned about three things:

First, is the past performance good and do I have reason to believe it will continue?

Second, how is the performance relative to the risk? So if this system (or manager) can produce 15% per year with drawdowns of 7.5%, then I have a 2:1 reward/risk. I also know that if I want to increase my gain and have access to margin or the equivalent, then I can get bigger gains with bigger drawdowns.

Third, how long do I have to wait to know something is broken? So if this system (or manager) has experienced drawdowns that last from 1 week to 8 months on average, then I know I must expect at least an 8-month drawdown. If I am not comfortable with this, then I should not use the system.

With an R-multiple simulator, we can measure the second two for random marble draws performed 5,000 times. The simulator measures the average yearly gain (in R-multiples) and the average of the maximum drawdowns for the 5,000 trials. This gives us a yearly Reward/Risk ratio. In addition, it measures the length of time that the system is likely to stay in a drawdown.

And what are your personal goals for your systems?

For me, I had problems matching my personal goals with what my systems would provide. Now I have some pretty stringent but achievable requirements:

- A system must produce at least a 3:1 reward-to-risk ratio before I will consider it.
- A system should be unlikely to stay in drawdowns more than 2.5 months. I am not saying this is right for everyone; I am just saying that for me, if it is longer than this, I get uncomfortable.

Why is the inclusion of time and trading frequency in simulation so important?

Without understanding the time factor, I would never know if I had a match between my desire for short duration drawdowns and what the system is likely to produce. It will surprise many people but most systems that operate at end of day or longer time scales will typically have drawdown durations lasting for a few months to a few years.

Trading frequency plays a key role in determining how fast you come out of drawdowns and also the reward-to-risk ratio that you can achieve on an annual basis. Many systems require between 25 and 200 trades to recover from a long drawdown. If I trade twice per month, then that recovery is very long. If I trade 50 times per month, then my recovery will be 4 months or less. Right now, I trade about 12 times per month but would like to get that to about 25 times per month.

How do you measure drawdown characteristics and what does it mean to have a 10% chance of a 15R drawdown?

Let's say I simulate an R-multiple distribution that trades 10 times per month and I simulate 120 trades, which is one year's worth of trading. Figure 16-2 shows such an example from the simulator. This means that out of 5,000 trials of one year durations, only 10.5% of them had a 14.8R drawdown. That means that for the next year, I only have about a 10.5% chance of seeing such a large drawdown thus it is pretty safe to assume that it will not get any worse than this (if the R-multiple distribution truly represents the trading system).

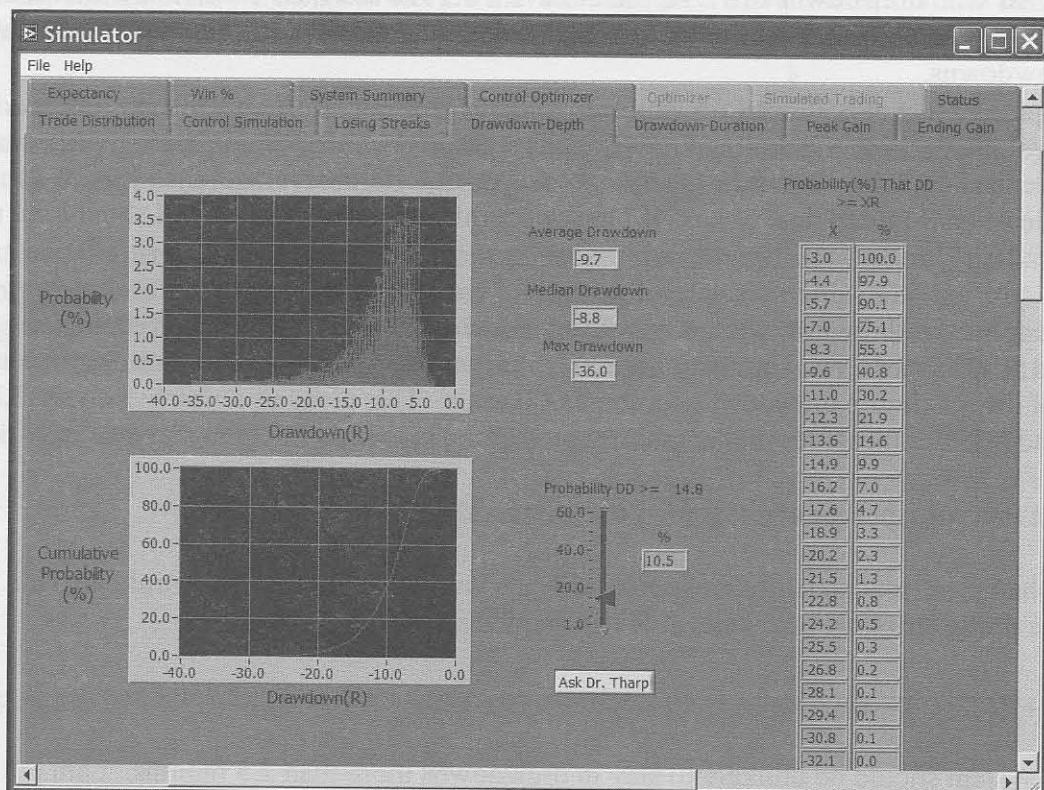


Image created from Know Your System software. Software not available for sale.

Figure 16-2: Drawdowns in a System

How do you apply traditional position sizing to the results?

I think you've done a good job of covering that. Determine your objectives and System Quality NumberSM and then use the guidelines in this book to determine what strategy is right for you.

What do you see as the primary goal of most traders? And how would you measure that?

I believe that most traders simply want to maximize returns while minimizing the pain of trading. But this really gets into determining your objectives. If you think about it, there are very few activities where you can be knowledgeable about what you are doing, can work hard for many months on end, and still have less money than when you started several months ago. Most of the time in trading is spent in drawdowns. Understanding what gains you are after and what you are willing to live with is crucial in mentally surviving the tough periods. As I stated above, I believe the yearly gain/average (or median) drawdown is a good measure when coupled with drawdown duration.

What characteristics should I look for in a system that will produce those kinds of results? And have you any ideas what to do to produce those characteristics in a system?

I believe that your ideas about expectancy are a great benefit to many traders, myself included. Until I read your work, I did not have a good connection between what I do with random electrical signals and trading. In my opinion, what is much less known in the trading community is how important it is to compare expectancy (i.e., the mean R) to the standard deviation of R for your trades.

Chris, explain what standard deviation means and what the implications of it are for traders?

The standard deviation of the trades is just a measure of the randomness of our results. So for example, suppose we calculate that we make an average of \$50 per trade with a risk level R of \$200 (note: our expectancy is $0.25R$). We then calculate our standard deviation and it turns out to be \$300 per trade. A standard deviation like that probably means we take a lot of losses bigger than $1R$. Crudely, this means that it would be quite common for us to get losses on the order of a \$250 loss (i.e., $$50 - 300) or a \$350 gain (i.e., $$50 + 300). If you can imagine adding together a series of random winning and losing trades, then your equity curve will tend to go up but will appear quite jagged. As the standard deviation becomes smaller, relative to the expectancy, then the equity curve will be much smoother and drawdowns will be much shorter.

As the standard deviation becomes smaller, relative to the expectancy, then the equity curve will be much smoother and the drawdowns will be much shorter.

So how does it work?

So if we have a list of R -multiples, we simply calculate the expectancy by taking the average. What we hope is that expectancy is a measure of the non-random (or edge) part of the trade. And we can determine if it is a real edge statistically. From the same list, we can also compute the standard deviation of the data set, which can easily be done in Excel. This is really a measure of how randomly those results vary around the expectancy. If I take the ratio of expectancy divided by standard deviation, this gives me a feel for how big my edge is relative to the random variations. This will translate directly to “smoothness” of the equity curve.

So what is a good relationship?

Standard deviations that are less than 5 times the expectancy (expectancy/STDEV > 0.2) typically produce drawdown characteristics that I can accept.

And if that holds up over a large enough sample, say 100 trades, we'd have statistical significance. That would produce a System Quality NumberSM of 2.0. And that's really a t-distribution for 100 samples, which is highly significant, meaning the odds are better than chance that you'll make money from the system. Anything else?

While it is beyond the scope of this interview, one can show that there is a unique relationship between this ratio and how many trades it typically takes to recover from a drawdown. The bigger the ratio, the more likely the system will recover.

There is a standard measure in statistics (that is also reported in some testing packages like TradeStation) that is the inverse of this ratio and is called the coefficient of variation:

$$\text{STDEV} \times 100\% / \text{Expectancy}$$

So for example, I just tested a system with expectancy of 0.8 and a STDEV = 4.82.

$$4.82 \times 100 / 0.8 \text{ yields a coefficient of variation of } 602.5\%.$$

So what does that mean?

The smaller this coefficient, the smoother my equity curve and the more rapid my drawdown recovery.

How did you come to that conclusion? That's a huge jump!

I agree that this is a huge jump concerning the drawdown duration. It comes from a fairly intense statistical analysis that I performed because I was very interested in knowing what to look for in a system to meet my goal of short duration drawdowns. Of course after doing this, I realized that others had known about this for quite some time and I had successfully reinvented the wheel.

So traders could just look at their coefficient of variation for a number of systems and over time, they'd probably observe the same relationship. You also mentioned trading frequency, please discuss that.

Trading frequency is also very important since it impacts my yearly gain and my drawdown duration. So, for example, if I trade 10 times per month with an expectancy of 0.5R, then my average yearly gain (without compounding) is $0.5R \times 10 \times 12 = 60R$. I can increase that if I just draw marbles more frequently. However, I should not drastically change the depth of my drawdown. Drawdown duration is shortened because I trade enough that I am likely to get through in shorter time. So if my simulation results suggest that the average drawdown recovery will require 91 trades and I make 10 trades per month, then my drawdown time is just $91/10 = 9.1$

months. If I can increase the number of trades, but keep the same R-multiple distribution, then this drawdown duration obviously is shortened.

I recommend that my Super Traders have three systems that they are using, and I know you are a strong believer in multiple systems. Can you explain why?

There are two reasons: If one marble bag (system) has changed, chances are another system will keep on working and I will be fine. Also, multiple systems allow me to increase my trading frequency, while still taking only high quality trades.

Are there any particular criteria you have on multiple systems?

First, each system has to be strong enough on its own to warrant trading. Second, each system has to be uncorrelated with my other systems. Unless it is uncorrelated, then you will frequently take losses in multiple systems at the same time. So when I started trading automatically with a basket of stocks, I used a single swing trading system with multiple stocks that were reasonably unrelated to one another. Even though my backtest data did not show it, I frequently found that I would get into all the stocks at about the same time. If a major reversal then occurred in the general market, I would then find I would take a loss against all my positions. Of course, when things went well, I made a lot across all the positions. This is really no different than just increasing your position size on a single stock and is very dangerous. I only mix systems if it is highly unlikely that I will be in more than one position at a time. This is by no means a requirement, but it works out well for me.

For good systems, what limits your position sizing growth rate and how do you know?

I have run into a problem where my position sizing wanted me to take a larger position. I was very comfortable with that, but my buying power would not allow me to take the increased size. This especially happens with FRPS and it has significantly limited my gains. My lesson was to carefully watch margin usage as you layout a plan to grow with increasing wins.

How can traders bring on-line a new system while substantially minimizing portfolio risk relative to their ultimate gain if this system is successful?

The trick here, once you think you have a good system with a solid yearly gain /drawdown performance, is to bet small initially and then grow with winnings. We can do this with fixed ratio position sizing or percent risk position sizing. I will use the latter as an example.

Suppose we model the following system: 10 Marbles -1.0R 10 Marbles +1.5R

It makes 10 trades per month. So the system wins 50% of the time and has an expectancy of 0.25R. When I test this, it has a typical drawdown of 9R.

Initially, let's say I want to be very conservative and I only want to risk 10% of my original portfolio in a bad drawdown. I set up the optimizer so that I consider it ruin if I got a 10% loss of

initial capital. Figure 16-3 shows what happened. I simulated 120 trades (1 years worth) 5,000 times.

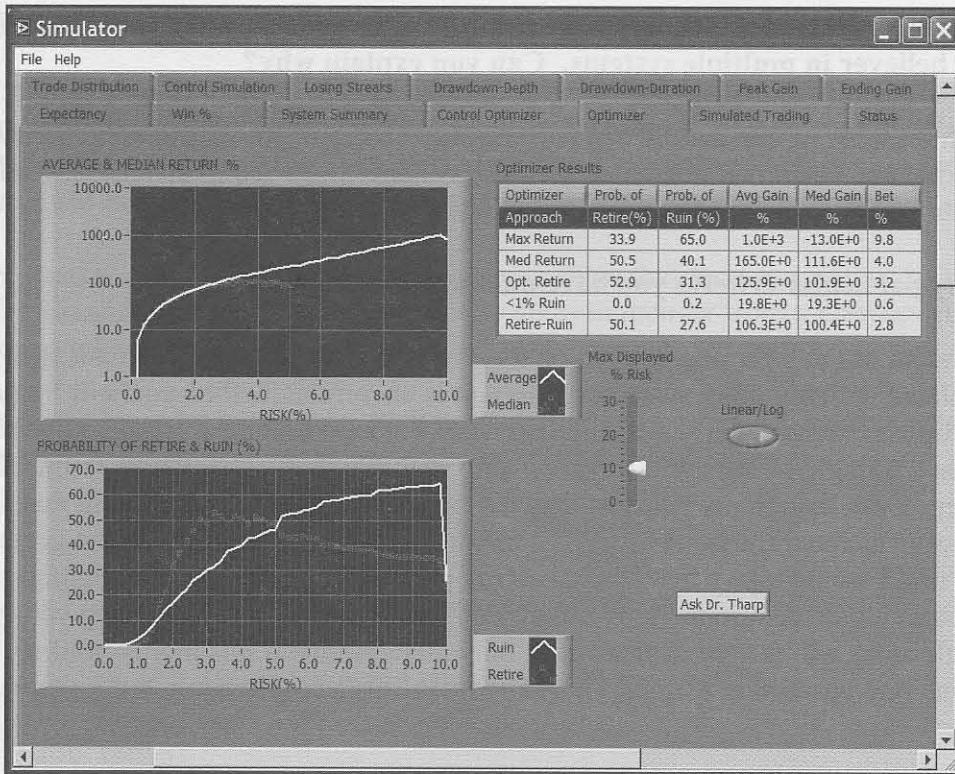


Image created from Know Your System software. Software not available for sale.

Figure 16-3: Simulation to Determine Optimal Bet Size

Notice that I have < 0.2% chance of ruin if I start with a bet size of 0.6%. Also notice that I get my best median return with a 4.0% bet size, but I have a 40% chance of ruin, which is unacceptable. What if we bet small until we build up enough winnings that we can safely bet 4% with a negligible chance of hitting our ruin amount? So I set up the percent risk simulator with 0.6% original bet size, which then switched to 4% if I'm up 15% or more. I then simulated 2 years worth of trades and the results are quite impressive. Probability of stopping out at -10% was negligible at 0.2% chance. Our median gain after 2 years was 155%. So with position sizing and a quite marginal system, we risked 10% to make a typical amount of 155%. (*If you are concerned that you don't have a simulator to do this, Chris is simply describing a form of Model 18, Two-Tier Position Sizing, described in Chapter 14, along with guidelines for how to do it based upon your System Quality NumberSM.*)

Thank you, Chris, that was interesting, and it gives people a pretty good idea of how to put it all together.

Chapter 17

Position SizingSM Software Examined

I'm often asked the following question: "What kind of software do you recommend to help me with position sizing?" I'll give you two answers to this: a short one and a more lengthy explanation. The short one is that every software product I know of has some drawbacks. The long answer you'll probably understand after I give you some history.

My Experience with Position Sizing Software

The first trading software was either developed to screen stocks (i.e., to help you with the "stock picking" job that most people believe is important) or to optimize a trading system to fit the data. The first type of software simply searches the universe of stocks to find some technical or fundamental criteria that you think are important for stock picking. The second type of software allows you to overlay all sorts of technical indicators on a multi-year set of trading data to develop some sort of system that will give you a great profit on the instrument you are testing.

The problem with both of these types of software is that they don't operate the way you do as a trader using position sizing. With position sizing you must make decisions with a portfolio of positions time period by time period. That's not really compatible with how other types of trading software (that most people want) operate. Thus, there is a basic incompatibility between position sizing software and trading software.

The first person to seriously address this issue was Bob Spear who developed a product called *Trading Recipes*. *Trading Recipes* worked on a set of data as a whole, so Bob didn't really solve the incompatibility problems I just mentioned. He did, however, have a position sizing overlay to work with the trading system you'd developed. Nevertheless, because the money management was basically an overlay to traditional "one trade at a time" type software, it was impossible to do anything that was time dependent in position sizing such as scaling in and out. Bob and I worked together for a while and I discovered the seriousness of the incompatibility problem. *Trading Recipes* was a DOS-based product and he found that the job of converting it to Windows and making it do "real" position sizing was overwhelming for him in the mid-1990s. However, his new Windows version, **Mechanica**, is now available.

My next adventure into position sizing software was when a software developer from England developed a product called *Athena* that would do everything that was in the original *Special Report on Money Management*. The software was great, but very expensive (\$12,500). It basically linked with *Trade Station®* to combine systems with multiple position sizing models. Moreover, it had basic trading models built into it, in addition to "thinking" in terms of R-multiples. *Athena* had a channel breakout system built into it and also a random entry system. Many of the models from the original *Money Management Report* were tested with that software.

Athena also had major problems that prevented it from ever becoming a viable product. One of the problems was the lack of technical support for the product. In addition, through my research I also discovered that position sizing software like *Athena* could optimize position sizing to do extremely well with past data and not perform that well in real trading. As a result, I became much more interested in simulators to look at position sizing.

The first simulator we used was an Excel simulator developed by Frank Gallucci. At one time we offered a position sizing workshop with Excel products that Frank had developed. We stopped doing these workshops, which included the software for free, simply because there was not enough demand for them.

And finally, Chris Anderson developed a much more sophisticated simulator called *Know Your System*. I used this software to do my position sizing research, and have saved you a lot of time by giving you the results in this book. However, it is not available for sale for two primary reasons. First, there are major assumptions made with R-multiple simulations that could be violated by real trading. People could make some financially ruinous conclusions if they didn't understand those assumptions. Second, my company is not a software company and my staff is not capable of doing any sort of technical support for the software.

I originally wrote the *Definitive Guide to Position Sizing* with the idea of bundling it around *Know Your System*. When we made the decision not to move in that direction, much of this book had to be rewritten. Instead, I have relied on using the System Quality NumberSM to help you with guidelines for what you can do with position sizing. We are also putting out the *Secrets of the MastersTM Trading Game* version 4.0, which has a lot more simulation capabilities, including allowing you to see your drawdowns in terms of R-multiples.

Overall, position sizing software has many problems, but the same can be said for trading software. My opinion, prior to writing this chapter, was that you probably need to develop your own software, or learn to program in Excel to get what you need in terms of position sizing. In fact, almost every really good software solution seems to require that you learn to do some programming. You probably didn't want to hear that, but that's just the way it is.

Nevertheless, I've asked various people to fill out a brief questionnaire about the software they are using. In some cases, I've asked the developer to fill out the questionnaire. Please understand that *just because the software is mentioned here does not mean that I like it or recommend it*. In fact, at the time I wrote this review, I had not personally tried any of the products mentioned here with the exception of XLQ.

As a result of doing this review I now believe that there are a number of packages out there that have become quite sophisticated. And whether you want to find a simple system that works and allows you to do position sizing or develop an almost custom solution to your needs as a trading business, there is some software that could meet your needs. Finding the right software is a lot like finding the right position sizing algorithm. You need to find out who you are, what you want to accomplish, and then look for the software package that comes closest to meeting your needs.

Software of this nature usually is “out of date” very quickly. Thus, if I mention that some software has certain shortcomings or lacks certain features, it doesn’t mean that will be the case when you read this. As a result, I’ve also included a web site for each product mentioned. I’d recommend that you go there, read about it, view the software demo (if they have one) or download the software users manual (if it’s available), ask questions related to what you want, and then make more informed decisions. In addition, I’ve only included software that is available commercially and has some support for the end-user.

First, it is important that you understand that there are six different categories of software that might be useful to you. I have not included software that primarily does screening or system optimization in any of these reviews. I’ve chosen to include six categories:

1. Software to keep track of trades and help you with expectancy and R-multiples.
2. Simulation software.
3. Position sizing software.
4. System-specific software with some position sizing capability.
5. Multipurpose software with position sizing capability.
6. Advanced software that might save you from having to spend hundreds of thousands of dollars on custom programming to run your trading business.

We will be reviewing the software that our clients have mentioned under each of these categories. In each case, when I mention some software, I’ve also put the name of the person who filled out the questionnaire, gave me enough information so that I could write the review, and, in one case, actually wrote the review that is included in this chapter.

Software to Keep Track of Your Trades

With software that keeps track of your trades, there are several ways to go. The first way involves using spreadsheets to do almost everything. Most people who travel this route use Excel, although one person said he uses Lotus 1-2-3.

EXCEL

If you have *Microsoft Office* on your computer, then you have Excel on your computer. In this guide I’ve already shown you examples of Excel keeping track of your R-multiples for each trade. You can then use the many Excel functions to determine the mean and standard deviations of your R-multiples as well as your System Quality NumbersSM. And if you use Excel, you can basically keep a running total of all of this information. For example, look at Table 2-6, which is an Excel table.

Excel also has the ability to get data from financial websites by simply clicking on the data tab, clicking on “import external data” and then on “new web query.” This will bring up a box in which you can enter the address of the web site you wish to go to (for example, Yahoo! Finance is

full of historical data). And once you get to that web site, you can simply import the data you want into Excel. This requires a certain amount of knowledge of how to use the spreadsheet.

XLQ

If you like the Excel route and don't mind doing your own programming, then I highly recommend that you subscribe to XLQ¹. This is basically a whole series of enhancements that you can add on to Excel that will give you lots of financial formulas and indicators. For example, there are formulas built-in to do many of the most common trading indicators, such as the Average True Range, various moving averages, MACD, DMI+ and DMI-, etc. There are over 250 different formulas, including many fundamental values that are added to Excel when you use XLQ.

XLQ costs \$74 (\$119 for the enhanced version) with a reduced yearly renewal price and it is well worth it if you are very competent with Excel. In fact, Ken Long uses XLQ to write and send out huge reports on ETFs and Mutual funds to his database every evening (www.tortoisecapital.com). If he did this by hand, it would take 6-8 hours to prepare, but he does it all with XLQ and it only takes a few minutes of his time each day to run the software and generate the reports.

I would actually follow this same route, but it requires that you really become very competent working with Excel, and learn how to program macros, etc. That is not one of my skills at this moment, so I'm not using it as much as I'd like. But if you are considering software that still requires you to do a lot of programming and you don't know how to program, then learning how to program in Excel and how to use XLQ might be the way for you to go. There really isn't any training for how to use XLQ except for a demo spreadsheet; however, a fully functional version of XLQ can be downloaded and used for free for 45 days before the purchase. Ken says that there is a very active Yahoo users group for XLQ where you can ask questions and get help.

XLQ also has a COM interface allowing you to use all the formulas and data via other programs with a COM interface or any of the popular programming languages, including Visual Basic, C#, Access, C++, perl, etc.

For information about XLQ, go to <http://www.qmatix.com>. In addition, the developer, Leo van Rijswijk also offers custom solutions.

Stator® Financial Management Software

I've included Stator^{®2} in this review because several of my clients have recommended it as a strong financial software package. Here's what one reviewer said:

"I think the strong points of the software don't lie in its position sizing capabilities (it doesn't feature any testing, for example), but in the extensive ways you can present your past trades via statistical measures and graphical representations. It has all of this plus the ability to handle

multiple systems and generate a trading diary. Thus, it is a great package for monitoring your trading.” —Thorsten Reiss

The software is easy to use and will analyze your entire portfolio. It does have percent risk, along with portfolio heat and group heat, but it really isn't designed for position sizing. It's portfolio analysis software. Here's what the web site says:

“Stator® provides you with all the tools you need to monitor and analyze your trading performance so that you can accomplish what all traders strive to do:

1. **Limit losses** by practicing sound risk management techniques.
2. **Improve weak spots** in your trading methodologies.
3. Know your exact **Profit/Loss situation at any point in time**.
4. **Learn from your mistakes** so that you never repeat them.
5. **Have total control and confidence** in your trading systems. [Note from Dr. Tharp: I tend to doubt the control part.]
6. **Find the perfect trading formula** suited to your trading style.
7. Find and exploit new **trading opportunities** from all over the globe.”³

In addition to all of these benefits, you will also cut down on the amount of time you spend on simple administration tasks so that you can concentrate on finding more profitable trading opportunities.

Proper performance management is where successful trading evolves from. **For the cost of less than one single trade you can make an investment which will influence all of your future trades for the positive.**

It has the following important features:

- The ability to work with trading pools (i.e., multiple systems)
- Stop and target management of ongoing trades.
- A tax module.
- Extensive charts and system statistics. They've even included the System Quality NumberSM based upon one of my answers to a question that was reproduced in *Tharp's Thoughts*.
- It allows you to create a trading diary.
- And it does numerous reports.

I have not seen this software myself, but you can visit www.stator-afm.com to learn more. The website contains over 20 free video tutorials, which should give you a good feel for the software. The software comes in three editions, ranging in price from \$55AU to \$495AU (~\$417US) and, according to the reviewer, is easy to use. Also when you purchase the software, you get a number of bonuses. I was interested to see that one of those was a copy of an article I wrote with Hank Pruden on the *Tasks of Trading*.

StockTickr

StockTickr⁴ provides an online trading journal, shown in Figure 17-1, that tracks the performance of your trading system using the R/expectancy model. Trades can be manually entered into the journal or automatically entered using a simple Application Programming Interface. There are plug-ins for various software vendors and brokers.

When you enter a trade for a particular stock, StockTickr displays default values that correspond to your trading history and preferences. These defaults can be adjusted to fit your style. The values can be easily changed to reflect an actual trade. Changing the values for open price, shares, stop price, and portfolio value automatically adjusts the percent risked fields so you can see what your risk would be under different scenarios.

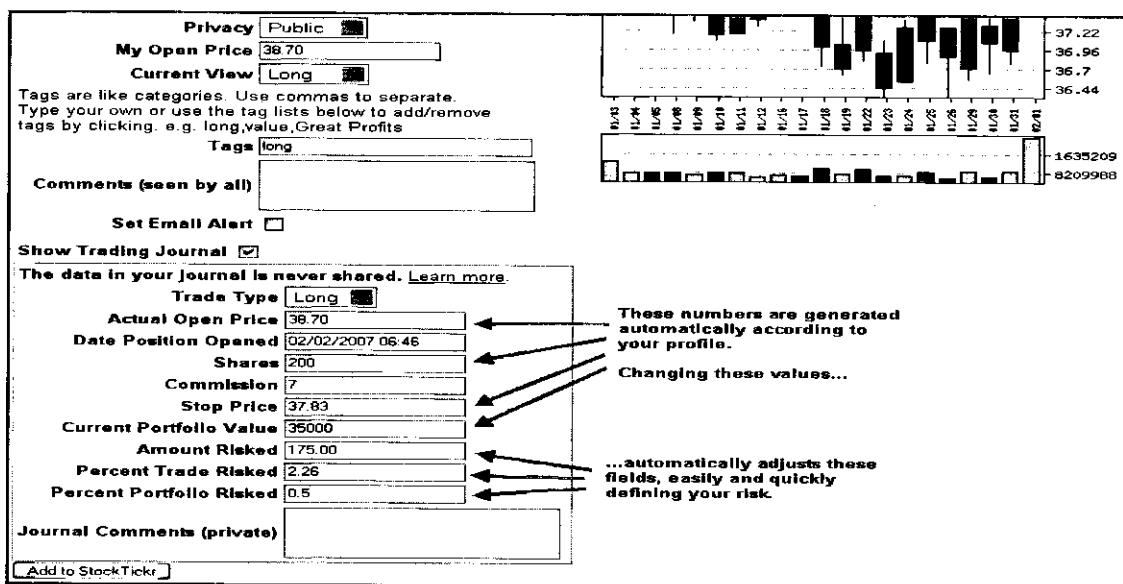


Figure 17-1: StockTickr Journal Entry

Once the trade is entered, it goes into your trading journal that can be accessed from any web browser with your login and password. StockTickr provides an "R table" that can be accessed by hovering over the dollar icon, shown in Figure 17-2. This displays price levels that would need to be reached to meet certain R-multiples for the trade.

Hover mouse here to
display prices to
reach certain R level

davernabe Trading Journal
Export Journal to CSV

Showing Journal entries from last 30 days. Show All

Symbol	Opened	Status	Shares	Type	Entry	Last	Stop	Profit	Close	% Risked	Total % Risked	Expectancy
ADM	2007-02-01 11:00:00	Closed	600	Long	35.00	35.27	34.73	126.00	35.21	0.77	0.46	0.78
ALL	-1R at 34.73		1000	Short	60.65	61.19	60.85	20.00	60.63	0.33	0.57	0.1
ZMH	0R at 35		500	Long	83.50	82.75	83.16	-67.50	83.36	0.41	0.49	-0.4
WDC	1R at 35.27		1000	Short	19.04	19.32	19.19	-80.00	19.12	0.79	0.43	-0.53
WDC	2R at 35.54		1400	Short	19.16	19.32	19.31	-210.00	19.31	0.73	0.56	-1.07
WDC	3R at 35.81											
WDC	4R at 36.08											
WFR	2007-01-26 11:15:00	Closed	400	Long	50.59	52.64	50.11	370.00	51.51	0.94	0.54	1.95
CHIC	2007-01-25 14:00:00	Closed	500	Short	29.03	30.29	29.40	65.00	28.90	1.27	0.53	0.35
ACXM	2007-01-25 12:31:00	Closed	600	Short	22.58	22.96	22.86	286.98	22.10	1.25	0.48	1.7
NUE	2007-01-25 11:00:00	Closed	250	Long	63.63	64.83	62.95	-170.00	62.95	1.07	0.49	-1
GLW	2007-01-24 12:22:00	Closed	800	Long	20.88	21.09	20.67	0.00	20.88	1.01	0.48	0.00
STX	2007-01-24 11:00:00	Closed	1000	Long	28.14	26.34	27.95	-56.40	28.08	0.67	0.54	-0.3
UTX	2007-01-23 14:23:00	Closed	300	Long	66.60	68.00	66.17	-72.00	66.36	0.65	0.37	-0.56
TXN	2007-01-23 13:33:00	Closed	1400	Long	29.96	31.39	29.84	-126.00	29.87	0.40	0.48	-0.75
VFC	2007-01-23 12:07:00	Closed	300	Short	76.14	76.12	76.75	-150.00	76.64	0.80	0.52	-0.82

Figure 17-2: StockTickr R-Multiple Table

For each trade, StockTickr automatically generates charts in various timeframes with the entry point, initial stop, and exit points plotted on the chart. This helps traders determine if they are moving their stop too soon or not quickly enough. You can also query for charts with various characteristics, such as 15 minute charts for trades that resulted in a 3R or better gain. This is shown in Figure 17-3.

Figure 17-3: Monthly Performance

One of the most useful features of StockTickr is the ability to assign "tags" or categories to each trade. For example, you might want to track the performance of different strategies such as trading

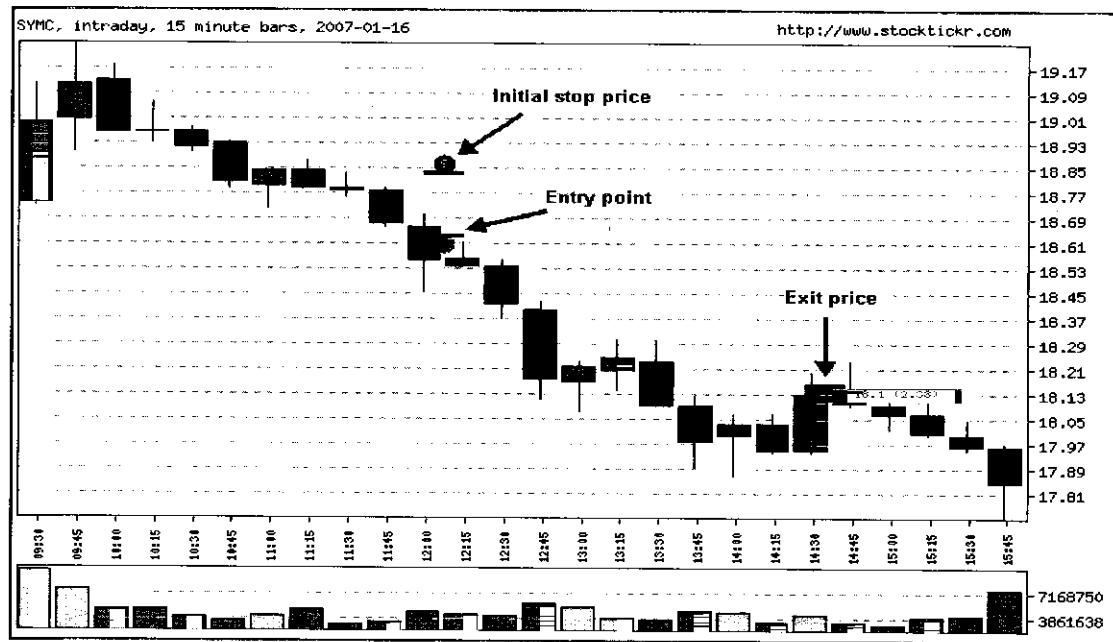


Figure 17-3: StockTickr Candlestick Chart

StockTickr also provides a calendar view of your trading that is color-coded, showing more extreme gains and losses in darker colors. You can write comments for each day and you can click on the number link on each day to view the trades that occurred on that particular day. This is shown in Figure 17-4.

Trading Journal Monthly View						
10/2006		November 2006			12/2006	
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1 R: 2.36R Win Rate: 50.0% Winners: 1 of 2 Expectancy: 1.18  	2  	3 R: 0.89R Win Rate: 33.3% Winners: 1 of 3 Expectancy: 0.30  	4
5	6 R: -0.91R Win Rate: 0.0% Winners: 0 of 1 Expectancy: -0.91  	7 R: 0.23R Win Rate: 100.0% Winners: 1 of 1 Expectancy: 0.23  	8 R: 1.33R Win Rate: 100.0% Winners: 2 of 2 Expectancy: 0.67  	9 R: -0.22R Win Rate: 0.0% Winners: 0 of 2 Expectancy: -0.11  	10 R: -1.25R Win Rate: 0.0% Winners: 0 of 2 Expectancy: -0.62  	11
12	13 R: 1.03R Win Rate: 33.3% Winners: 1 of 3 Expectancy: 0.34  	14  	15 R: 1.99R Win Rate: 66.7% Winners: 2 of 3 Expectancy: 0.66  	16 R: 5.77R Win Rate: 100.0% Winners: 2 of 2 Expectancy: 2.88  	17 R: -0.05R Win Rate: 50.0% Winners: 1 of 2 Expectancy: -0.03  	18
19	20 R: -0.99R Win Rate: 0.0% Winners: 0 of 1 Expectancy: -0.99  	21  	22  	23  	24  	25
26	27 R: 0.67R Win Rate: 50.0% Winners: 1 of 2 Expectancy: 0.34  	28 R: -0.73R Win Rate: 0.0% Winners: 0 of 1 Expectancy: -0.73  	29 R: 0.92R Win Rate: 100.0% Winners: 1 of 1 Expectancy: 0.92  	30 R: 1.34R Win Rate: 100.0% Winners: 1 of 1 Expectancy: 1.34  		

Figure 17-4: StockTickr Calendar

Figure 17-5 is an overview of the expectancy of your trading system per month.

My Performance by Month						
Month	Total R	Win %	Expectancy	Profit	Trades	Shares
February 2007	0.78	100.00	0.78	126.00	1	600
January 2007	0.80	39.29	0.03	392.33	28	17,550
December 2006	6.70	50.00	0.30	1,122.50	22	14,200
November 2006	12.38	48.28	0.43	1,410.00	29	16,700
October 2006	-2.61	33.33	-0.09	-553.50	30	14,300
September 2006	5.35	42.86	0.19	725.12	28	12,300
August 2006	9.07	43.33	0.30	1,199.91	30	13,650
July 2006	0.29	20.00	0.06	-17.20	5	2,800
June 2006	-4.00	0.00	-1.00	-608.00	4	400
May 2006	-6.33	12.50	-0.79	-934.00	8	2,600

Figure 17-5: Monthly Performance

One of the neatest features of StockTickr is the ability to assign "tags" or categories to each trade. For example, you might want to track the performance of different strategies such as trading

against the 15 minute bars versus the 30 minute bars. You might assign the tags “long,” “15 Minute Bars” for a long trade you took using the 15 minute intraday bars and “short,” “30 Minute Bars” for a short trade using the 30 minute intraday bars. This would allow you to track the performance of your trading system for trades you assigned “15 Minute Bars” versus trades you assigned “30 Minute Bars.”

You can assign multiple tags to each trade and then access reports based on each tag. Figure 17-6 is a sample report based on the tag that was assigned to trades.

davemabe Tag Expectancy				
Tag	Expectancy	Win %	Trades	Links to Reports
scalp	1.31	100.00	1	Week Day , Calendar , Total R
Good EPS	1.24	26.32	19	Week Day , Calendar , Total R
long	0.37	39.50	119	Week Day , Calendar , Total R
Opening Gap Fade	0.27	66.67	9	Week Day , Calendar , Total R
30Min Bars	0.24	41.58	101	Week Day , Calendar , Total R
Dummy Trade	0.18	40.37	161	Week Day , Calendar , Total R
short	0.09	40.40	99	Week Day , Calendar , Total R
momentum	-0.09	37.50	24	Week Day , Calendar , Total R
15Min Bars	-0.17	36.67	30	Week Day , Calendar , Total R
Gapper	-0.29	26.67	15	Week Day , Calendar , Total R
breakout	-0.31	50.00	2	Week Day , Calendar , Total R

Figure 17-6: Example of Tags

There are a variety of reports available to slice and dice your trading system and figure out what works and doesn't work, such as the one in Figure 17-6.

StockTickr also allows you to detect trends, and trade based on probabilities of what works and doesn't work with your trading system. There are new reports being added quite frequently that give the trader more information about and more confidence in their trading system.

You can find out more information about StockTickr at <http://www.stocktickr.com>.

I also believe you can do similar things at StockCharts.com, but we did not receive any reviews for that web site.

Simulation Software

Secrets of the Masters™ Trading Game

The **Secrets of the Masters™ Trading Game** is the only software product that my company puts out. The game's purpose is to help you understand (at an experiential level) the immense impact that position sizing has on your bottom line. You get to play three levels for free when you download it from www.iitm.com and then if you activate it, you get to play the remaining levels.

When people play it over and over again, the typical response is “I learned so much.” But if your approach is to “try to figure it out,” then you’ll probably discover that there is no answer, simply because position sizing is as much an art form as it is a science.

You can probably do any sort of position sizing model in this book in the game, but none of these are built-in because that would defeat the purpose of the game, which is to experience different methods of position sizing. Instead, to follow some model, you’d have to calculate exactly how to do it outside of the program and then enter it into the program for each trade as it comes up. You could even take the last 10 R-multiples as a measure of volatility and use volatility position sizing. It’s up to you and your imagination.

Yes, we could make it automatic and incorporate many models in there. We could make it do everything quickly based upon a particular model. But that’s not the purpose of the software. This software is designed to give you a feel for the impact that position sizing will have on your trading, one trade at a time. And to do that you have to experience it one trade at a time. This means calculating your position sizing, entering the trade, and then seeing the results.

One nice feature of the software is that you can plug in the R-multiple distribution from your own system and simulate that one trade at a time. The *Secrets of the MastersTM Trading Game* version 4.0 will also keep track of your peak drawdown in terms of R for you because that feature is required in some of the position sizing models.

Version 4.0 of the game is designed to work well with Windows Vista. We also have a new realistic feature. In the old edition, there was no slippage, no commissions, no taxes, and no psychological errors except for some built-in losses. All of these things limit the growth of your account, but they were not built into the game. People would think the game was unrealistic because they could make trillions of dollars. The newest version will have a box you can check to add in most of these obstacles to wealth building for those of you who want more realistic results.

Incidentally, we get people who ask me how to do specific position sizing models with the game or try to find out how to get through a particular level. Remember the purpose of the game is to experiment with position sizing so you can get a feel for it. It’s not a problem to solve. *It’s supposed to be a learning experience and you only get that experience by playing it a lot and experimenting.* Asking me what to do (or to comment on what you are doing) in order to get through a specific level defeats the purpose of the game.

TradeSim®

TradeSim^{®5} was developed by an Australian company, CompuVision, as an add-on product for MetaStock. The author said that he developed the software after reading about *Athena* in *Trade Your Way to Financial Freedom*.

TradeSim[®], however, is much more than a simple add-on because it allows you to do portfolio analysis, position sizing, and Monte Carlo simulations. TradeSim[®], according to its web site, is a true portfolio trading simulator and backtester, which analyzes the trades in the proper

chronological order and sequencing, thus mimicking the way that real trades would be executed. The web site says that it can do dynamic money management (i.e., position sizing) and risk control at the portfolio level.

So let's take a look at what one of the reviewers said about the various features. First, it comes with a basic system to simply demonstrate its functionality, but the software requires either *Metastock* or *Bull Charts* to generate the system signals. My understanding is that you can also manually input data to do simulations. It's easy to use, according to the reviewer, but does require some programming.

In terms of position sizing, it does equal units (i.e., 10% per unit), fixed dollar risk per position, percent risk, percent volatility, and portfolio heat. It apparently doesn't do things in which the position sizing depends upon what happens in the portfolio without some tweaking. For example, scaling in to positions could be done if you assumed two systems were operating together to produce the signals. Scaling out is also possible by assuming multiple systems. However, it does not do any form of market's money, nor does it do fixed ratio position sizing.

TradeSim® will calculate expectancy and it will provide the data to generate the standard deviation of R, but you would have to calculate it outside of TradeSim®. It will not calculate the worst-case drawdown in terms of R.

Apparently, TradeSim® is pretty good with simulations. Based upon comments from the reviewer and the developer, I think TradeSim® may do simulations with R-multiples, on R-multiples with position sizing, and on equity curves. I'm curious if it can do that, why it can't generate the worst-case drawdown in terms of R.

The software will allow you to run up to 20,000 simulations of the portfolio to generate the risk of ruin, frequency distributions and standard deviations of key portfolio statistics such as net profit, percent wins, percent losses, average drawdown, and maximum drawdown. The Monte Carlo output also produces charts so that you can see the relationship between various system statistics, such as profit to drawdown.

The Enterprise edition also generates open equity curves so that you can review individual trades on the chart. You can also review a whole portfolio of systems at one time. And lastly, you can model slippage with different types of buy and sell orders.

The documentation with TradeSim® is excellent and there is a strong user community with forums for support. To buy it, you simply pay for it online at <http://www.compuvision.com.au/TradeSim.htm> and download it. There are actually three versions of TradeSim®, the standard edition (\$159US), the professional edition (\$385US), and the enterprise edition (\$1,199US). What was reviewed for me was a pre-release version of the newest Enterprise edition (V5.2.0) of the software. You can buy lesser versions, such as a trial to the standard version and then upgrade to other versions if you think it meets your needs.

Position Sizing Software

Market System Analyzer

Market System Analyzer⁶ is perhaps the purest form of position sizing software that I've seen on the market. Again, I have not used it, so this review is simply based upon users' comments and my observations looking at the software web site.

In terms of position sizing, Market System Analyzer helps you determine what your position sizing should be with a large number of models, including the following:

- Fixed number of shares/contracts
- Units per so much equity
- Percent Risk
- Fixed ratio and a version of that in which you can adjust the speed at which position sizing increases (GRPS). It probably doesn't include FRPS the way we recommend you do it in this book.
- Margin target
- Leverage target
- Equity curve crossovers

It also includes a number of methods we don't recommend including optimal f , Kelly Criterion, and a Larry Williams method based upon your drawdown.

The software seems to be missing the ability to do time dependent analysis such as market's money, scaling in and scaling out. However, the manual explains that to do scaling in or scaling out, you simply have to treat each scale in or scale out as a separate trade and enter it into the software individually.

The software also does Monte Carlo simulations to give you confidence levels on your return rate, drawdown, return/drawdown ratio, and a modified Sharpe ratio. It does Monte Carlo simulations on your equity curve (as I understand it), but not on your R-multiples.

It helps you optimize your position sizing to meet various objectives including 1) maximum net profits, 2) maximum rate of return, 3) maximum average trade in a currency, 4) maximum average trade percent, 5) maximum profit factor, 6) maximum return to drawdown ratio, 7) modified Sharpe Ratio, and 8) limiting your maximum drawdown to a percentage of equity.

It also allows you to include trade dependency studies, parameter studies (a graphic position sizing sensitivity analysis), statistical studies, and has the ability to create trades from statistics. I have not really worked with any of these studies, so I don't have a feel for how useful they are. However, the dependency analysis could be worth the price of the software by itself.

And lastly, you can either import data from TradeStation® (which is not necessarily a plus for me) and MT Predictor (reviewed below) or enter it as a spreadsheet. One drawback, in my opinion, is that it takes the data as the total profit/loss on the trade rather than as R-multiples. However, you can also input your risk, so there might be some way to use R-multiples.

The third version of the software is about to come out and the web site says that it will do portfolio analysis. The software is priced at \$199 right now, so the price is certainly low enough for you to experiment with if you are so inclined. And you can download a free trial of the software, so that's even better. There is also a complete manual online for how to use the software.

Although I haven't used the software, I've looked at the web site (<http://adaptrade.com>). You might find it quite interesting and worth your while.

System Specific Software with Position Sizing Capabilities

MTPredictorTM

MTPredictorTM is the software that more people commented upon than any other. There is a reason for that. When I asked for a review, the folks at MTPredictorTM sent out an email asking their customers to send me a review. Eventually I just settled on having the people who developed and sell the software fill out the questionnaire.

This software is a little bit different from any of the others. It essentially offers trend following resumption methods based on a special Isolation ApproachTM to Elliott Wave and has risk/reward assessment and position sizing abilities attached to it. When I asked, "What's an isolation approach to Elliott Wave?" I was told that it involves a trademarked process that isolates the simple Elliott Wave ABC correction-to-trend and uses it to enter trades with a small, controlled risk and high potential reward. This approach has the added advantage of not having to fit the pattern into a larger pattern or to fit a smaller pattern into the isolated correction. In other words, it's a trend-following with retracement type method.

Thus, I thought I'd do a review on both the methods and the software.

The System: There are 5 main types of trade setups (TS) automatically identified by the software and the developers stress MTPredictorTM is a method, not a system.

- TS1 involves a trend resumption into Elliott Wave 3.
- TS2 involves a trend resumption into Elliott Wave 5.
- TS3 involves a trend resumption into an unspecified Elliott Wave.
- TS4 involves a non-specific trend resumption.
- DP involves a swing trade confirmed by divergence.

The MTPredictorTM process enables the trader to find a trade, assess its risk/reward outlook, position size and manage the trade. The standard exit strategy uses automatically-generated Elliott Wave targets for profit-taking and there is also the option to use their Average True Range (ATR) volatility stop, adapted from J. Welles Wilder's work.

With that information in mind, the developers supplied me with 838 trades published daily for customers between July 26, 2004 and July 22, 2005. These were all *day trades* lasting a few minutes to hours. The starting account size was \$50,000 (though a minimum of \$10,000 is advised as acceptable). Included were the key TS1, TS2 and TS3 set-ups, on the US index futures and ETFs and with a minimum +2x risk/reward outlook. Profits were taken according to the standard exit strategy mentioned above. The data did not include slippage and commissions. In addition, the R-multiples I was given were rounded to the nearest 0.25R.

The 838 trades had an expectancy of 0.46R with a standard deviation of 2.42R. They produce a System Quality NumberSM of 5.52, which is excellent and highly significant. However, the huge number is partially due to the fact that they gave me 838 trades. If I just look at the ratio of the expectancy to the standard deviation and then base the System Quality NumberSM on 100 trades, it comes out to 1.91, which is still an acceptable system that makes money at better than a chance level. A number of our customers said they were using this software (and thus these methods) and they were quite happy with it.

The Position Sizing Capabilities: According to the developers, the software does percent risk position sizing, using an integral position sizing calculator in both the real-time and end-of-day versions. Position sizing is supported in stocks, forex and futures. Percent volatility and group or portfolio heat are not supported. Scaling in position sizing (pyramiding) and scaling out techniques are routinely explained to customers, but don't seem to be a part of the software.

As it is not a standard system, it doesn't do simulations, but the developers say that they support and use Adaptrade's *Market System Analyzer*, which was reviewed previously. It also doesn't do expectancy calculations, but the in-house records (i.e., the ones I reported on) are available and customers' own records are often posted to their discussion forum.

Thus, if you want to use a complete process from identifying the trade, through risk/reward assessment and position sizing to logical trade management, in a relatively automated package, then *MTPredictor*TM might be for you. It works on worldwide liquid markets and is supported by daily training reports focusing on risk control and position sizing. There are also two versions of the software: the end of day version is \$1,995 and the real-time version (i.e., for day trading) is \$2,495. For more information, please go to <http://www.mtpredictor.com>.

The software requires a moderate level of skill to use, but doesn't require programming skills, which may be a plus for some of you.

Multipurpose Software that Includes Position Sizing

AmiBroker

AmiBroker⁷ is a fully programmable open-ended system that can probably do most of the things you want with sufficient programming. But that's like saying SAS or C or FORTRAN, for example, are capable of doing what you want, too. AmiBroker's advantage over general-purpose languages is that it has dozens and dozens of precoded features for technical analysis. My reviewer said, "Someone without strong programming skills who hoped to start AmiBroker and do all of the things you suggest in the second edition of *Trade Your Way to Financial Freedom* will be very disappointed. For example, I have not been able to program it to do simulations with my R-distributions to help me select a position sizing algorithm to achieve my objectives."

I looked at the *Table of Contents of the Users Manual* and the newest version has a position sizing variable built into it. It gave the following comments about using it.

"For example,

"Position Size = 1,000/ means invest \$1,000 in every trade

Position Size = -20 /means invest 20% in every trade (minus means invest a percentage of equity)

Position Size = -100 + RSI() means that the amount invested will depend upon the value of the RSI indicator with lower value resulting in a bigger investment."

This is a classic example of how software developers will invent new position sizing models. This one certainly was not covered in this book, but it also doesn't make any sense to me, unless it was somehow used in conjunction with a trend following retracement. But even then, does that mean invest 100% when the RSI is zero?

There is also a section that says "allow position sizing shrinking, which allows you to still invest if your available cash is less than the position size algorithm requires."

I also thought it funny when I read, "*Below is an example of the Tharp ATR based position sizing technique coded in AFL.*" And what followed was an example of using 1% risk, where risk was defined by a trailing ATR stop. Thus, the example was both risk based and volatility based. So obviously you can do percent risk and percent volatility position sizing.

I also read a section of the Users' Manual on portfolio backtesting. It gives an example of being 100% invested and dividing your portfolio into X number of equal positions based upon the dollar amount.

Another section of the Users' Manual focuses on pyramiding, so obviously you can scale in and scale out. However, to give you an idea of the focus of the software, the manual gives the following as examples:

- “1) Dollar fixed cost averaging, so that each month you might buy \$X worth of some security.
- 2) Increasing the position when the profit is greater than 5% and decreasing the position when the position has a loss greater than 5%.
- 3) Partial scaling out at profit targets.”⁸

Approximately nine pages of the nearly 800 page Users’ Manual were devoted to position sizing and portfolio testing. I saw nothing in the manual about simulations or R-multiples. However, that doesn’t mean that someone hasn’t written something for this package that you might be able to use.

The price is right for this software. It’s a one time fee of \$299 for the professional edition and a \$149 fee for the standard edition. The fee includes four upgrades. Also, Amibroker’s language, AFL, is an open architecture language and my understanding is that there is a strong user group. The software seems to be compatible with multiple data feeds.

My opinion, after reading the examples in the manual, is that learning the language will involve a steep learning curve, and this software would not be very useful at all if you did not master the programming skills necessary to use it. For more information (and to purchase or download a free trial), go to <http://www.amibroker.com>.

Since this review was written, I was sent a book entitled, *Quantitative Trading Systems*⁹ by Howard B. Bandy. The book is written by someone with an extensive math and statistics background and it gives lots of programming examples using AmiBroker’s AFL language. Thus, if you plan to use this software, the book is a must.

OmniTrader Professional

I included OmniTrader¹⁰ in this review because of the recommendation of a long time client. However, when I went to the web site, www.omnitrader.com and took the tutorial, I would not have guessed it to be a product that does position sizing or simulation extensively.

Anyway, I got the following information from the web site about OmniTrader Professional.

“OmniTrader is the only software that generates buy and sell signals based on the ‘personality’ of each security in a given list. We call this powerful technique the Adaptive Reasoning Model (ARM). In just seconds, the program will test all of its 120 built-in methods on each symbol in a given list to find the precise techniques that are working well. Then, it uses those methods to generate signals. ARM was invented at Nirvana Systems in 1994, and here is how it works:

“1. A list of symbols is provided to the software. This list can be as short as the S&P 100 or as large as the entire stock market, depending on how many candidates you want the program to generate for you.

“2. Press ONE BUTTON in OmniTrader, and it will begin its proprietary analysis. In a matter of seconds, OmniTrader will test each of its built-in trading methods on each security, choosing the

BEST techniques to use. Using this approach, OmniTrader is able to determine the personality of each individual security, according to our proprietary Personality of Markets Theory.

“3. The software automatically finds Buy and Sell Signals on each symbol in the list, using the methods that have been found to work well for each individual security. The result is a set of Buy and Sell Signals—automatically. No other software offers this automation benefit.”¹¹

I have no information about the R-multiples generated by this system, and thus can offer no opinion about the system quality. You are on your own here to do your own research.

OmniTrader also has a simulation mode, but it doesn’t appear to be a Monte Carlo simulator. Instead, it is a way to practice trading the system to see what would happen before real money is at stake.

The latest edition of OmniTrader (2007) has a portfolio simulator. And according to Ed Downs from Nirvana Systems, it does all of the following position sizing methods: fixed size, fixed price, fixed percent, price to equity, size to equity, optimal *f*, Kelly, percent risk and portfolio heat. It doesn’t do market’s money, or scaling in or scaling out.

The portfolio simulator provides full reporting of statistics (e.g., worst drawdown, best trade, worst trade). The user can simulate all methods at once to pick the best one. And the simulator generates equity curves that you can look at to determine how smooth they are.

There are several versions of the software 1) a Stock Version for \$495, 2) a Futures Version for \$695, 3) a real-time version for \$895 and 4) a professional version for \$1,948.

Trading BloxTM

Trading BloxTM¹² has a number of fairly good systems built into it, plus built-in position sizing. In addition, it also works with portfolios. Let’s look at the systems first. The built-in systems in Trading BloxTM depend upon the version you purchase. The “Turtle” version includes three systems:

- The Turtle System,
- Triple Moving Average, and
- Donchian—a simplified Turtle-like system that does not pyramid.

The Professional and Builder versions add eight more systems and some “trading blocks” that are not included in the standard version. The additional systems include:

- ADX,
- +DI/-DI
- ATR Channel Breakout—a volatility channel breakout system
- Bollinger Breakout
- Bollinger Counter Trend

- Dual Moving Average
- MACD
- RSI
- Stochastics

The extra blocks include a strength filter, a MACD filter, a group risk manager, having a profit target, pyramiding, having a gap open against, chandelier exits, percent risk, and percent volatility position sizing. If you want to have the flexibility to use all the basic position sizing algorithms, Trading Blox™ Professional is the minimum version to purchase. In addition to the supplied Blox™, Trading Blox™ Professional will allow you to add other Blox™ written by other users or posted to their support forums.

Trading Blox™ Builder has everything that the professional version has, plus the ability to build your own new trading blocks. This does require some programming skill in the Blox™ programming language.

The software allows you to look at R-multiples and do an expectancy calculation. It also has some Monte Carlo simulation features including the ability to look at what your possible drawdowns might be as a percent of your equity.

Let's look at the basic building blocks of this software.

First, the portfolio manager allows you to track securities, commodity futures, and forex futures. It will also let you dynamically select which markets or stocks are available for trading based on a portfolio selection algorithm defined in code. And it has the ability to enter the exact specifications of the futures contracts so that the data can be properly analyzed.

Second, the Entry block allows you to create an order for actual trading.

Third, there is a Money Manager block, which implements the position sizing algorithm for a system.

Fourth, an optional Risk Manager helps you set risk parameters for dynamically controlling the risk of your positions. This includes the ability to insert stops, and adjust the position size of open trades based upon risk criteria that you set. This block allows you to both scale in and out of positions based on risk criteria.

Lastly, the Exit block allows you to specify your exit conditions. It's important to know that this block will accept multiple criteria.

The System Editor, shown in Figure 17-7, is used to create new systems and modify old ones. It requires no programming skill to do this. All you do is simply drag and drop available blocks into the system and several entry and exit blocks can be used with each system. Each block can also be used in multiple systems, so all systems can share a common position sizing algorithm, for example.

The figure illustrates the concept of building a system by dragging various “Blox™” into appropriate spaces. Notice at the top you have a list of available systems, a list of available trading blocks (or Blox™), and a place to drag all the components, including the portfolio manager, the entry signals, the money manager the exit signals, and the risk manager.

The system tester allows you to test one system (or multiple systems) as a portfolio. And if you use multiple systems, each can be weighted by certain settings. Also, variables like the interest rate, the initial stop, and slippage can be defined globally so they are valid for each system. In addition, separate position sizing rules can be entered for each system. The output of the system tester includes all sorts of statistics and ratios, including the R-multiple distribution.

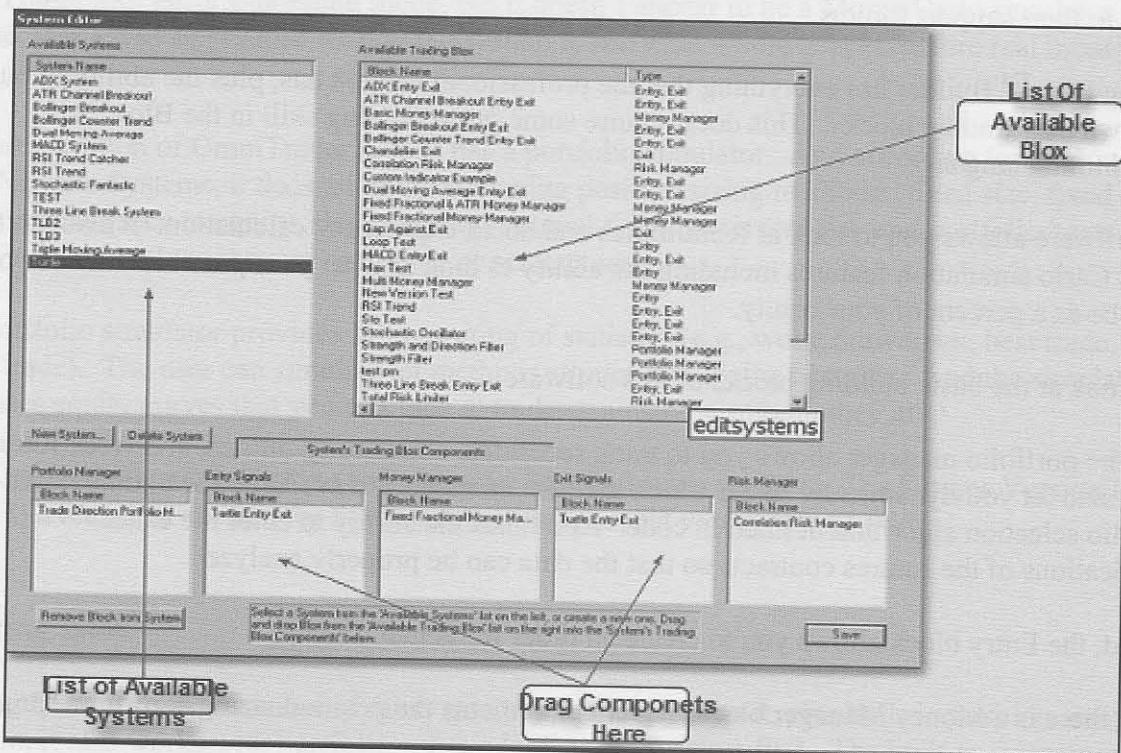


Figure 17-7: Trading Blox™ System Editor

Figure 17-8 is an example of how easy it is to use a particular system. It shows the Triple Moving Average system. It allows you to plug in the size of each moving average, the size of the ATR, and use different risk amounts for position sizing in a step-like function. You can specify the range of values and the stepping increment to automatically run a series of tests for all the values in the specified range. The example in Figure 17-8 will run tests with risk as 0.5%, 1.0%, 1.5%, 2.0%, 2.5%, and 3.0%. It will also vary the size of the stop and the number of days in the ATR computation across the values specified.

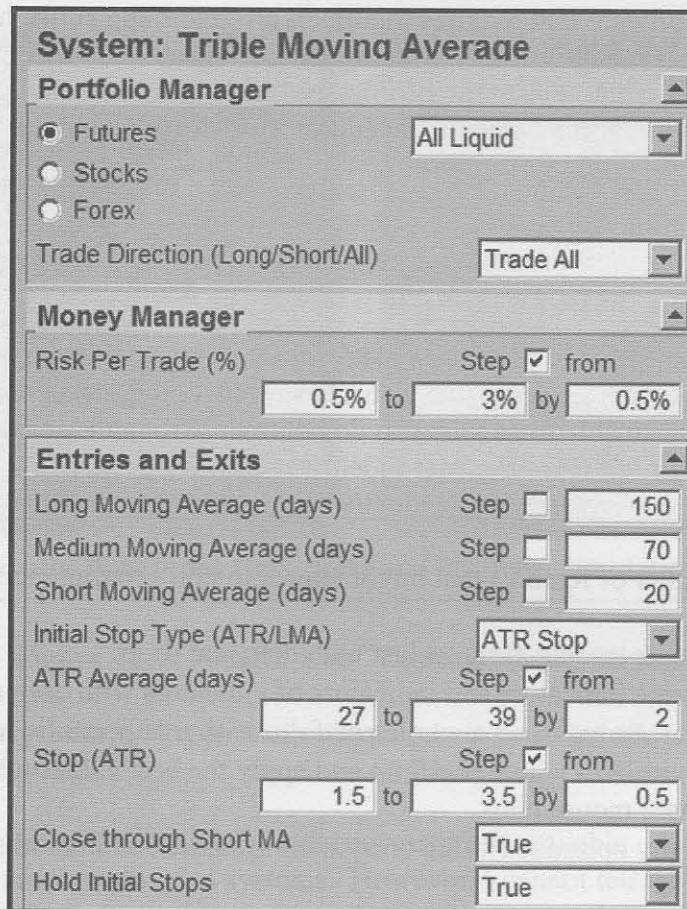


Figure 17-8: Editing a System in Trading Blox™

I find the conceptualization of Trading Blox™ to be quite impressive. First, many systems are included and can be adjusted according to your preference. Second, the more important components of position sizing and simulation are built into the testing. And it looks easy in that it just requires mouse clicks and dragging the right blox™ into the system testing components. Perhaps this is the future of system testing.

However, let me also be the devil's advocate. Suppose I simply want to trade something that's strongly trending, has a retracement, and then starts to resume its trend. I want to trade that with a stop below the old retracement. Chances are I probably couldn't trade it without getting the version that allows you to do custom programming. And you must ask yourself "Is this what I'll probably face?" I don't have any experience using Trading Blox™, but this is the sort of issue that I would guess that most traders will eventually come up against.

And if that's the case, then you'll need to learn the "Trading Blox™ Language" and build your own systems. My impression is that the learning curve for that language might be rather steep, but that probably depends upon your programming skills.

However, if you want software that requires minimum programming skills, has good systems, and does position sizing and simulations, then Trading Blox™ Turtle or Trading Blox™ Professional might be the product you want. For more information, go to their web site, www.tradingblox.com. The Turtle edition costs \$995, the Professional edition costs \$1,995, and the Builder edition costs \$2,990.

Wealth-Lab®

Wealth-Lab®¹³ is often mentioned to me as a platform for doing position sizing. This software is owned by Fidelity Brokerage; however, the web site says that other data providers are supported, so the software may be available to people who do not trade through Fidelity. You can apparently download a demo copy of the software from Fidelity at <http://personal.fidelity.com/products/atp/content/wealthlab.shtml.cvsr>.

Wealth-Lab® has a number of features that might appeal to non-programmers:

- Create trading systems just with drag and drop.
- Create indicators and indicators of indicators with drag and drop.
- Test strategies on a whole portfolio with true portfolio level backtesting.
- Optimize a whole portfolio and apply the best values to each symbol with a single mouse click.
- Apply optimized value on symbol/system combination and on all relevant tools.
- Real time scanning for systems.
- And Automated Trading Execution via Fidelity.

Of course, my primary interest in doing this review is to focus on the position sizing. My understanding is that with Wealth-Lab® you can scale in and out of your current position. In addition, there are a number of pre-programmed position sizing methods. To see the effect of position sizing you don't need to change the whole code. You just key in a number in the appropriate field. The software also features (for programmers) the ability to create your own position sizing strategy (called SimuScript) and apply it to any system on a portfolio level by just clicking on it. You can create your own performance report metrics as well.

About five pages of the very large manual for Wealth-Lab® are devoted to position sizing. The basic models are there, but they are very simple as illustrated by Figure 17-9. I scanned through the entire manual and couldn't find how to scale in and scale out, even though I was told the software has the ability to do that.

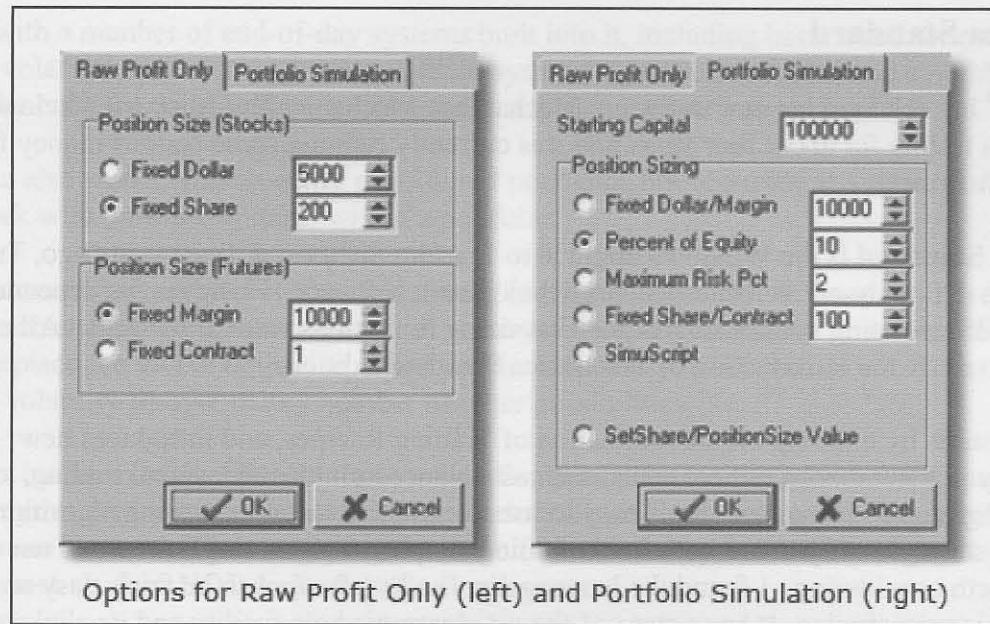


Figure 17-9: Wealth-Lab® Position Sizing Screens

However, the SimuScript selection apparently allows you to program all sorts of position sizing algorithms into the software.

Most of the manual is devoted to the many indicators that are available. And it almost sounds like the various indicators are thought of as systems. However, I cannot tell that for sure, not being a member of the Fidelity Brokerage community and never having used Wealth-Lab®.

Here is what one of the reviewers particularly liked about the software:

- “They have done a really good job at trying to break a trading system into different parts that will allow you to address your trading system in these different parts.
- For programmers who really want to get control of their trading system, this is the platform to use.
- They have a drag-n-drop indicator builder that will allow a non-programmer to build custom indicators by dragging and dropping pre-defined indicators in a wizard. Then you can custom configure each pre-defined indicator to your liking.
- I tried TradeStation®, and even took their program training classes and I have to say that Wealth-Lab® is a much better product for me.”

For more information about Wealth-Lab®, go to <http://www.wealth-lab.com>. Or if you'd like to download the trial version and play with it, go to the Fidelity link given earlier.

Mechanica Standard

Bob Spear¹⁴ has released his new software, Mechanica. Mechanica Pro (discussed below) has been in Beta testing for about four years and it is currently running some serious money for various CTA firms.

Mechanica Standard is the Windows upgrade to *Trading Recipes*. Fifteen years ago, *Trading Recipes* was definitely my favorite systems development software. However, its dependency upon the DOS operating system and its position sizing limitations were drawbacks. All of that has now been fixed by the introduction of Mechanica Standard Edition.

Mechanica starts by building on the foundation of *Trading Recipes*, and introduces new functionality in a number of critical areas, such as advanced multi-dimensional trading, and an enriched programming language that's easy to use to code and test your trading algorithms and risk control strategies. If you are not afraid of doing simple programming, its ease of use definitely makes it worth considering. I found the language in *Trading Recipes* to be fairly easy and this one (a superset) is very similar. It has a state-of-the-art electronic help facility and its clickable cross-reference links are especially useful.

Bob sent me a number of screenshots from the software, but I've only included one because I believe it best illustrates the best feature of Mechanica—the ease of programming your own code. Figure 17-10 illustrates how simple it is to program a simple position sizing algorithm. It basically says you have \$100,000 in cash and that your position sizing is equal to 2% of equity. Even I can handle that.

The screenshot shows the Mechanica Rules Editor interface. The main window displays a basic sizing rules file:

```
' A basic sizing rules file for the Parabolic system
STARTUPCASH = 100000
NEWCONTRACTS = (TOTALEQUITY * .02) / SIZING[1]
```

A 'Find / Replace' dialog box is overlaid on the editor. The 'Find What:' field contains 'totalequity'. The 'Replace With:' field is empty. Under 'Search Options', the 'This Tab' radio button is selected. There are also checkboxes for 'Match whole word', 'Match case', and 'Signal Tabs', 'Sizing Tabs', 'All Tabs' (which is checked). The 'Replace' and 'Replace All' buttons are visible, along with a 'Cancel' button.

Figure 17-10: Mechanica Rules Editor Showing Easy Programming Language

It's a unique collection of software tools developed through the years in response to Bob's own research and the automation needs of CTAs and hedge fund managers, and has been subjected to years of real-world testing by others.

It comes with a number of end-of-day systems built into it, including basic trend following, a pivot system, a volatility system, a support/resistance system, a parabolic system, and a number of others. The code for these is already there for you to use or modify.

Mechanica also works with an entire portfolio of positions, not one trade at a time. And it allows you to work with multiple systems within a portfolio.

You can measure risk, as you choose to define it and view it globally, across every layer of your portfolio, across multiple systems. You can write your own algorithm for how to define risk and that will replace the global definition of risk in Mechanica if you tell it to do so. Thus, you could substitute volatility for risk or any number of other possibilities.

Mechanica has an extensive Monte Carlo suite. For example, you can take the daily percent changes in your equity curve and do a Monte Carlo analysis to see a range and probability distribution to show what you might expect in the future based upon the daily changes you have had in the past. It does NOT do R-multiple simulations.

The software will allow you do most of the position sizing models given in this book. This includes fixed dollar, fixed percentage, percent risk, percent volatility, group and portfolio heat, fixed ratio, and to some extent market's money, scaling in and scaling out. My guess is that some of these require some programming. More advanced scaling in or scaling out is supported in the Pro version of the software, which is reviewed later in this chapter. In Bob's opinion, the need for these advanced features only comes into play with futures, once your account size reaches about \$1.5 million.

The software also offers portfolio level debugging, accurate forex conversions, has the ability to run all processes from a batch file, allows you to import an unlimited number of data fields (so you could do fundamental screening, for instance), automatically nets out commission/slippage from long and short positions that might happen at the same time in different systems (rather than charging for them), and it allows you to manage discretionary trades.

Bob has also promised me the ability to do lots of things with R-multiple analysis in the next version of the software. In addition, although the built-in systems are all end-of-day systems, one client uses it for intraday analysis though that functionality is not documented or supported.

Generally, if you want software that will allow you to program your own functions in the simplest way possible, then **Mechanica Standard** may be the way to go. It costs \$3,000 (\$995 for an upgrade) from *Trading Recipes* and you can get a lot more information at www.mechanicasoftware.com.

I've been using Mechanica in some of the articles in *Tharp's Thoughts* (with help from Bob Spears for the programming), and at this point I'm quite impressed with it.

High End Software (As a Possible Alternative to Building Your Own)

Many trading businesses simply hire a team of programmers and develop the software that is needed to do their trading and research. To do this properly, you are probably talking about a minimum of \$250,000 in expenses with no guarantee that you'll be happy with the software that is developed. Nevertheless, most professionals seem to go in this direction. For example, at one point I asked Tom Basso if he thought there was a market for *Know Your System* among hedge funds and CTAs. His response was, "I doubt it because they all develop their own software." Tom originally developed all of the software that was used to run Trendstat in Foxpro (which later became Access). However, by the time I met him, he already had a team of programmers on his payroll.

If you think you have special needs, but have few programming skills and only a moderate budget (i.e. \$30,000 per year) for programming skills, then you may want to consider one of the following packages.

Mechanica Pro

Mechanica Pro¹⁵ is the first of two advanced software packages that I found. It will be officially released by the time you read this, but it has been beta tested for many years and, according to Bob Spear, the developer, it is currently managing significant money for various CTAs. This software, according to its website, www.mechanicasoftware.com, "Puts you on a level playing field with the biggest CTAs in the world. It is powerful..."

Mechanica Pro does everything that Mechanica Standard does but offers some additional features, including 1) Dynamic Risk Management 2) the ability to control multiple accounts 3) the ability to do options hedging simulations (there are many games that you can play with this) 4) automated report exporting to Excel so that you can quickly send almost any selection of Mechanica's extensive graphical output to Excel and then to a client, 5) custom formatted order sheets and position output to use for execution and 6) the ability to call Bob and ask questions on issues that are giving you problems.

The first two features are the real gems. The dynamic risk management basically means that you change the size of any position in the portfolio at any time based upon what's happening on any number of portfolio variables. You can dynamically resize open positions based on any combination of portfolio-level conditions or events you can envision. This gives you the ability to research and trade advanced scaling strategies, or make any number of market's money adjustments to the portfolio. In my opinion, the ability to do dynamic risk management in a portfolio with multiple systems and support multiple accounts is an amazing achievement for a complete trading software package. However, if your account value is less than \$500,000, then dynamic risk management may not be feasible for you to do.

The second two features really go together. With Mechanica Standard you can do multiple systems in a portfolio, but if you have multiple clients, each with their own account that you need to manage, you would need to have a different installation of the software for each account. And even if you did that, you still couldn't easily export custom research to a spreadsheet to show prospective clients, or create custom order sheets for the execution desk. With Mechanica Pro you can do all of these things.

Mechanica's advanced new multi-account Order Manager is specifically designed for CTAs and others who manage funds or multiple individual accounts. Featuring custom order and position reporting, with full batch automation, and advanced account level error detection, Order Manager helps keep multiple account equity divergence to a minimum.

- For fund managers, order management automation directly translates into administrative cost reduction, and frees your time for the pursuit of more important matters, like talking to customers, and increasing assets under management.
- For individual professional traders, it translates into more time spent on other endeavors...such as research.
- Customization allows you to output order and position reports, formatted to fit *your* unique requirements.
- For all traders, Order Manager's error detection helps eliminate potentially expensive order management snafus.

Bob says, "When a client says, 'Here's a million dollars to trade, what now?' I know exactly what: Set up the account in Mechanica and push GO, repeat on a daily basis, and watch the system go to work.

*"When the client decides to add funds...Mechanica knows how to rescale the positions and adjust for the change."*¹⁶

The last feature, I'm not too familiar with, but many funds like to put on an option hedge against a basket and even define the option pricing model. There are many sophisticated games you could play doing this and Mechanica Pro allows you to simulate them.

In addition, Mechanica Pro offers you the ability to talk to Bob Spear about any issues or questions you have. Though custom programming can be done for you on a contract basis, he will point you in the right direction and give you examples of what you need to do to solve your problems on your own.

Mechanica Pro is definitely a high-end product, selling for a one time fee of \$25,000. The software also has an optional yearly maintenance fee of \$4,500, which is waived the first year, but gives you access to all of the upgrades and also gives you the free access to Bob Spear.

There is also a *System's Developer Edition* of Mechanica. Bob and I didn't talk about that edition at all. But if you are a professional who develops trading systems for others, then you might want

to make some inquiries about this edition, which includes security features for protecting your systems against piracy.

PowerSTTM

PowerSTTM¹⁷ is a complete package developed by Bob Bolotin. Bob suggested that people come to his web site to find out about his product. However, his web site does not discuss the features of the software. Anyway, with that in mind, here is the description of PowerSTTM that Bob gave me in a number of emails.

“PowerSTTM is a professional level trading strategy testing product directed towards the more advanced systems researcher. With a specialty of end of day position trading and portfolio level money management, PowerSTTM supports integrated portfolio level testing including the ability to test portfolios composed of multiple markets and multiple systems, advanced portfolio level money management testing capability, forward trade signal generation, extremely flexible optimization capabilities, and in general a very powerful and highly customizable testing environment.

“PowerSTTM is an advanced, highly customizable, highly programmable backtesting software product with a depth of customization and strategy testing capability.

“For more information please visit the PowerSTTM web site: <http://powerst.com/>.”

I don’t know the software capabilities, its features, or if there are built in systems. The following is a quote from an email from Bob Bolotin on its capabilities.

“Something about PowerSTTM is that if a certain type of analysis is not provided, all of this type of analysis is user programmable (I think I have a good enough idea of what you are getting at in your list of features to say that with confidence). Most other software would require that the developer add support for this type of analysis and release a new software version, but that is not the case with PowerSTTM. PowerSTTM users can program these kinds of concepts themselves.”

Thus it obviously requires programming, and I have no idea what level of skill is required.

“Also, I tend to be customer driven about what features are added to PowerSTTM. If customers request certain types of analysis I will often volunteer to provide it for them, or at least to help them get started with sample code (per what I say above that this kind of analysis is end user programmable). I consider this to be part of the ‘business level’ technical support provided with PowerSTTM.”

Bob responded to my question in the second paragraph about the level of programming skill required:

“To answer your question in the above, you are correct that the level of customization I am referring to requires some programming skill. Programming simple trading systems that are

relatively simple in other platforms is also relatively simple in PowerSTTM. However, PowerSTTM also supports programming at a more advanced level, which is what I was referring to in this paragraph you are asking about."

The hedge fund manager who developed the R-multiple chart shown on page 260 of *Trade Your Way to Financial Freedom* (2nd Edition) uses this software and swears by it.

PowerSTTM costs \$25,000 and has a maintenance fee of \$1,000 per month, which I assume gives you a lot of custom help with whatever you need.

My overall impression is that if I were running a trading business and thinking about having someone develop software for that business, I would certainly look into the option of using either PowerSTTM or Mechanica.

Conclusion

After writing this chapter, I must admit that I no longer think that the situation involving position sizing software is dismal. Instead, I think that, depending upon your needs, you can probably find the software you want. With that in mind, what you purchase will depend upon both your needs and your skills.

There seems to be plenty of entry and simulation software available. However, I haven't used any of it and can't really offer much of an opinion about any of it. Here, I would recommend that you go to the web sites, download sample programs or go through the online tutorials, and then decide what makes sense for your needs. If you go with Mechanica or Trading BloxTM Builder, then you have simulation software built into your program. I would also guess that you also have this capability in PowerSTTM, although it is not specifically mentioned anywhere in the web site.

If you have no programming skills and a very low aptitude for programming, then you appear to have three choices:

- MTPredictorTM
- OmniTrader
- Trading BloxTM (Turtle and Professional Editions)

I would suggest that you check out the possible systems and see if they are something you believe in and would feel comfortable trading.

If you have some aptitude for programming and want to use the simplest language, then I think your choice would be Mechanica Standard or Mechanica Pro. Wealth-Lab® might work, although I don't know how simple the programming is, however, it is limited to Fidelity Brokerage Customers. Trading BloxTM Builder might also work here, but my impression is that the language is a little more difficult.

If your programming skills are good, then you have a wide variety of choices, including Mechanica, Trading BloxTM Builder, AmiBroker, and PowerSTTM.

Lastly, if you want fairly complete software that will really help you run a trading business, then I would certainly check out PowerSTTM and Mechanica Pro before looking into custom programming.

NOTES

¹ Ken Long and Leo van Rijswijk reviewed XLQ.

² Thorsten Reiss filled out a questionnaire on Stator[®] that I used in this review.

³ *Stator[®] Advanced Finance Management*. 2004. Anfield Capital Pty Ltd. 21 Apr. 2007 <<http://www.statorafm.com/investment-software-purchase.html>>.

⁴ Dave Mabe reviewed StockTickr.

⁵ Adrian Reid filled out a questionnaire on TradeSim[®] that I used to write this review.

⁶ This review was accomplished through a software questionnaire filled out by Thorsten Reiss.

⁷ Steven O'Keefe filled out a questionnaire that enabled me to do this review.

⁸ Janeczko, Tomasz. Amibroker. 2001. 26 Apr. 2007 <<http://www.amibroker.com/bin/UsersGuide.pdf>>.

⁹ Howard Bandy, *Quantitative Trading Systems*. Sioux Falls, SD: Blue Owl Press, 2007.

¹⁰ Ed Downs filled out a questionnaire on OmniTrader that enabled me to write this review.

¹¹ OmniTrader. 1999. Nirvana Systems. 26 Apr. 2007 <<http://omnitrader.com/omnitrader/products/omnitrader.asp>>.

¹² Curtis Faith filled out a questionnaire that enabled me to write this review.

¹³ Amanda Tonkin-Hill and Frank Eaves both filled out questionnaires that enabled me to write this review.

¹⁴ Bob Spear filled out a questionnaire that enabled me to write this review.

¹⁵ Bob Spear filled out a questionnaire that enabled me to write this review.

¹⁶ Spear, Bob. Mechanica. 2006. 26 Apr. 2007 <<http://www.mechanicasoftware.com/research.htm>>.

¹⁷ The review was written through numerous emails that I had with the developer, Bob Bolotin.

Chapter 18

Some of Your Questions Answered

The purpose of this chapter is to walk you through some questions that I get all the time about position sizing. Hopefully, you can answer these questions for yourself after reading this book.

I find that many of the questions sound different, but the answer is typically the same. So to help you understand this, I've divided the questions into nine different categories.

1. Miscellaneous Questions
2. Expectancy versus Position Sizing
3. I Don't Understand One of Your Models
4. Position Sizing and Risk of Ruin
5. Account Size and Liquidity
6. Multiple Accounts
7. How Do I Position Size? What Do You Think of My Method?
8. What Do You Think of This Form of Position Sizing?
9. Math Questions (I don't generally answer math questions, but I've presented some guidelines for what to do if you have such a question.)

In this chapter, I've put the questions in **bold**, my responses in regular type, and general comments in *italics*.

Category 1: Miscellaneous Questions

The first two questions come from someone who basically doesn't understand (or agree with) many of my concepts that I've put into this book. As a result, I thought I'd address them first.

Question 1: I don't believe that losing streaks are random. Why design mechanical systems if we do not believe in non-random market behavior? The bottom line is that if something doesn't happen "frequently" (i.e., at least once in a thousand trials), then I don't worry about it. The chance of something else going wrong (9/11, power blackout, line failure, virus, etc.) is far greater and overwhelms a losing streak of 20 straight losses (2.6% as noted in Van Tharp's recent example table).

I would suggest that you read *Fooled by Randomness* by Nicholas Taleb. One of the common judgmental heuristics is that people do not understand randomness and your question is an example of that. For example, I've always said that the markets are not random because they have fat tails. We get movements in the market that we could never expect if the markets are random. For example, it wasn't long after the S&P 500 futures contract was open that the market had a one

day move (on Black Monday of 1987) that could only be expected once in 10,000 years on a random model.

The reason I'm saying losing streaks are random is because I do simulations by random sampling. The only way you can do accurate sampling is randomly, when you know that you have a pretty accurate estimate of the population. Thus, I will determine the R-multiple distribution of a trading system, and then I will randomly sample from it to determine what to expect trading it. That's what simulation is all about. However, the lengths of the losing streaks you get DO NOT depend upon random sampling. Instead, they depend upon the win rate of the system.

Furthermore, just because a streak is unlikely starting with the current trade, doesn't mean that it isn't certain to occur given enough trades. For example, a streak with a 2% chance of occurrence starting with the current trade, might have a near certain chance of occurrence in, say, 300 trades.

Question 2: The R-multiple concept strikes me as out of touch with today's fast trading methods. Long-term trades and buy-and-hold are out of style; I never believed in them. Van Tharp's methods sound good for institutional traders who trade huge sums and stay in the market for longer periods. Long-term trades have indeed a greater randomness.

This question comes from the same person as question 1 and it is clear to me that he doesn't understand 1) randomness and 2) my teachings. First, every good trader I know of thinks in terms of reward-to-risk ratios—especially short-term traders. The R-multiple distribution is just a way to conceptualize that. R-multiple sampling is actually more accurate for short-term trading because those traders will have much larger samples from most of the different kinds of markets. Larger samples will more accurately estimate what you can get from your trading system than smaller samples. Lastly, it is absolutely false that long-term trades have greater randomness than short-term trades. If anything, the opposite is true.

Question 3: I'm looking at a web site that ranks the performance of their traders who trade with their software. Apparently the top 10 people there don't position size with any consistency. So what gives? How can I possibly compete with them?

What you really mean is that they do crazy things with position sizing, like risk everything on one position. My experience is that about one-third of the people who do this are likely to blow out after six months, another one-third will be down substantially and the last one-third will have huge gains. You are basically looking at the "lucky" ones. In another six months, two-thirds of those people will also be down significantly or broke.

The way to long-term success is to set your objectives carefully and to use position sizing to meet your objectives through consistency. Remember that a low-risk idea is one that allows you to survive the worst case in the short run so that you can achieve the long-term expectancy of your system. These people are not doing that.

The next question really asks, "What does position sizing do?"

Question 4: Let's say I have a trading system, that wins 50% of the time and makes twice as much as it loses. Since the expectancy cannot be changed based on this system, what role does the money management play to change the structure of trading and let the traders get more advantage from their positions?

Your system is characterized by some R-multiple distribution that it generates trading and that can be described pretty well by the mean and standard deviation of that distribution. In your case, you described the system well enough that I could calculate that it has an expectancy of 0.5R and a standard deviation of 1.58R. Over 100 trades, it would have a System Quality NumberSM of 3.16, which is good.

Position sizing helps you achieve your objectives and with a fairly good system like the one you described, it's not difficult to do. So let's say that you consider ruin to be a drawdown of 25%. At that point, you'd stop trading. And your goal is to make 200%. You are going to trade for six months (50 trades) and you want to maximize the probability of making your goal and minimize the probability of ruin. I ran this through our simulator for 10,000 50-trade periods, with a beginning risk of 0.2%, moving up in 0.2% increments to finally risk 30%. Figure 18-1 basically shows what you can do with position sizing.

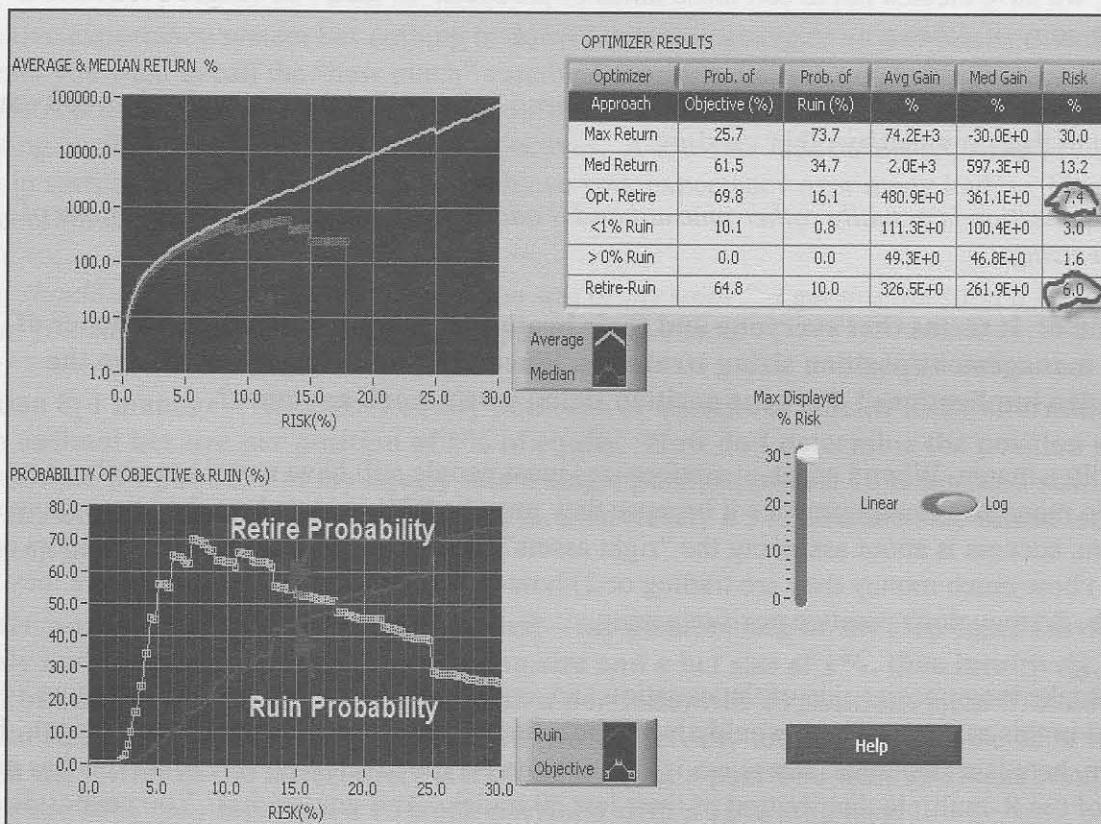


Figure 18-1: Illustration of How Position Sizing Helps Meet Your Objectives

Notice that you get the optimum difference between ruin (down 25%) and retirement (up 200%) risking 6% with this system. At this level of position sizing you have a 64.8% chance of making

your 200% and a 10% chance of ruin. Also notice that you optimize your chances of retiring by using a position size amounting to 7.4% risk per position which gives you a 69.8% chance of retiring. But your risk of ruin continues to go up the more you risk.

The next question addresses a common question that I get about our position sizing software all the time. Even though I addressed the issue in the last chapter, I'll also briefly answer it here.

Question 5: In my opinion, serious traders can find everything they need on your web site except one of the most important things: money management software. Over the years, you've talked about two different types of software, *Athena* (your money management software) and *Know Your System* (your simulation software). Why don't you sell these?

That's a great question. Just as you have to look at yourself and decide who you are before you develop your trading systems, I must do the same for my business. We are a coaching/educational company. We are not a software company. Both of those software products were developed by outside people, and we depended on them for support for the products. And that just didn't work. The people who work at my company are not able to answer most of the software questions that could come up with those products, and we pride ourselves on having great customer service. As a result, we have elected not to sell those kinds of products. In fact, I no longer even have a working copy of *Athena*.

However, if you know what you want, then Chapter 17 shows that there is probably a software solution to that provided by other vendors.

The next question is actually rather unusual and it addresses the contrarian implications of position sizing.

Question 6: It seems that everyone and their brother is now an avowed practitioner of money management/position sizing strategies. Since everyone's doing it what are the contrarian implications? Perhaps position sizing won't work anymore?

It's hardly a mania. When I speak at conferences most people still have never heard about it. Portfolio managers cannot practice it because they must be 97% invested, so they don't have stops. For them, success is about assigning the "right assets" to your portfolio. Most bank traders don't know 1) how much money they are trading or 2) how much money they can lose before they lose their job. So they don't practice position sizing.

But let's take the opposite side of the equation and assume that everyone did become more efficient in this manner. There would always be other ways in which they are not efficient. For example, here is a challenge. My guess is that not one person in ten who is reading this has a record of the R-multiple distribution of their last 50 trades. And guess what? You cannot develop a meaningful algorithm for position sizing without knowing that information. You can be conservative and only risk 0.5 to 1%, but you cannot know exactly how to do position sizing without it.

And on top of that, probably nine out of ten of those who do have their R-multiple distribution still don't have a clear idea of their trading objectives, except perhaps to make a million and not lose it all. And again, without detailed objectives, position sizing is meaningless.

Category 2: Expectancy versus Position Sizing

If you've read this book, you probably can answer the next set of questions easily. However, it's probably a good test for you to read through them. There is obviously a misunderstanding that occurs between expectancy and position sizing, perhaps because there are several implications for R, including the risk per unit and the total risk in a given position.

Question 7: Isn't the creation of a positive expectancy system a result of applying proper position sizing and money management? Therefore, how could it be said that once you have a positive expectancy system and apply proper position sizing and money management, you can achieve the system's expectancy over a long number of trades? It seems like a circular argument because in the first instance to develop a positive expectancy system you need proper position sizing and money management.

A positive expectancy system has nothing to do with position sizing or money management or whatever you want to call the "how much" variable. It means that your system's average R-multiple is positive. Read part one of this book! Position sizing is about defining your objectives and using position sizing to achieve those objectives. A low-risk idea means applying position sizing in such a manner so as to be able to achieve your expectancy over many trades. Thus, there is no conflict and no circular argument.

"What should I do first, determine my position size or my stop?" I get this question a lot, but thought you might like to see a specific example of the question.

Question 8: I manage a long/short equity portfolio of around 25 stocks. Kelly's formula gives me an optimal bet size per position of 1% of equity. How do I determine the position size? For example if I put 10% of my equity into a single position (thus a 10% position size), then, given my bet size, my stop loss would be 10%. Conversely a 5% position size would lead to a 20% stop loss, given a 1% bet size.

In other words, what should I determine first—my position size or my stop-loss? Obviously if I only had ten positions with 10% position size and a bet size of 1%, then intuitively, this would be subject to a larger drawdown than a portfolio with 20 positions each with 20% position size as the stop loss per position. In the former, my total risk would be 10% versus 20% in the latter. In the latter, there is less chance that a portfolio with 20 stocks would all trigger the 20% stop loss than a 10 stock portfolio with a 10% stop loss.

I have a number of problems with what you are doing. And this question tends to confirm my belief that many portfolio managers do not know what they are doing. First, you are not following my key fundamentals of trading. Let me repeat what I've said in this volume: **Never enter a trade until you have determined when you would abort the trade, or your initial stop.**

Second, you need to determine your SQNSM based upon your past results. Since you've never had stops before, you could use your average loss as 1R. However, I think you really need to think about the system you are trading. Success is not about picking the right stocks.

Third, once you have your System Quality NumberSM, then you need to position size according to your objectives as we also show in this book.

Fourth, the Kelly Criterion was only developed for binary data and has nothing to do with good position sizing. Determine your SQNSM and your objectives and then use one of the suggestions given in this book for how to position size for that objective.

Fifth, remember the market occasionally has price shocks in which the entire market can go down big time (like September 11th, 2001). You need to be prepared for that with your portfolio.

If you are running a portfolio, and if you must be 95% invested, then I'd suggest that at a minimum you read the interview with the mutual fund manager in Chapter 9 and how he interprets position sizing. But if you don't have that restriction, then I suggest that you make sure you understand everything in this book and follow the steps that I've suggested above.

Incidentally, position sizing has nothing to do with your stop. Your stop should be determined by where you think you are wrong about the trade. If you are a long term investor, then a 25% stop would probably be good. If you decide that you really want to risk 1%, then your investment would be 4% per stock. And you could buy 25 different stocks and be fully invested.

Question 9: I've discovered a simple moving average system I'd like to try. You use two different moving averages and when the price closes above (below for shorting) the band of the two averages, that gives you your setup bar to enter a position. When the price exceeds the high (low) of the setup bar that was your entry signal, you exit the position. How do you size your positions using this method since there is no obvious place to set your stop before the market actually takes you out?

How do you do risk-based position sizing when your system doesn't give you a stop? Some systems don't have a pre-determined stop, so I get this question quite often.

I have two suggestions for you. First, set some sort of worst-case scenario stop and use that for position sizing. You may always get out before that, but you should still have some sort of stop of that nature.

The second suggestion would be to use volatility position sizing. What's the daily volatility? Do position sizing based upon that.

However, you still have to do the basics. What is your expectancy and what is your System Quality NumberSM? What are your objectives? When you've gotten that information, then use the guidelines in this book, plus those two pieces of information to determine how to position size to meet your objectives.

I get the next type of question from institutional traders who are trading other people's money. I've addressed this issue earlier in this book, but I think the question is interesting.

Question 10: How do you determine your stops so you are not risking more than your determined account risk? Also, how do I figure out risk control when I have an account of \$10,000 but am actually using a company's capital to leverage my trades?

You've asked the wrong question. Your system determines your stops, not your position sizing. The first step you must take is to determine your system and your R-multiple distribution. If you've done that you'll know how to determine your stops. Next you want to determine your R-multiple distribution and your SQNSM. Third, you need to determine your objectives. And once you've done all that, then your position sizing will work itself out following the guidelines in this book.

As for what to base your risk on, when you are leveraging your trades with your company's money, I'd suggest that you ask yourself, "How much money could I lose before I'd get fired?" Or if it's your company, then how much of your company's money could you lose before you'd fire yourself? Once you have that answer, then you need to base your position sizing on making sure that loss NEVER happens.

Category 3: I Don't Understand One of the Models

Over the years people have read the precursor to this volume, the Special Report on Money Management, and asked specific questions about what I did. Since all of those basic studies are included in this book, I wanted to answer those questions here. In addition, the first question seems to have a problem with the idea of "R" so I thought I'd include it first.

Question 11: Van, I've found your books to be excellent, truly mind opening. I still have a conceptual problem that keeps coming up. I have been religiously using a fixed "R" concept, trading lower priced, yet liquid equities, around 30 of them at any one time and assigning an extremely conservative dollar amount of loss as "R" when compared to my account equity, each "R" for me is a lot less than 1%. I have not bothered to change the "R" amount as the account has gone up steadily.

Your R value depends upon where your system says that you should get out. It doesn't have anything to do with position sizing and it should not necessarily change as a function of your account size, unless, your account gets so big that you cannot trade the same way.

My conflict is that although the approach I've described has worked extremely well for me from both a steady equity growth perspective and a psychological one, I end up having rather unequal amounts of dollars in each stock position, because of the fact that my initial stop on one stock maybe represents a 20% price drop and in another stock my stop might represent a 7% price drop. (I use a flexible range of allowable technical stop percent loss because other factors might override the higher risk). Now when you combine this with radically different stock prices anywhere from \$10-\$1 you can see how this would happen.

Let's say my "R" is \$100. (Let's exclude commissions for the moment, though I do factor them in.)

Are you defining R as the percentage of your equity that you are willing to risk? I don't. Take a look at the CPR model in Chapter 7. The percent of your equity there is really C. I've probably confused people over the years by calling both the total risk and the risk per unit, R. If you use the CPR model and call the total risk C, then perhaps you won't be confused. C is determined by your percent risk position sizing model.

Let's say the \$10 stock has a tech stop loss level for me at \$9.30, so my loss could be \$0.70 per share. The proper position size would be $\$100/.70 = 142$ shares (odd lots are OK these days). That would mean that the dollars invested in this trade would be \$1420.

Now let's look at another trade. I have another stock priced at \$1.00 and my stop loss level is at \$0.80. In this case my loss is \$0.20 so my position size in this stock would be $\$100/.20 = 500$ shares. Thus, I would have \$500 invested in this trade.

You talk about the equal units model for stocks and many books on trading have seemed to make good arguments for equalizing the dollar amounts in each stock so as to overcome price differences and equalize the % change effect into absolute dollars gained. I have seen this view espoused more and more and it seems to make sense intuitively. When there is a big difference between dollars invested in various stocks it does create a rather uneven performance. So let me ask the following questions:

Do you think I have a problem at all? Emotionally I don't feel like I do. But I am concerned that the math of the situation could be working against my returns, whether or not I "feel" it.

If you do think that a problem exists, could you recommend a practical solution? I very much like the idea of using R as the basis and have become very comfortable with it.

If your stops are well thought out, then there shouldn't be a problem at all. People, who use an equal dollar approach, in my opinion, are more likely to have a problem. However, you might base your position sizing and stops on volatility. Let's say, you used 1.5 times the weekly volatility (do your own testing as this number is plucked from air) as your stop and trailed it. You could then position size based upon 1% (or whatever number you want) of that volatility and your performance should be fairly equal across all your stocks. That would solve your problem.

The next question involves someone trying to understand the table in the percent risk section.

Question 12: There is still one aspect of the percent risk model that I still don't fully understand. You state that, "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 8-3 suggests that you probably should not trade this system unless you had at least \$100,000." I just don't see the connection. Unless you know the R-multiple distribution of the trading system, I don't see how you could determine the account size necessary to trade the system with the data given in Table 8-3. I am trading a very small account right now, but my

commissions, slippage, and R-multiple distributions are such that I can weather the expected drawdowns and not be too concerned about wiping out my account.

If you look at Table 8-3, you'll see that you have to risk at least 2.5% per position in a million dollars account not to get any rejected trades (i.e., meaning you have enough money to trade). And you would still have to live through a 30% drawdown.

Notice that 1% risk in a million dollar account is \$10,000 worth of risk. If you only had a \$100,000 account, that would be 10% risk. And even at the 1% risk level on a million, you still get a lot of rejected trades. In other words, you need a lot of money to trade this system with that many different possible trades. However, my example is for trading futures. You could probably have a similar system to this one to trade equities with no leverage in a much smaller account.

The next question comes from someone who is attempting to understand the differences between the percent risk and the percent volatility position sizing models.

Question 13: I'd like to check that I've correctly understood the differences between the percent risk and the percent volatility models that you talk about. Am I correct in understanding that while both models are sized using dollar amount of volatility as a fixed percent of my account size, one model uses a 21-day stop only, whereas the other one uses a 21-day stop in conjunction with a hard stop based on the 20-day ATR?

The percent risk model uses your stop (i.e., risk) to determine position sizing, while the percent volatility uses ATR to determine position sizing. There is no hard stop in the volatility model. The stop is still the 21-day channel breakout. The 20-day ATR is simply used to determine your position sizing. Let's look at a volatility example.

So let's say you are buying XYZ at \$50. You want a stop at \$48 (i.e., a \$2 risk), but volatility is \$4 (this stock moves a lot). One percent of your equity is \$1,000. Based upon the percent risk you would buy 500 shares ($1,000/2 = 500$), but based upon the percent volatility, you would buy 250 shares ($1,000/4 = 250$). Notice that with the percent volatility model, your total risk (because of position sizing) would be half of what the risk model would produce.

Both systems are tested with the same model, but when volatility is used to determine position sizing, the 20-day ATR is used to determine volatility. However, let me clarify something. If you have a stop based upon volatility, as the Turtles did, then percent risk and percent volatility are both the same. This is actually one way to really equate all of your trading positions because you know that you have the same risk exposure in all positions and the same volatility exposure in all positions.

The last question comes from someone who is totally confused about the CPR model. The assumption in his question is totally illogical, but I'm showing it to you here because this is how some people think and why they get confused.

Question 14: If you want to risk \$1,000, why don't you take the price of the stock plus what you are willing to lose to give you the cost of the risk you are taking and use that to calculate

the shares? Let's say the stock is priced at \$50, and you're willing to lose \$2. Why don't you divide 1,000/52 for the amount of shares? Similarly, for percent volatility, where volatility is \$4, why wouldn't I divide the total risk by \$54 to get my position sizing?

You are defining risk incorrectly. Risk is only what you are willing to lose. In your example, risk is \$2, not \$52, so you would divide by \$2. Similarly, volatility is \$4, not \$54, so you would divide by \$4. By adding in the price of the stock you are saying that your risk is equal to more than the price of the stock itself and you would therefore be willing to lose more than 100% of your money before you would consider exiting a trade.

The following question involves another request to explain some of the material in the tables that present the results of the basic position sizing models. It really has to do with how some of the material is calculated by the software used.

Question 15: In the tables in which you present the various position sizing, you compare them in terms of net profits, rejected trades, percent gain per year, margin calls, and maximum drawdown. I cannot understand how to compute the margin calls and rejected trades.

For example in model 1 (Units per Fixed Amount of Money) the unit (number of contracts or number of shares per unit) is fixed to 1 and the amount of money is fixed (say \$X in the equity) and the position may be taken irrespective of the risk. So say in an equity Z the number of $\$X = Z / X$ hence the number of units is also same as number of $\$X$. Now if one unit cost is more than $\$X$, should it be called a margin call or a rejected trade? Is the maximum drawdown percentage given in the tables the “maximum peak-to-trough drawdown?”

All of these results were generated by the *Athena* software about 8 or 9 years ago. At this point, I cannot remember exactly what *Athena* does and I no longer have a working copy of the software. Consequently, I don't remember what the maximum drawdown calculation was for sure, but I assume that it is the maximum peak-to-trough drawdown.

The other two questions are easy. Margin levels were fed into *Athena* and if the equity value fell low enough, a margin call was given. That's pretty simple. Rejected trades are also pretty simple. Let's say that you calculate the risk involved in a position to be \$5,000. If your risk parameters only allow you to take \$3,000 worth of risk, then you cannot take that trade and it becomes a rejected trade. That's why these trend following systems require a lot of money to trade.

I have not gotten the next question yet. I am simply anticipating it when this book is published. So if you have a question like this about something in Chapter 13, here is my answer in advance.

Question 16: When I read about Fixed Ratio Position Sizing (FRPS) in Chapter 13, I was confused by how you calculate (fill in the blank), could you please clarify that.

Of all the methods given in this book, I'm the least comfortable with FRPS. It sounds to me like you have a similar problem. If you don't have great math skills and FRPS doesn't really make any sense to you as described, then AVOID IT. There are much simpler methods, such as market's

money, that will accomplish the same thing. Pick one of those and don't worry about FRPS. Aside from Chris Anderson, I don't know anyone else using FRPS to control his/her position sizing.

Question 17: I have just finished reading *Trade Your Way to Financial Freedom* and found it to be an excellent resource. There is however a confusion in the position sizing department. I understand percentage risk model very well from Guppy's books. However, percentage volatility needs more elaboration. Can you please provide an example where a tight stop would be useful with this model? What is the kind of stop that can be used? I've read a few of the forum posts on it and I got the idea that the volatility model uses volatility stops ONLY.

What he's doing is making some assumptions and then trying to fit the models to his assumption rather than just using logic.

Let's say you have a \$50 stock and a \$100,000 portfolio, risking 1%. Thus, your risk per position is \$1,000. However, let's assume that you are a day trader and your stop is 10 cents.

If you divide your risk per share into your 1,000, then you can purchase 10,000 shares, which at \$50 per share amounts to \$500,000 worth of stock. Based upon the position sizing model you could do it (with 1% risk) even though you'd be breaking all the margin requirements.

If the daily volatility is \$3, even without a volatility stop, you could position size based upon volatility. If you want to only allocate 1% of your equity, then you would divide \$1,000 by \$3 and get 333 shares. You could purchase 333 shares of the \$50 stock or \$16,650 worth. This is a little more realistic than \$500,000 worth, but you would still have your 10-cent stop.

Category 4: Position Sizing and Risk of Ruin

If you look at a typical percent risk curve, what happens is that your probability of achieving your objectives continues to go up to some maximum point and then it drops precipitously. In addition, as your position size goes up, your risk of ruin continues to rise until it reaches 100%. The two questions on this topic both come from the same person and relate to this topic.

Question 18: I've heard that when you double your position size, the results are not doubled (i.e., double the win, double the loss). In testing, I recently found this to be true. Now I'm trying to figure out why it works like this.

Sometimes when you double the position size you fall over the cliff and put yourself with a 50-75% or even greater chance of total ruin. For example, if you have a 5R loss in a system and are risking 10%, you'll have some big losses but you are okay. As soon as you risk 20%, you have 100% chance of going to zero as soon as the 5R comes up. As you increase position size, you generally improve your average return, up to a point, and then you start to degrade it. And the degradation curve is much steeper than the improvement curve. The graphs in Figures 18-1 and 18-2 (given elsewhere in this chapter) illustrate that.

Question 19: I've been trading stocks for 18 months. I lost money quickly for the first two months and then I read *Trade Your Way to Financial Freedom*, started doing position sizing and I have not lost money since then. Here are some of my rules:

- 1. Picking stock directions is like herding cats. I don't care HOW consistent something was falling or rising. If I bet on it, then it instantly has a 50/50 chance of making money.**
- 2. At 2% position size my stocks stay even and at 4% I make money consistently but slowly.**
- 3. By dumping the stocks going against me and keeping the winners until I get an exit, I consistently get ahead. Now, I think I should do more risk—bigger position size.**

However, I was told here that doubling position size more than doubles risk. I didn't understand why and I still don't. What I do know is I'm watching others with huge position sizes do cartwheels around me, but everyone says that risking more than 4% is way too risky. What are your suggestions?

You need patience, and you need to do some more homework. Again, I don't see the key information I need. What is your SQNSM? What are your objectives? When you've answered these two questions you can use this book to figure out how to position size to meet your objectives.

Right now your position size is very high. And if you make money at 4%, you certainly should make money at 1% or 2%. What it sounds like you are saying is that your positions only go up if you position size bigger. And that doesn't make sense, unless your account is so small that trading costs are eating you up at 1-2% risk.

Lastly, as you increase your risk, there definitely is a point where you will fall over the cliff. And you could be close at 4%, depending upon your methodology. Be careful. To understand this better, take a look at Figure 18-2.

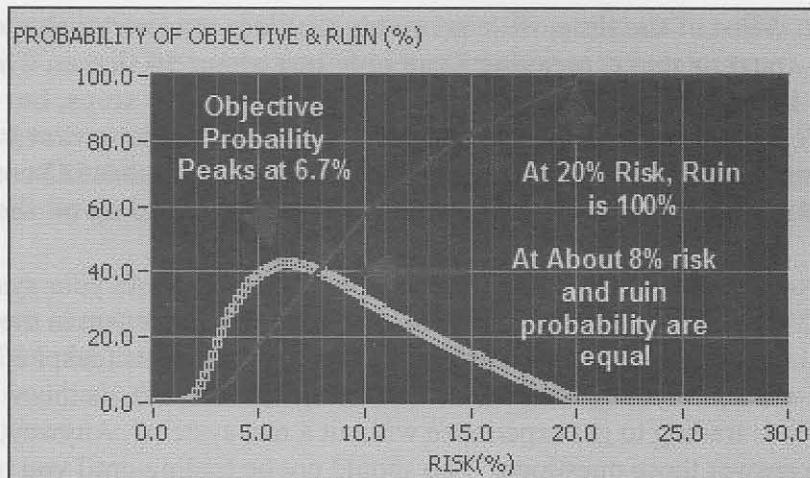


Figure 18-2: How Your Probability of Your Objective and Probability of Ruin Change as the Percent Risk Position Sizing Increases

Figure 18-2 shows a typical curve resulting from simulating a system thousands of times at various risk levels. The curve, however, will be different for different systems or different objectives. Notice how the probability of reaching one's objective goes up pretty dramatically as the percent risk increases, peaks at 6.7% and then drops. Notice that at 6.7% risk, where one has the highest chance of reaching one's objectives, there is better than a 20% chance of ruin. That wouldn't be acceptable to most people. Also notice that the chances of ruin continue to rise. At about 8% risk, the probability of reaching one's objectives and the probability of achieving ruin are about equal. However, the probability of ruin continues to go up until it reaches 100% at 20% risk. Obviously, this system has a 5R loser. This figure totally illustrates my response to this question. And remember that the simulator assumes that you make one trade at a time. Thus, if you trade a portfolio of correlated positions, we are really talking about portfolio heat, not the individual risk in one position. Look what happened on February 28, 2007. In one day, the market went from well above its 50 day moving average to fall below it and many, many stops were hit. These kinds of things happen several times each year.

Also the people who risk a lot more than you and still outperform you are just the lucky ones. They are lucky in that they have not yet gotten the huge loss that will eventually come and wipe them out. That trade will come along one day and then you will look like a genius.

Category 5: Account Size and Liquidity

The concept of position sizing leads to a number of issues having to do with liquidity, minimum account size, and maximum account size. So let's look at these types of questions. The first question relates to the minimum position size, which really means the minimum account size.

Question 20: Is there a minimum position size below which trading is too difficult? I believe you suggest using 0.5% of the total capital as the maximum risk for beginning traders. I have \$10,000 which gives a risk of \$50 per trade, excluding commissions which are \$22

round trip for me. Most of the time, with my swing trading, my entry price and the stop price are a dollar apart or more, meaning I can only buy about 50 shares. The stock has to move a lot before I break even. I am pretty good at sticking to my stops, but I am wondering if it would be easier to be profitable if I increased my risk per trade so that I would be able to buy more shares. My portfolio is decreasing by \$72 losses (\$50 plus \$22 commissions) pretty regularly, and I rarely seem to make that much when I wind up on the plus side.

To really answer your question, I need some information from you about your system. What's the expectancy, the SQNSM, and what are your objectives? Also where are you in the testing process? I frequently recommend that you begin trading with very small amounts (despite large costs) just to make sure the R-multiples you got in your initial testing are accurate. Is this what you are doing? Or are you just trading to get experience without a real system? Anyway, my first advice to you would be to answer those questions. You should not be trading until you have done so.

Once you've answered those questions and confirmed that your testing results are accurate through real time trading (and yes you can exclude the commissions from your position size testing), then you can trade with a more realistic position sizing. If your SQNSM is 3.0 or better, then you probably can do 2% position sizing. However, I'd only recommend that you do ONE position at a time.

As for your actual question, "Is there a minimum position size below which trading is too difficult?" The answer is no. Your real question should be, "Is there a minimum account size below which short-term trading is too difficult?" Here the answer is yes, and I think you are below that level at \$10,000. I think \$25,000 to \$50,000 is much safer, but most people try to do it with much less. With \$10,000, I'd recommend a long-term approach, looking for consistent growth.

I've included the next question because it illustrates some of the problems people have trading a small account.

Question 21: I am a new trader, but an educated one. I have a plan, a trading system, confidence and patience. I believe in not losing more than 2.5% from my total equity on any trade. My paper trading results seem quite acceptable until now (although I know that real trading is somehow harder). I'm going to begin real trading soon, but my equity is very small because I can only afford to lose \$3,000. What are the problems that I might face in trading (stocks) with such small equity other than the commissions (\$7 to \$10/trade)? Please consider that:

- **My average trading buy/sell is 2 stocks a month ($4 \times \$7$ or $4 \times \$10$).**
- **I trade with only 2 stocks at once.**
- **I'm not willing to take out any 'profits' from my trading for the next 5 or 7 years.**

Consider the following. Let's look at your minimum conditions. Let's say you buy and sell two stocks each month and that costs you \$28. That means your costs (and I haven't included any

slippage or the bid-ask spread) are about 1% per month. You might have other costs as well such as equipment, etc. You will have to make 12-15% per year just to break even.

Second, if you are just starting real trading, I wouldn't recommend more than 0.5% risk to start with per position—at least not until you've proven yourself. There will be lots of psychological problems that you'll face when real money is at stake, so don't compound them by risking too much.

How much have you (or your parents) paid for education? Probably a lot more than \$3,000. I'd consider the \$3,000 to be the beginning of your tuition towards learning how to trade. If you have that attitude, then you have the potential to learn much of what you'll need to do before you can make some real money.

And just as a test to see how much you've learned, what are your objectives and what's your SQNSM for your system? And what do you think your biggest psychological challenges will be? That's where the real lessons come from, overcoming your psychological challenges.

The next question relates to the maximum position size that one should use.

Question 22: What is the largest position size that you should ever use in any kind of trading system?

This question is somewhat system dependent, but to answer it I'll assume that you have the best possible system (SQNSM of 10 or better) and you want the largest possible returns without any risk of ruin. Generally, you always risk price shocks when everything could go against you. As a result, I would say that even under these ideal circumstances you should limit your portfolio heat to 25%. You can then divide the portfolio heat among the maximum positions you might have at one time and limit your total risk per position to that. But even here, I probably say that the maximum risk you should have in one position that has totally gone your way, and that you've scaled into as a result, should be no more than 5-6%. **Remember that these are absolute maximum risk levels under ideal conditions.** In a high-leverage area like futures, you will still risk ruin with a significant price shock.

The next question really relates to the liquidity issue using position sizing in large accounts. Is there a level at which your system will stop working with the position sizing you were using initially?

Question 23: I am curious as to where I can learn more about liquidity and its effects on trading systems, particularly with large position sizing. As I extrapolate my results by 5 to 10 years into the future, it seems that I may have to very frequently violate my rule of not buying more than 2% of the daily trading volume. At what point does one cease to trade the market, and become the market? How does trading system strategy and methodology change at that point?

If you are trading large size, then you have to pay attention to order execution big time. People will come to know who you are, especially if you can move markets. Thus, you must learn order

execution methods that will help cover up your actual size. Curtis Faith was one of the most successful Turtles making \$31 million for Richard Dennis. In his book, *Way of the Turtle*, he talks about how order execution became important for them because they were big enough to move markets. For example, you could look into alternative execution venues that do not directly impact the markets you trade. An example would be a volume weighted average price (VWAP) cross for an equity trade. These types of trades generally are guaranteed a price for any size.

That will give you some leeway. However, you still must accept the fact that any strategy you trade will have a ceiling in terms of what you can do with it. For example, if you look at the objective questions that I asked Tom Basso, you'll notice that his answer had to do with his capacity based upon the systems he was trading.

At an academic conference on Behavioral Finance in Germany, I played a marble game to illustrate the importance of position sizing on the account equity. At that conference, I mentioned that I frequently have clients who make 100% or more each year in the markets through position sizing. One gentleman basically accused me of lying, saying that in his experience, it was impossible to make those kinds of returns. I started to answer that response in the last question, so I thought I'd complete it here with the next question.

Question 24: How is it possible to make returns of 100% each year through position sizing when no professional traders can do that consistently?

The smaller your account, the more you can make through position sizing. First, I know of professional day traders (who act as their own broker and have virtually no trading cost and the best execution possible) who can make 100% per month on a small account such as \$25,000. However, they can only do this trading 1,000 shares at a time, scalping. If their account got bigger, their returns would go down because they still could only trade 1,000 shares at a time.

Small futures traders with accounts of about \$100,000 can also make 1,000% per year if they push the envelope. However, they will also have some huge drawdown years when the markets are choppy and do not trend well.

I had an S&P 500 day trader as a client who could turn \$200,000 into a million each year. When he'd get over a million, he would basically take 75% of his account and turn it over to a hedge fund manager and then start again at \$200,000. Why? At a million dollars, his position size was getting too big to follow his system. Incidentally, this person paid a floor trader to execute his orders for him and to keep him out of danger. The floor trader charged him very low commissions, but he was also guaranteed a minimum fee each year. So if the trader had not been active enough to produce the minimum fee, the floor trader got a nice check. Order execution was critical in this system.

I've had hedge funds that I've coached that were capable of making 100% per year. Here we are talking a fairly nimble hedge fund with, say, under \$50,000,000 in equity that has one or more great systems, great execution and uses position sizing very well.

I've worked with a large trading firm whose offices occupied an entire floor of the CBOT. They can also make similar returns because their returns come from 1) having floor traders on the floor to execute orders, 2) having many different traders with different specialties, 3) having many systems and markets for these traders to trade, and having a thorough understanding of position sizing. This firm probably stretches the limits of what a large firm can do because they are like having 100 traders who are capable of making 100% returns. As of this writing, that firm has grown to over 130 employees in just over six years of existence. That's phenomenal growth. They're now moved out of the CBOT because the space was too small.

Once you get over a certain size (for example, I've consulted with some hedge funds that control a billion dollars or more), then, except for exceptional market conditions such as 1999 in equities, we're probably talking about average yearly returns of 20% or so as a ceiling.

However, one large fund has taken the approach of hiring doctorates to program neural networks for day trading. They have over 100 such doctorates on the payroll. In 2006, my understanding is that this firm made over \$7 billion doing day trades. And while I don't know the percentage gain, my guess is that it was huge.

Large mutual funds are also capable of making 20%+ as an average with many billions of dollars, but the only way they can do it is through value investing. Probably the best example of this is Warren Buffett. And Buffett has set himself up with some huge tax advantages to what he is doing.

And when you get to Wall Street with big firms controlling trillions of dollars, then we have a totally different ball game in which they invent their own rules and tell you that's the way you should play as well. They also control the media. For example, most big funds make the money from the fees they charge their customers no matter how they perform and they've made up rules in which good performance means beating the market averages, which 80% of them cannot do.

Thus, my overall answer is that the vast majority of money in the market **cannot** make returns of 100% or more. However, small accounts of \$50 million or less do have a chance to make these sorts of returns if they understand the principles in this book and have their psychology under control.

Incidentally, you will find very few newsletters that are capable of these sorts of returns, because 1) if they are good they will have lots of subscribers and the number of subscribers will limit what they can do because of liquidity concerns, and 2) they have no real ability to time trades because they come out once each month and have to make recommendations. As a result, if you look at Chapter 13 in *Trade Your Way to Financial Freedom (2nd Edition)*, you'll find that the best newsletters (i.e., those with the highest SQNsSM) are like the better mutual funds. They give value-based recommendations. And the best ones that perform well over many years will probably give you returns of about 20% or so.

Category 6: Multiple Accounts

People seem to get confused when they have multiple accounts. Should they lump them all together to determine their equity or should they treat each account separately? So let's look at the first one.

Question 25: In our family we have multiple accounts: my spouse's IRA, my sons' IRAs or Roth accounts, a cash (marginable) account, and several IRAs for me. I even break up my own IRAs into multiple subsections by using more than one broker because of wanting international stocks or currencies (e.g., when Etrade does not offer those). Thus, when I buy a position, I am somewhat conflicted in what dollar amount to consider my Total R risk. Should I lump all my subaccounts of my IRAs into one amount and use that, or use only the total in each separate account? Since theoretically the balance could go to zero in my Eurodollar account and I might lose \$50,000 which is 100%, when looking at my total accounts it may represent only 10% of my IRA holdings. It makes a difference in my thinking because in the smaller accounts, I feel like I have to make a more substantial initial purchase than a typical 1% risk rule would indicate. I don't want 20 different stocks in an account with \$10,000, but spread over 6 accounts that would be fine with me.

You can do this however you want, but my bias is to always treat each account separately. That does make the smaller accounts more difficult to trade, but that cannot be helped. Thus, in a \$20,000 IRA, if you were risking 1%, you'd only risk \$200.

If you lumped your accounts together, you could become absurd with your position sizing risk. You could say that my retirement accounts are worth \$350,000, my cash accounts are worth \$100,000 and I have \$450,000 equity in my house. Thus, for each trade I'll risk 1% of the total \$900,000 or \$9,000. That would mean in your \$20,000 IRA you would be making trades with \$9,000 risk or 45% per position. That's absurd, but that's essentially what you are saying you might like to do.

The next question is the same. It just sounds different.

Question 26: Let's suppose I'm trading three strategies, risking 2% on each trade. Should I have three accounts and risk 2% of the money in that account? Or should I risk 2% of the entire amount in all three accounts?

First, for each system, find the position sizing strategy that meets your objectives.

Second, I would equally allocate my money to each account. And I would position size based upon that equity in each account, not the total equity.

Third, you have to determine the correlation between the systems. If they are all highly correlated, I'd probably risk one-third of what you'd risk if you were trading just one system. In other words, if I decided that 2% was optimal and I had \$100,000 in each account, I'd probably risk about 0.67% in each account due to the correlations. However, if the systems were highly correlated I'd probably just trade the one with the highest SQNSM.

Fourth, if the systems were all quite different and not that correlated, then I would periodically rebalance between the accounts. That is, if the best account had \$250,000, the next best \$100,000 and the worst one \$50,000, then I'd take the \$400,000 and divide it equally between the three systems (assuming I didn't think the worst one was somehow broken). See Method 21 in Chapter 14 of this book. You might do that monthly or at least once each quarter.

Category 7: How Do I Position Size? What Do You Think of My Method?

I get the most questions in these two areas with respect to position sizing. You'll notice that the questions all sound totally different, but they are really the same. And in every case, when people ask this question, they don't give me enough information to answer it. As a result, I'm just including these as examples and you can see how questions you might ask would also be of this nature.

I've designed this book to help you answer this question for yourself. Thus, if you've read all of the prior chapters, you should know how to answer them. All of them require the following information first.

First, you need to describe your system. The better your system, as defined by the SQNSM, the easier it will be to use position sizing to meet your objectives. And I've presented guidelines for this throughout this volume. So what's your expectancy and what's your SQNSM?

Next, what are your objectives? This is not a trivial question. What are you trying to accomplish? Remember that the real purpose behind position sizing is to help you achieve your objectives. But I cannot tell you what to do, and you cannot use the guidelines in this book either, if you don't know your objectives. So what are they?

Okay, so with that introduction, you'll understand my answers. So let's look at the questions. Notice how they all seem different, but they are all really the same.

The first question is probably the generic version of the question, how should I position size, so I've included it first.

Question 27: How do you select a trading strategy based on expectancy versus money management?

Your expectancy and SQNSM tell you the quality of your system. It has nothing to do with position sizing. However, the better your SQNSM, the easier it will be to use position sizing to meet your objectives.

Let's take a look at the system described in Figure 18-1. At 7.4% risk we have a 69.8% chance of reaching our objective of making 200% after 50 trades. That's pretty good and that's because the system is pretty good. However, at that position sizing level, we now have a 16.1% chance of ruin. If we had a better system, we might have to risk even less to meet our objective and have closer to a zero percent chance of ruin.

The second part of the question has to do with your position sizing. **Position sizing is that part of your system that helps you meet your objectives.** However, you need to know what your objectives are to make position sizing meaningful. Most people just say they want to make as much money as they can. If that's the case, then you probably should risk 30%. You have the highest mean ending equity at 30% risk, so that probably qualifies as making as much money as you can. But you also have a 73.7% chance of ruin at that level. Are you willing to expose yourself to that big of a chance of ruin? Probably not, and that's why objectives are critical before you position size.

The next question, of course, is the same, but it is phrased in terms of a forex system. Notice that the person asking the question really doesn't give me any critical information.

Question 28: I've got \$100,000 and I trade forex spot cash. I want to risk no more than 0.5%. That equates to \$500 or 50 pips, 1pip = \$10. Do I a) risk \$10 a point and risk 50 pips, or b) risk \$20 a point and risk 25 pips, or c) risk \$5 a point and risk 100 pips?

First, you don't have a system and you are asking me about position sizing. You need to develop a system. Then you need to determine the SQNSM and your objectives. From there you can position size to meet your objectives. In your case, I think it is smart to probably start with 0.5% risk, but don't use position sizing to determine your risk. Get a system. Use the system to determine when you are wrong and then position size based upon the SQNSM of the system.

The next question is the same. It sounds different, but it is not. This one relates to how to position size when trading e-mini contracts.

Question 29: I am a day trader of e-minis. I have \$50,000 to trade with. What should I do for position sizing? Should I take \$1,000 as my daily risk (2%) and then use 20% of that as the risk per trade?

The question you've asked is "How should I position size in my circumstances?" And like everyone else who has asked it, you have not given me enough information to answer it. Do you even have a system? I suspect you do not. If you do, then what is your SQNSM? What are your objectives? If you have answered those two questions, then this book will give you fairly clear guidelines to help you achieve your objectives.

The next question gives a little more information about the system, and it touches on the issue of percent risk versus percent volatility. However, it is still the same basic question as all of the others.

Question 30: I trade the 5 Day Momentum System, made popular by Jeff Cooper, author of *Hit and Run Trading*. The 5 Day Momentum system uses a \$2.00 stop. I traded it recently using position sizing based on the 5-day ATR. I took 1% of my \$100,000 equity and divided it by the 5-day ATR to determine size. Since the market was choppy during December, the stop was hit several times. Here is the problem: the lower the ATR, the larger the position and of course, the higher the ATR(5) the smaller the position. Both positions require a \$2.00 stop.

Example 1: Stock XYZ, ATR(5) = 2.00. 1% of \$100,000 = \$1,000. Position = 500 shares. Potential Stop = $2 \times 500 = \$1,000.00$.

Example 2: Stock ABC, ATR(5) = 5.00. Position = 200 shares. Potential Stop = \$400.00.

The slower moving stocks create a much bigger loss than the faster moving stocks. Also when I am correct on a fast moving stock, it has to go up quite a bit to at least equal the slow moving stock potential loss. Several times during December I lost the max and my gains on the faster moving stocks could not overcome these losses. Am I doing something wrong or should I not use this type of sizing with this type of system? It has tested well, which leads me to believe it was just the market conditions. Does it make sense to continue to trade this way?

I'm not sure what the question is here—whether it's about position sizing or the size of your stop. However, all of the comments I've made before still apply. Using the stops you are using, what is your R-multiple distribution and what is the SQNSM of your system (using the calculations given in this book)? If the SQNSM is above three, then the system probably makes sense.

However, I think I see a significant problem with what you are doing. Why are you using volatility-based position sizing instead of risk-based position sizing? Percent risk position sizing would equal things out a lot more. And because your stops are tight (at \$2) you could just use a smaller percent risk (i.e., 0.2% to 0.7%). Otherwise, make your stops equal to the 5-day ATR and see how that tests out with your system.

Most questions of this nature take a slightly different form. They explain a little bit about what they are doing and then ask what I think. Again, they don't tell me their SQNSM or their objectives, so they are impossible to answer. Nevertheless, I wanted to include some of these examples just for illustrative purposes.

I included the next question because it really asks two questions and thus is a little different.

Question 31: When I started, I split my money into 4 different stocks and placed an initial stop loss at 8%. This kept my risk in each stock to less than 3% of equity per stock. As my stocks move up, I trail my stop behind them a safe distance. My question is how do I adjust for changes in the value of the shares? For example, one stock is up over 50%, one is up over 20%, one is even and one is stopped out for an 8% loss. To make it simple I'll assume \$1,000 initially in each stock. Now, I have one stock worth \$1,500, one is \$1,200, one is \$1,000 and I have \$920 in cash to use to buy a new stock that I have just found. My 8% stop loss is equal to \$73.60, but 3% of my overall portfolio is \$138.60. Clearly I can afford to risk more in this new stock, but I am limited as to my available capital, which prevents me from using optimal position sizing. How can I overcome this obstacle?

I really get two questions out of this. The first one: "I'm fully invested and my performance among my different investments is unequal. How do I find the money for new investments?"

My response to this question is that you probably should sell off your losing investments or your worst performing investments, especially if you have something that you believe will perform much better.

The second question: "I'm fully invested and my performance among my different investments is unequal. And I also have a lot more risk in some trades than others. Can I (or should I) do anything about this?"

Consider some of the scaling out models given in this book. For example, if your initial risk is 3%, you might consider keeping your open risk at 5% and scale out of positions to make sure you never have more than 5% open risk. That way you will have equal maximum risk in all your positions and you'll also have extra cash as you scale out.

Lastly, I'd strongly advise you to read the sections of this book on portfolio heat. All of your positions could go down at one time and that could be a very sad day for you.

The next question is more typical of the "Is what I'm doing okay?" type questions.

Question 32: I have been thinking about how to successfully add margin trading to my money management scheme. I trade a stock system, but so far I have stayed off of margin just to be on the conservative side and eliminate the risk of margin calls. A strategy I have been thinking about would work like this. I enter my trade as usual and set my stop-loss exit. After the position moves say 1 ATR (or some other predetermined amount) in my favor, I plan to add to my position using margin. I would only add enough shares to not exceed my predetermined risk in the trade - currently 1%. I would be using a trailing stop to maintain the risk exposure throughout the trade.

It seems to me that this strategy has some advantages. First, I'm not adding margin to my positions until the trade is going in a favorable direction. This will increase the probability of a successful "pyramid" position size on margin and reduce the risk of a margin call. Second, I am maintaining constant risk exposure as my stop moves in the favorable direction. Ultimately I should be enhancing the risk/reward ratio for the entire trade by scaling into the trade.

I can see one drawback to this idea. I don't think I would want to increase my bet size too fast because if the market did move against me, then I don't want too much risk in one trade. My personal comfort level would be not exceeding my original risk in the position on the added position. If I started with 1% risk, then I would maintain that risk or reduce it but never exceed it.

This seems to me a reasonable way to add margin trading to my money management scheme, and try to enhance my risk/reward ratio per trade by using margin. I would appreciate any thoughts on this type of money management or margin trading in general.

This is basically a form of the scale in money management that was described in this book. And it seems fine to me. What you really haven't told me is your SQNSM and your objectives. If you

want my suggestion, then I would determine both. You can then read through the sections of this book related to your objectives and find the position sizing model that fits you the best (i.e., based on your beliefs and your comfort level).

Here is another question that's pretty typical.

Question 33: I am thinking of implementing the following Money Management System with my trend following strategies: 1) Sell half the amount of stocks when prices rally to a price where the reward = initial risk level, 2) Move my initial stop to break even and trail the rest of the half with trailing stops onwards. One advantage of doing this is that it enables me to capture half of the profit fast and conservatively, and then I can rely on the rest of the money to make significant profit. What do you think? The risk protection part is really important to me.

Your technique is one of the techniques that I've listed in Chapter 15 under strategies to avoid. It basically means that 1) you will have your best trades on with half of a position and 2) you will have your largest losses with a full position. Isn't this the opposite of cutting your losses short and letting your profits run? In addition, your initial stops are much more likely to be hit (even if they are "mental" stops).

It sounds to me like a critical objective for you involves minimizing your risk of ruin. As a result, I'd suggest that you look at the techniques involved in minimizing your risk of ruin in Chapter 14 of this book and use them instead.

However, good swing traders frequently have profit targets based upon what they think the market will do. They might have a goal of making 3R with the trade and when they are up 3R, they'll frequently take half the position off and let the other half run as it still looks like it has some potential. I've seen these traders accumulate huge R-multiples in profits through this type of trading, so I have no objections to it.

I've included this last because the person gave me enough information so that I could at least get an estimate of the SQNSM.

Question 34: I am using a system that has the following characteristics: It wins 43% of the time. The average win is \$3,957 and the average loss is \$1,584. I believe that gives me an expectancy of 0.5041. Currently I am risking 2.5% of equity per trade. According to backtesting 20 years of data, the largest drawdown with this amount of risk is 29.49% and the average yearly return is 100.02%.

I looked at this as a system and assumed that 1R was \$1,584. When I do this it has an expectancy of 0.51 and I can roughly (very roughly) estimate your SQNSM for 100 trades to be about 2.8. That's not a bad system, but it's not exceptional. Also my estimate of your SQNSM is very rough because I don't know what your R-multiple distribution looks like.

What I am looking at doing is using 2.5% of my starting equity plus 5% of profits. Using \$100,000 as the starting point I would risk 2.5% of this amount plus 5% of any profits over this amount. For example, if my account should be at \$125,000, then I would risk 2.5% of

\$100,000 (\$2,500) plus 5% of \$25,000 (\$1,250). Any time my account dips below the starting equity point of \$100,000 I would only risk 2.5% of my equity.

I know my volatility would greatly increase, but I believe most of it would occur above my starting equity point. Here's my reasoning: if a drawdown starts with the first trade, then I will only be losing 2.5%, no more than if I were to continue trading with my current constant 2.5% risk. Because of this the drawdown would be the same size regardless of which leverage system I used. If a drawdown should occur above the starting equity, then it will be much larger due to the additional 5% of profits being risked. If a drawdown should start above the starting equity point and continue to a point below the starting equity point, then the loss would be slightly greater than if I were using the constant 2.5% risk. This is because the drawdown would have been losing money at a greater rate while above the starting equity point.

Currently I am planning for 16 consecutive losses in a row (which has a 0.028% chance of happening). If this should occur starting with the first trade, it would result in a 33.31% drawdown to \$66,692.01, regardless of which amount of risk is used. Using 2.5% plus the additional 5%, a string of 16 loses, occurring at or above the starting equity point, couldn't result in equity going below \$66,692.01. Please comment.

This question is similar to the others. I really need to know your entire R-multiple distribution to understand what would happen to you in terms of drawdowns with this position sizing formula. You haven't given that to me. Based upon what I have, what you've suggested might work. Your 16 losses in a row will occur about 1% of the time in 100 trades.

However, real trading is replete with mistakes. If this is what you got with backtesting, you'd be lucky to be half as efficient as your backtesting with your real trading. Also, what happens to you psychologically when you are going through a drawdown? Do you have the stomach for what you are setting yourself up for with this type of trading? I don't know the answer to that.

Category 8: What Do You Think of This Form of Position Sizing?

Sometimes I get questions about ideas that I haven't presented in this book. Some of the ideas are crazy or make no sense at all, but it's also interesting to me how many different strategies people can come up with for my consideration. It really shows how many possible position sizing strategies (try an infinite number) are available.

So let's look at a few examples of this sort of question.

Question 35: I have a great trend-following system that trades futures. I'm fine with the system. Say I have a million to trade and over 20 years of backtesting it produced returns in excess of 50% per annum. Let's say I was risking 2% and my maximum drawdown was 50% with this account size.

What if I only traded 20% of it and put the rest in the bank, and I trade this at 10-15% per trade? In my backtesting with this, the returns went into intergalactic space. And let's say that each year I took 75% of my profits and bank it, which would effectively double last year's account. For 18 years of testing, the returns were phenomenal. What do you think?

It would be a disaster because of one or more of the following reasons:

- 1) Every 12 years or so we have a price shock and as a result of that, you would be so far in the hole that you would wipe out your bank account.
- 2) Trading this in backtesting doesn't mean you could stomach what might happen in terms of drawdowns. It's easy to live through a 50% drawdown with backtesting. But when your real money is at stake, it is a nightmare.
- 3) Your system might not have considered margin calls, or rejected trades because you didn't have enough money (in the notional account), etc.

Sometimes people ask me about what they've read in a book.

Question 36: I would like to know your thoughts on Larry Williams' money management/position sizing formula. He has emphasized the following in trading stocks or commodities in his last two texts.

Account Balance × .15/Largest loss or stop loss=Number of contracts/shares to trade.

Now I realize the .15 can be changed depending on how much you want to be leveraged. He says something like if you're conservative you may use .06, or if you're willing to take a little more risk use .08-.12 as the multiplier. For the denominator you could base the divisor on a limit move, the greatest intraday range, or the greatest overnight to opening range. Of course there are other ways to determine what that divisor could be.

Maybe using the term position sizing for this is incorrect, but Larry states he has not seen anything top this and refers to it as "the keys to the kingdom".

I have not seen these formulas before, but what he's basically saying is risk 8% to 15% per position divided by your largest loss. If your largest loss is 5R, for example, then you'd risk 3%. This is basically a simple version of optimal f , in my opinion. It also doesn't take into account multiple correlated positions. If you take a look at Chapter 15 on what to avoid, it basically includes most of what Larry Williams says in terms of position sizing. And Ralph Vince originally worked with Larry Williams. This formula is only the "keys to the kingdom," if you mean where you go after you commit financial suicide. However, it might work if your objective is maximum gain with no concern about drawdowns.

Sometimes people ask me about position sizing ideas that make no sense at all. Perhaps they've misunderstood what someone else has said, perhaps they've just made it up, or perhaps I'm just lost in trying to understand what they are saying.

Let me make a general statement on other position sizing models. There is an infinite number of possible position sizing models, but most of them will probably be subsets of one of the models given in this book. Chances are the methods in this book are all that you need. But if you see something new, then study it extensively. Figure out how it works. If you believe it is totally different from what we've presented here, I'd be interested to hear about it. However, I'm not interested in models that don't make sense (and there are many). In addition, I'm probably not interested in models that are just a variation of one of the models already presented here unless you believe that it adds a totally different slant to how to think about position sizing.

Category 9: Math Questions

One of my biggest frustrations is that people always ask me questions about the math involved in one of the models or in one of the examples. Here is an example of those types of questions.

I can't seem to get the same numbers that you did in your example. Here's what I did. Did I do something wrong?

It's quite likely that even after extensive proofing and checking by others that there are some errors in this book and others. I'd be surprised if there are not. As a result, I recommend that you go through the following procedure if you have a problem with the math in one of the examples. First, find a friend who is good in math and has at least an engineering degree. Ask them to check the example in the book that you are having problems with and make sure they do it independently. If both of you think I've made an error (which is possible), then please let us know and I will make corrections. However, I don't have time to explain individual calculations to everyone who has asked. I've tried to make the calculations as clear as I can so that these questions do not arise.

Chapter 19

Self-Evaluation

One of my biggest concerns is that people will take this information and start applying it without really understanding it. As a result, I've created this self-assessment chapter. Before you start using position sizing in your actual trading, please make sure that you understand all of the concepts contained in this book. And to do that, I recommend that you answer the following questions.

Each question below should be answered to the best of your ability. I've put a reference to the chapter in which this topic was discussed so that you can go back and look up the topic. Yes, this is an "open book" test. You can look up the answers because my only concern is your understanding. Looking up the answer is not cheating. I just want you to get the principles and ideas down. However, because I'd like you to look up the answers in the text (not just read them), I have not included answers to these questions in this book. **After you have completed the work in this chapter, you may request them by sending an email to position-sizing@iitm.com. Do NOT request the answers until you have already answered them for yourself.**

Chapter 1

- 1) What are the 10 Golden Rules of Trading?

Chapter 2

- 2) You buy 400 shares of XYZ for \$7,728. You plan to sell the stock if it drops \$2.20 from your entry point. What is your total 1R risk in this position?
- 3) You buy a stock at \$48 with a 25% trailing stop. The stock goes as high as \$62 and then drops 25% where you get out. What is your profit (or loss) expressed as an R-multiple?
- 4) You buy a futures contract for corn at \$210.20 with a stop at \$209.50. Over the next three months, corn goes to \$406.50 per bushel. What's your profit expressed as an R-multiple of your initial risk? Remember there are 5,000 bushels in a corn contract.
- 5) If you are trading corn with a \$30,000 account and you are willing to risk 2%, then how many contracts can you buy?
- 6) By the time corn reaches its high price, what has happened to your account? What problems are you likely to have as a result of this change?

Chapter 3

- 7) What are the variables that allow you to determine your System Quality NumberSM?
- 8) Table 19-1 shows your last ten trades. Determine your R-multiples (to two decimal places), your expectancy, and your SQNSM based on the last ten trades. (See Chapter 2, as well).

Table 19-1: Determining R-multiples from Total Risk			
Transaction	Total Risk	Profit or (Loss) Including costs	R-multiple
400 CSCO at \$31	\$800	\$3,322	
80 IBM at \$80	\$750	-\$813	
300 VLO at \$50	\$1,000	\$5,413	
400 HRB at \$48	\$800	-\$1,531	
500 IRF at \$58	\$700	\$3,890	
400 ISIL at \$18	\$600	-\$976	
600 LSI at \$5.38	\$750	\$4,961	
500 MYL at \$17.50	\$500	-\$367	
400 ORI at \$31	\$800	-\$2,314	
300 SRA at \$40.77	\$600	\$1,571	
Total			
Average			

- 9) If you make 100 trades, getting the same expectancy and standard deviation, how would you rate this same system based upon its System Quality NumberSM?
- 10) In Table 19-2, you just have a series of trade results. What's your best estimate of the expectancy of the system and your System Quality NumberSM?

Table 19-2: Determining Expectancy without Knowing the Initial Risk of Each Trade	
Transaction	Profit or (Loss) Including Costs
400 HRB at \$51	-\$565
80 IBM at \$80	-\$499
400 ISIL at \$16	\$9,782
500 MYL at \$17.50	\$1,244
400 ORI at \$31	-\$1,345
300 HD at \$46	-\$344
50 GOOG at \$245	\$2,389
2000 FORD at \$13.22	\$4,500
300 CREE at \$25	-\$1,240
300 GM at \$29	-\$1,300
Total	
Average	

11) What is the System Quality NumberSM of the trades in Table 2-2? (See Chapter 2, as well).

12) Table 19-3 gives you the R-multiple distribution of four systems. Which is the best system and why? If all four systems generated 100 trades per year, how would they compare to the systems in Table 3-9?

The summary data on the systems are included at the end, where EXP = expectancy, SD = standard deviation of R, and the bottom line is trades generated per month by the system. Rank the ten systems, including Systems 3-1 through 3-6 and Systems 19-1 through 19-4.

Also indicate, based upon your understanding of System Quality NumbersSM, if you would trade any of them. Why would you or why wouldn't you?

Table 19-3: Systems to Evaluate			
System 19-1	System 19-2	System 19-3	System 19-4
3 (-3R)	25 (-1R)	35 (-1R)	5 (-1R)
4 (-2R)	15 (-2R)	12 (-2R)	4 (-2R)
15 (-1R)	3 (-5R)	1 (-5R)	3 (-3R)
15 (1R)	3 (2R)	13 (1R)	2 (-4R)
5 (2R)	5 (4R)	10 (3R)	1 (-5R)
2 (5R)	2 (6R)	4 (9R)	50 (1R)
1 (10R)	1 (10R)	2 (18R)	
1 (15R)	1 (20R)	2 (36R)	
	1 (30R)		
	1 (50R)		
Exp = 0.61	Exp = 1.37	Exp = 1.56	Exp = 0.23
SD = 3.19	SD = 8.61	SD = 6.91	SD = 1.54
20 trades/mo	30 trades/mo	16 trades/mo	28 trades/mo

13) What are the primary factors that influence the System Quality NumberSM? What would you have to do to your system to get a high SQNSM? What is the value of having a strong System Quality NumberSM?

14) What is the potential impact of a price shock on your trading?

Chapter 4

15) What are the six questions you should ask yourself about your system?

16) What is a reliable system? What information would you need to know to believe that your R-multiple distribution is reliable? (See Chapter 3, as well)

- 17) You've backtested your trading system and have a year's worth of trades to show for it (i.e., 50 trades). What are some common sense questions you should ask yourself to determine if your system is reliable?
- 18) How would you know if your system is valid?
- 19) How can you determine what to expect from your system in all kinds of markets? How would you define the various kinds of markets?
- 20) What kind of information should you get from your system before you trade it?
- 21) Once you have this information, how will it cause you to think differently?

Chapter 5

- 22) How can you overcome the following:
 - a) the lotto bias?
 - b) the need to be right bias?
- 23) I recently saw an advertisement from an email newsletter talking about a stock-picking guru. What psychological bias is reflected here?
- 24) When a statistician says that "the market has fat tails" what does that tell you about the market? What bias does this phenomenon go against?

Chapter 6

- 25) The following pertain to the streak bias:
 - a) In a 30% system, what can you expect with almost certainty in terms of a losing streak in 100 trades?
 - b) How might the streak bias affect you?
 - c) What are the chances of ten losses in a row occurring in a system with a 45% win rate over 100 trades?
- 26) When you have a 50% drawdown, how much do you have to recover to get back to breakeven? When you have a 25% drawdown, how much do you have to recover? What does this tell you that's very important?
- 27) Define a low-risk idea.
- 28) Define position sizing. What is the purpose of position sizing?

29) What are the top four biases against using position sizing correctly? What is an example of a position sizing strategy that you should not use because it focuses on wanting to be right? (See Chapter 15, as well)

Chapter 7

30) What are the three different methods for determining your equity? When might you want to use each of them?

Chapter 8

31) When using a market's money position sizing model, what equity model should you use? What advantage does this particular model have? (See Chapter 12, as well)

32) Why is the "units per fixed amount of money" model weak?

33) In his newsletter, Louis Navallier requests that his subscribers be fully invested at all times and diversified equally among each of the stocks he recommends. Quite often he recommends that you sell some of your shares of certain stocks and buy more shares of others, always attempting to be equally diversified among each of his stock picks. What position sizing model is he using? What are the advantages and disadvantages of this model? Which of the Golden Rules of Trading is he violating by using this rebalancing technique?

34) You are day trading a \$50 stock with a 40-cent stop. You only want to risk 0.6% of your \$30,000 portfolio. How many shares can you buy? What is the problem with this sort of position sizing? What is an alternative form of position sizing that would solve this problem?

35) You are day trading a \$62 stock with a 40-cent stop. The daily volatility of the stock is \$2.30. What model should you use for position sizing? How many shares can you buy, risking 2% of a \$50,000 portfolio?

Chapter 9

36) What is group risk? What is portfolio heat? Why are they important?

37) Using the recommended guidelines, calculate the maximum portfolio heat for Systems 3-1 through 3-6. (See Tables 3-4 and 3-5.)

38) What tactic might you use that would allow you to safely increase your portfolio heat without undue risk? (Hint: it involves another position sizing model). (See Chapter 14, as well).

39) What is equity crossover position sizing? When might you use it?

- 40) What is the primary difference between asset allocation and position sizing?
- 41) How could you use position sizing if you had to be invested 95% long at all times and your primary objective was to outperform the S&P 500?
- 42) You don't know how much money you're trading because you're trading your firm's money. You know that if you lose \$5 million, you'll lose your job, but your bonus depends upon how much you make. What would your objectives be? And how could you best position size? What would you base it on and what models would you use?

Chapter 10

- 43) When you compare the impact of the various models in Chapter 10, what is your major conclusion?

Chapter 11

- 44) Name five ways you could phrase your objectives. How many possible objectives could you have?
- 45) Why does position sizing need to vary, depending upon your objectives?
- 46) What's wrong with most techniques that go for the biggest returns? (See Chapter 12, as well).
- 47) Let's say you have five systems, each with an expectancy of 0.45. Each system also generates 30 trades per month, giving you an average monthly gain of 13.5R. How might these systems vary? Is it possible that one of these systems would be terrible while another might be super? (See Chapter 3, as well).
- 48) What are some of the assumptions you are making when you use a simulator?

Chapter 12

- 49) Name five ways you could vary a market's money position sizing algorithm in terms of making the market's money your money. What are the advantages and disadvantages of these models?
- 50) Name four different scaling-in techniques. What are the advantages and disadvantages of these models?
- 51) Scaling-in position sizing models should usually be combined with _____ position sizing models, especially if you want a fairly smooth equity curve. (See Chapter 14, as well).

52) What's better: two-tier position sizing or market's money position sizing? Give your reasons for your answer.

Chapter 13

53) What are the dangers of fixed ratio position sizing?

54) Name 5 key assumptions that make fixed ratio position sizing a reasonable position sizing model.

55) You are using fixed ratio position sizing. Your delta factor is \$5,000 and your increment factor is 2 units. If your risk is \$1,000 per unit and you are currently trading four units, how much would your account have to increase to start trading five units?

56) Once you got to five units, if you had a dampening factor of 50%, how much would your account need to go down in order to move back to four units?

Chapter 14

57) You want to limit your potential drawdown in your system to 20%. Name three ways you could do this with position sizing.

58) What Martingale position sizing strategy actually works? Why?

Chapter 15

59) What is the problem with increasing your position sizing when you are really confident about a particular trade?

60) Some people advocate selling half of your position when you can raise your stop enough to break even on the trade. What is the problem with this approach and what psychological bias does it reflect?

61) What is the term that encompasses many of the position sizing strategies that you should avoid?

62) What are the biggest problems with using a fixed fractional model based on the hit rate of your system?

63) What are the assumptions of the Kelly Criterion and why doesn't it apply to position sizing?

64) What are the major problems with using optimal f to determine your position sizing?

Chapter 16

65) What did you learn from the interview with Chris Anderson? How does he exemplify what we've discussed in this book?

Chapter 17

66) Although there are many advantages of doing Monte Carlo simulations on your R-multiple distribution, what are some of the major problems with doing this?

67) What are some of the major questions you need to ask yourself before purchasing any of the software mentioned in Chapter 17?

Chapter 18

68) What are the steps that you need to take before you determine how to position size your system?

Invent a position sizing model not described in this book and send it to position-sizing@iitm.com.

All of the answers to these questions are contained in the book. We recommend that you complete this questionnaire as an open book test, before you start position sizing your own system. Again, you can request a copy of the answers from position-sizing@iitm.com after you've already answered the questions.

Appendix I

Simulator Evaluations of

Systems Used in Text

In this Appendix, I've included a simulation of each of the major systems given in this book. First, I entered the system into the simulator and took a screen shot so that you can see the R-multiples, the expectancy, and the standard deviation. Second, I printed out the summary results so that you can look at system characteristics such as R-drawdown, losing streaks, etc. And, I did an optimal position sizing study in which we did 10,000 simulations of 100 trades each stepping in position sizing from 0.2% to some maximum level, at which the system would break down. A summary screen shot of that material is included as well.

Overall, Appendix I has the following systems:

- 1) Systems 3-1 through 3-6, which were presented in Chapter 3 to teach you about evaluating systems.
- 2) SQN 1 through SQN 7, which were presented in Chapter 3 to help you understand what it took to change the System Quality Number and to help you make decisions about position sizing based upon the System Quality Number.
- 3) Systems 11-1 through 11-7, which all have an expectancy of 0.35 but have vastly different SQNs.
- 4) Systems 13-1 through 13-6, which were used to test FRPS.

These simulations were run on various occasions and the result differed depending upon 1) the number of trades selected, 2) the number of simulations performed, and 3) the risk and ruin levels selected in the position sizing optimizer. In the study on Systems SQN 1 through SQN 7, I ran 100 trades 10,000 times and assumed that ruin was being down 50% and the goal was to make 200%. However, I'm not 100% sure what levels were run in the earlier simulations. If questions arise about the results, it is probably due to one of these factors.

Appendix I

**System 3-1
through
System 3-6**

System 3-1: Expectancy and Standard Deviation

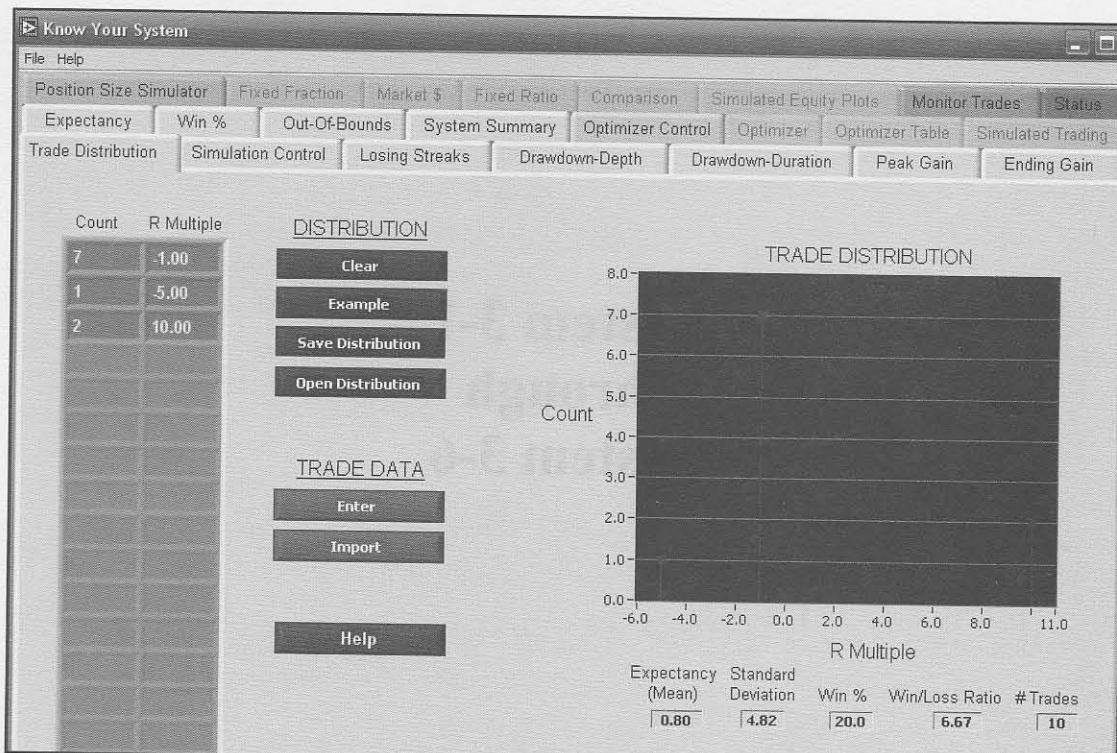


Image created from Know Your System software. Software not available for sale.

System 3-1: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	25.00			
Win/Loss Ratio	6.67			
Expectancy		0.32	0.79	1.26
Win %		16.0	19.9	23.9
Loosing Streaks			15	
Drawdown(R)		-38.4	-27.6	-16.8
Peak Gain (R)		47.0	89.5	131.9
Ending Gain (R)		32.3	79.1	125.9
Prob. Of Break Even or Higher (%)	96.0			
# Trades For Break Even (95%)	87			
95% Drawdown Duration (Months)	3.5			
Yearly Gain(R)	Not	Enough	Trades	
Avg Yearly Gain/Avg Drawdown	Not	Enough	Trades	

Image created from Know Your System software. Software not available for sale.

System 3-1: Results of Position Sizing Optimizer

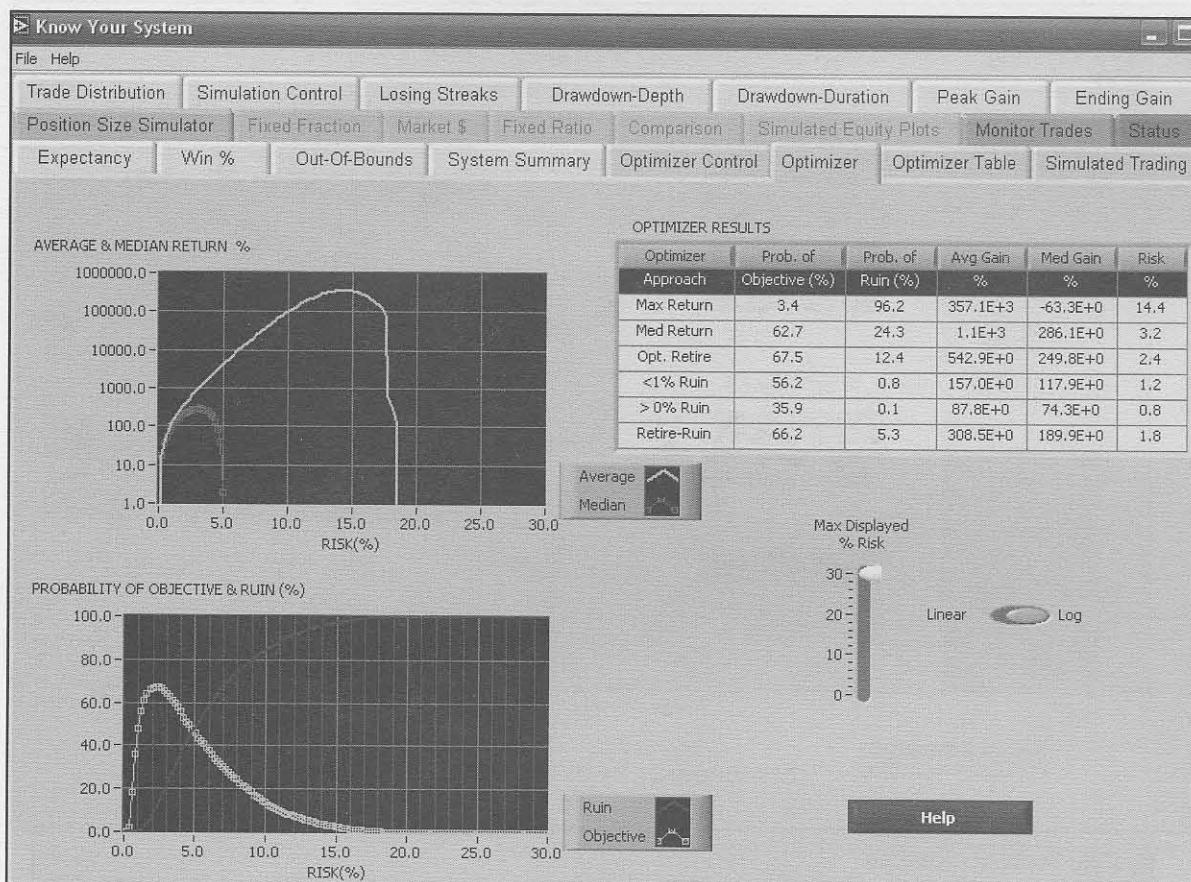


Image created from Know Your System software. Software not available for sale.

System 3-2: Expectancy and Standard Deviation

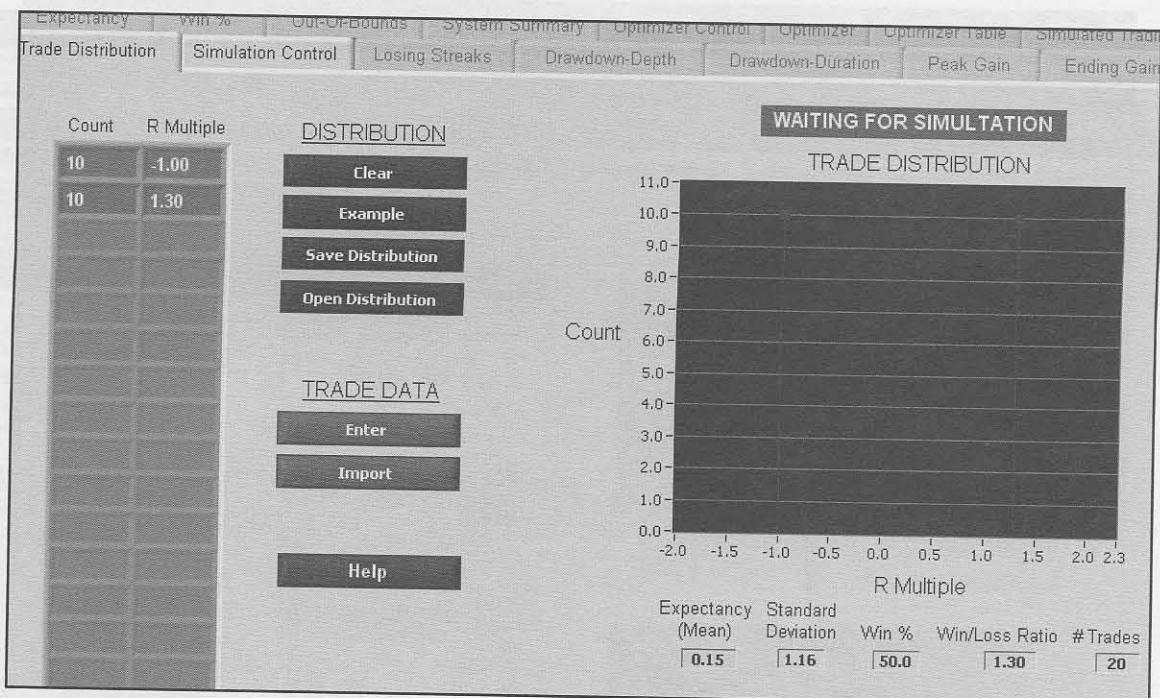


Image created from Know Your System software. Software not available for sale.

System 3-2: System Summary

TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	75.00			
Win/Loss Ratio	1.30			
Expectancy		0.04	0.15	0.27
Win %		45.0	50.0	55.0
Loosing Streaks			6	
Drawdown(R)		-12.3	-8.7	-5.2
Peak Gain (R)		8.8	18.6	28.4
Ending Gain (R)		3.6	15.1	26.6
Prob. Of Break Even or Higher (%)	90.6			
# Trades For Break Even (95%)	147			
95% Drawdown Duration (Months)	2.0			
Yearly Gain(R)	Not	Enough	Trades	
Avg Yearly Gain/Avg Drawdown	Not	Enough	Trades	

Image created from Know Your System software. Software not available for sale.

System 3-2: Results of Position Sizing Optimizer

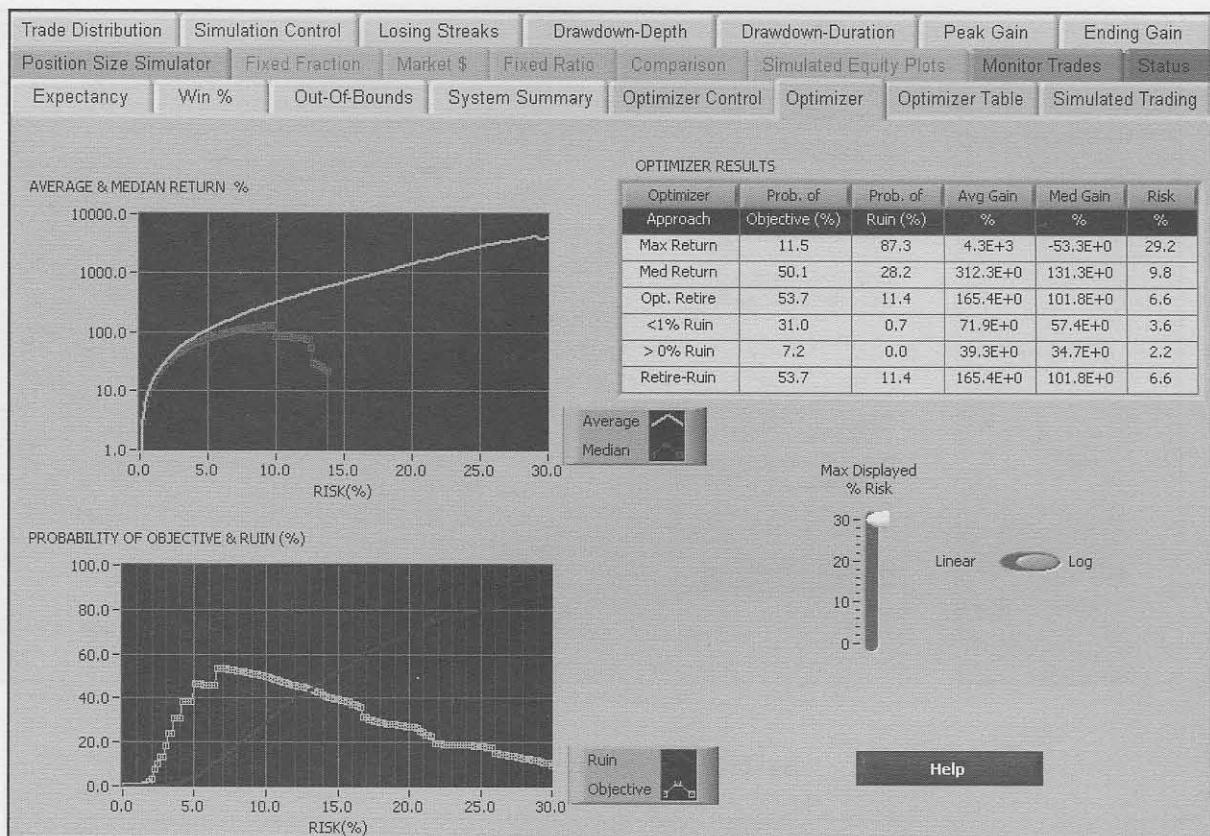


Image created from Know Your System software. Software not available for sale.

System 3-3: Expectancy and Standard Deviation

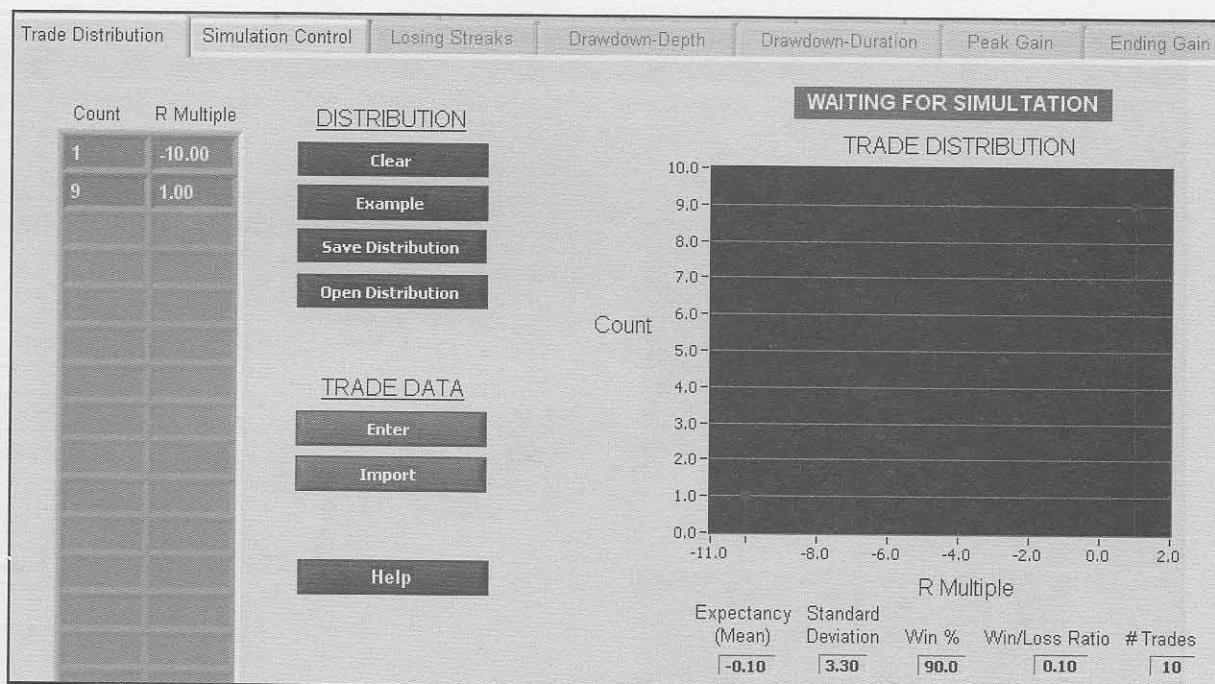


Image created from Know Your System software. Software not available for sale.

System 3-3: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	60.00			
Win/Loss Ratio	0.10			
Expectancy		-0.43	-0.10	0.23
Win %		87.0	90.0	93.0
Loosing Streaks			2	
Drawdown(R)		-62.9	-42.2	-21.4
Peak Gain (R)		3.5	19.1	34.8
Ending Gain (R)		-42.9	-10.0	22.9
Prob. Of Break Even or Higher (%)	45.1			
# Trades For Break Even (95%)	2968			
95% Drawdown Duration (Months)	49.5			
Yearly Gain(R)	Not	Enough	Trades	
Avg Yearly Gain/Avg Drawdown	Not	Enough	Trades	

Image created from Know Your System software. Software not available for sale.

System 3-3: Results of Position Sizing Optimizer

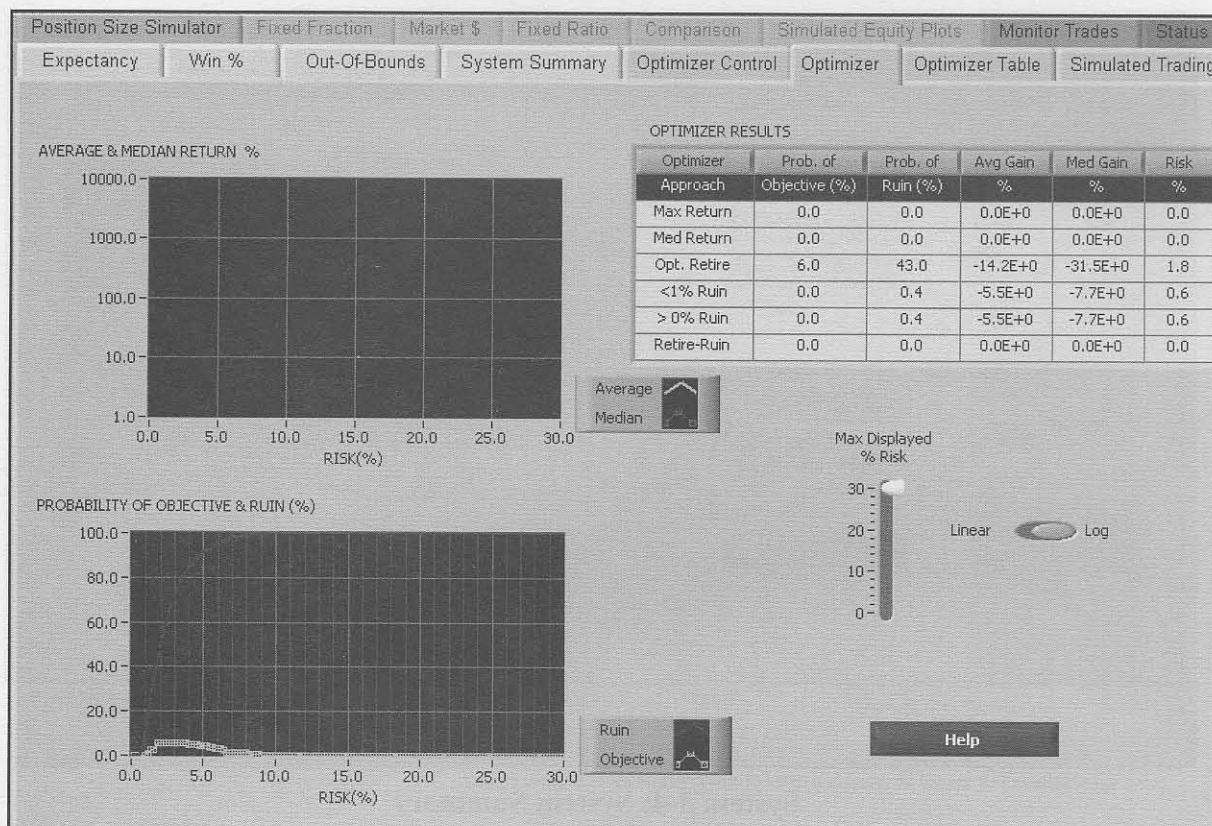


Image created from Know Your System software. Software not available for sale.

System 3-4: Expectancy and Standard Deviation

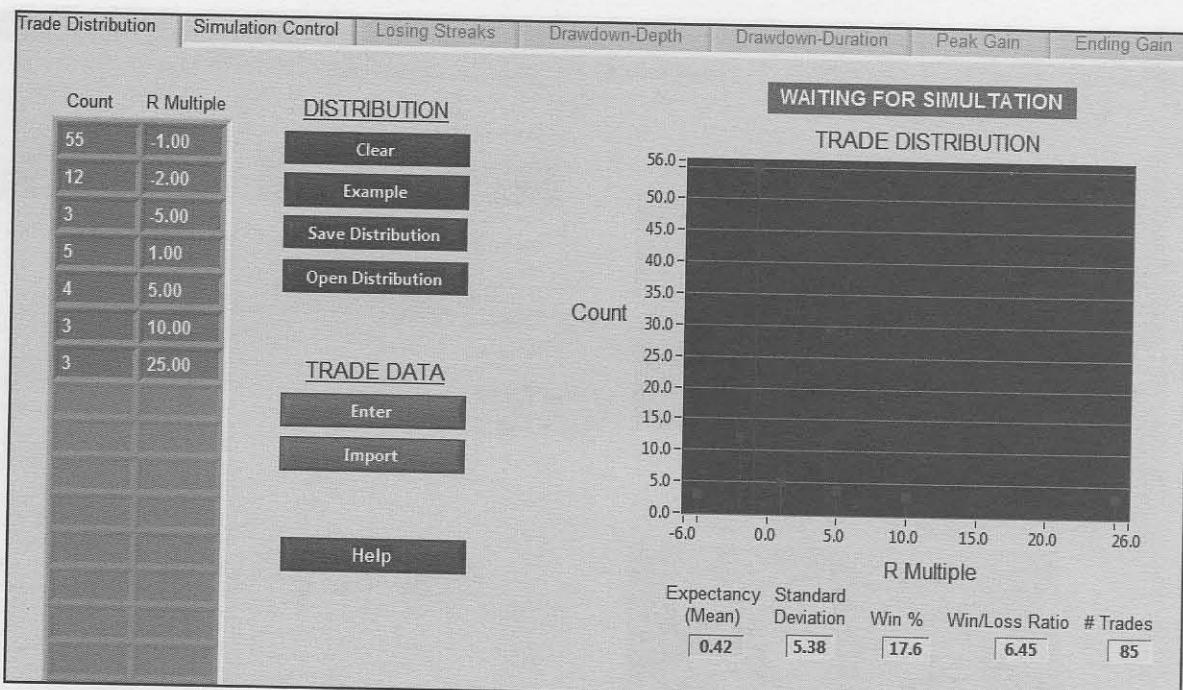


Image created from Know Your System software. Software not available for sale.

System 3-4: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	5.00			
Win/Loss Ratio	6.45			
Expectancy		-0.12	0.42	0.96
Win %		13.8	17.6	21.4
Loosing Streaks			17	
Drawdown(R)		-51.4	-36.6	-21.8
Peak Gain (R)		17.1	61.6	106.2
Ending Gain (R)		-12.1	41.9	95.9
Prob. Of Break Even or Higher (%)	77.6			
# Trades For Break Even (95%)	416			
95% Drawdown Duration (Months)	83.2			
Yearly Gain(R)	25.4			
Avg Yearly Gain/Avg Drawdown	0.7			

Image created from Know Your System software. Software not available for sale.

System 3-4: Results of Position Sizing Optimizer

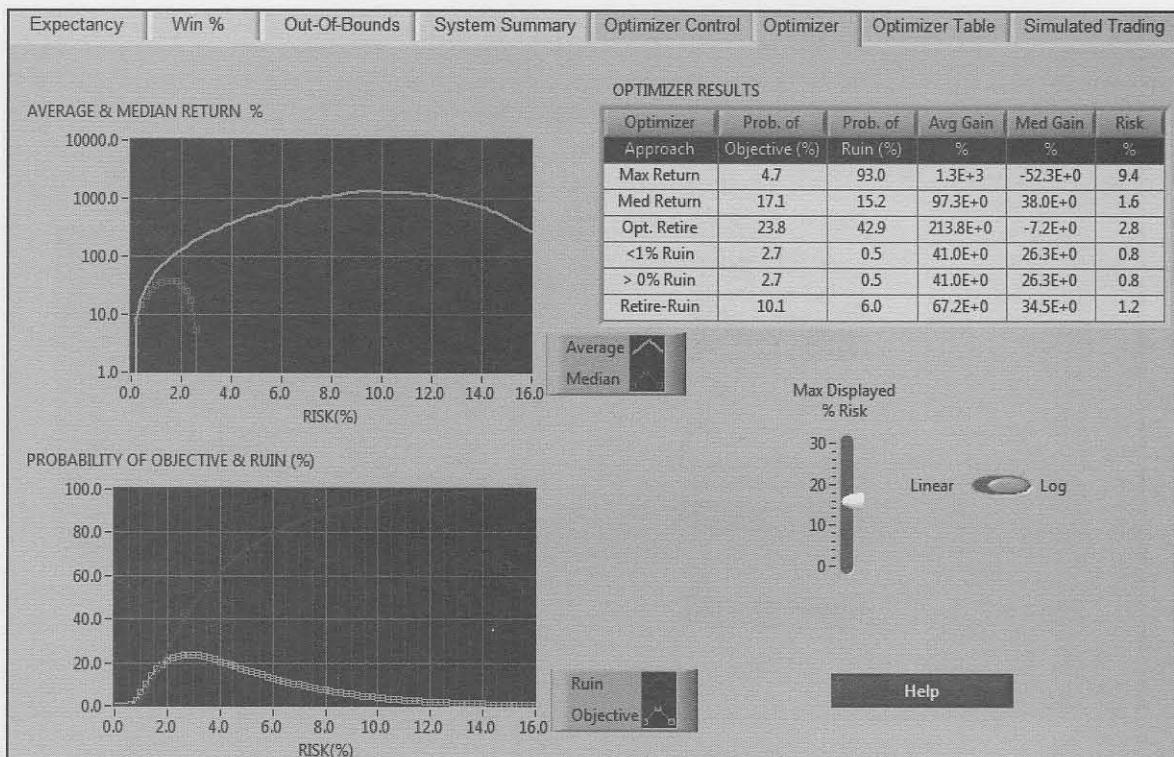


Image created from Know Your System software. Software not available for sale.

System 3-5: Expectancy and Standard Deviation

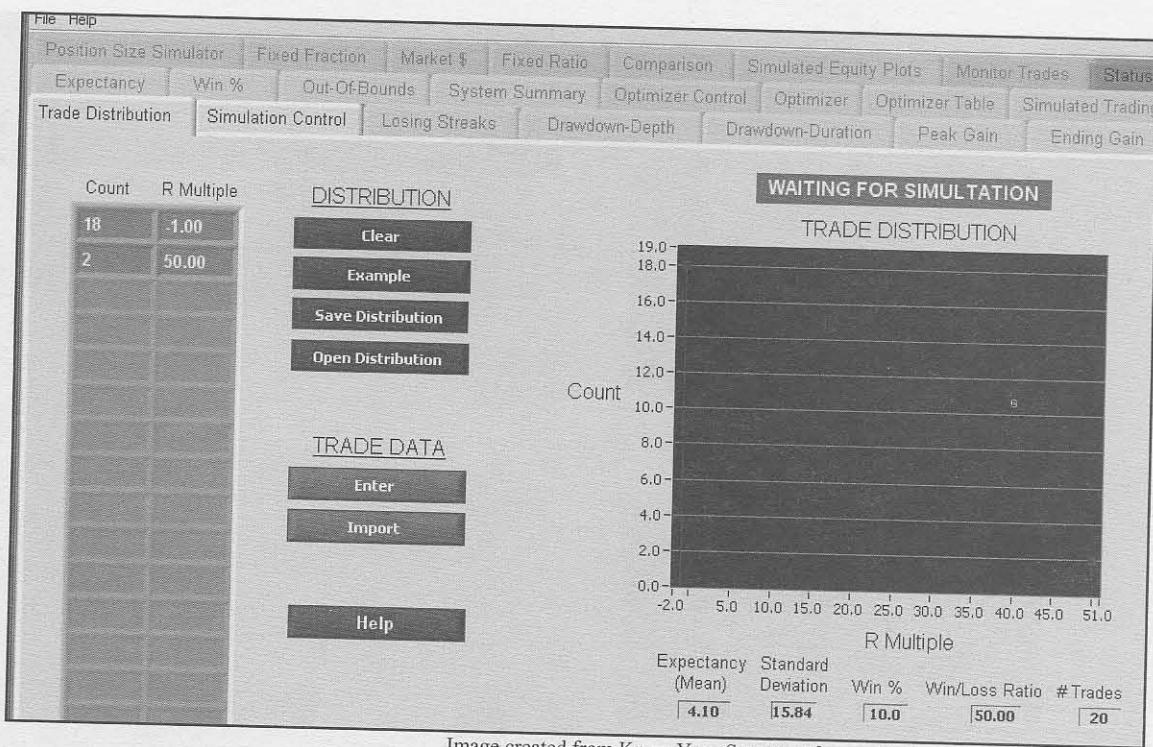


Image created from Know Your System software. Software not available for sale.

System 3-5: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	15.00			
Win/Loss Ratio	50.00			
Expectancy		2.65	4.16	5.67
Win %		7.2	10.1	13.1
Loosing Streaks			26	
Drawdown(R)		-35.9	-26.5	-17.0
Peak Gain (R)		276.6	425.0	573.3
Ending Gain (R)		265.1	416.2	567.3
Prob. Of Break Even or Higher (%)	100.0			
# Trades For Break Even (95%)	29			
95% Drawdown Duration (Months)	1.9			
Yearly Gain(R)	Not	Enough	Trades	
Avg Yearly Gain/Avg Drawdown	Not	Enough	Trades	

Image created from Know Your System software. Software not available for sale.

System 3-5: Results of Position Sizing Optimizer

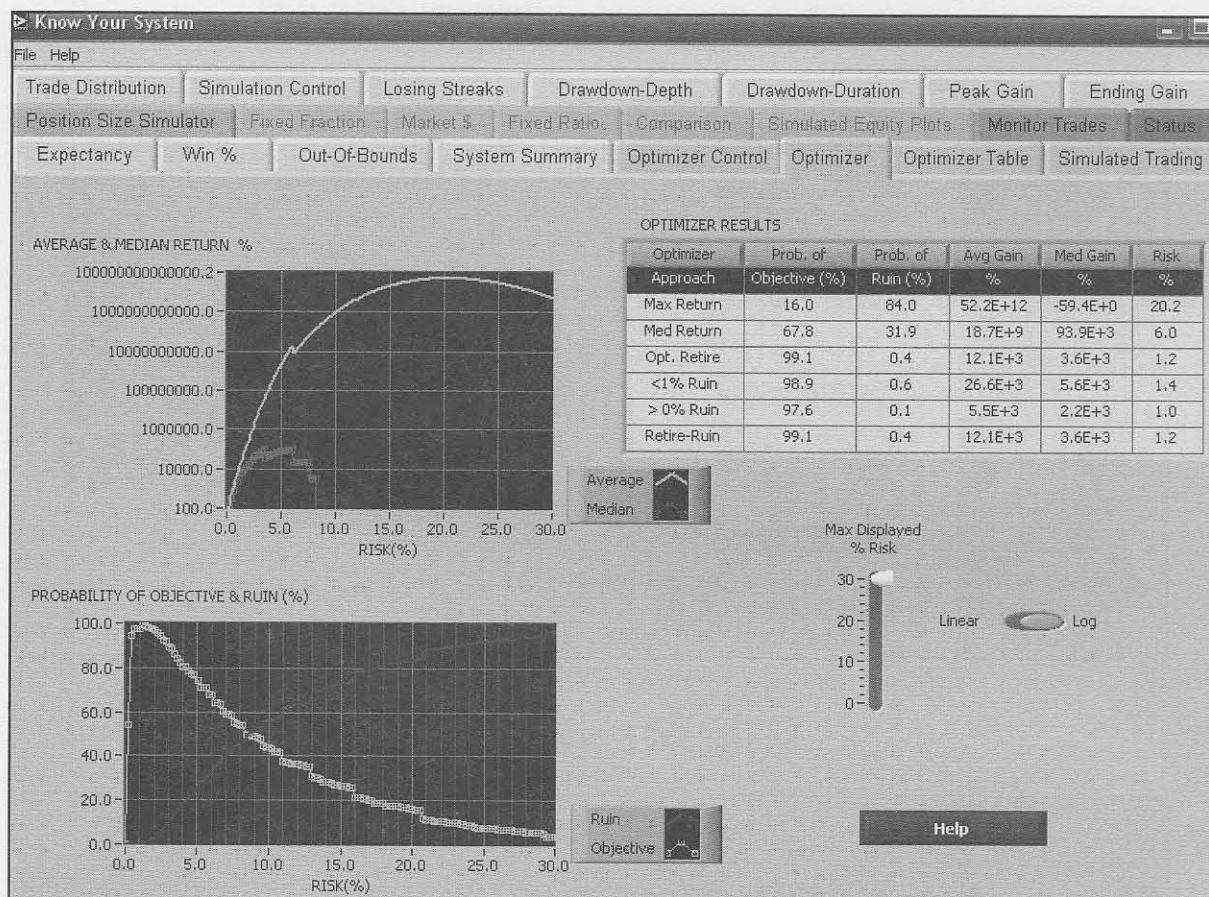


Image created from Know Your System software. Software not available for sale.

System 3-6: Expectancy and Standard Deviation

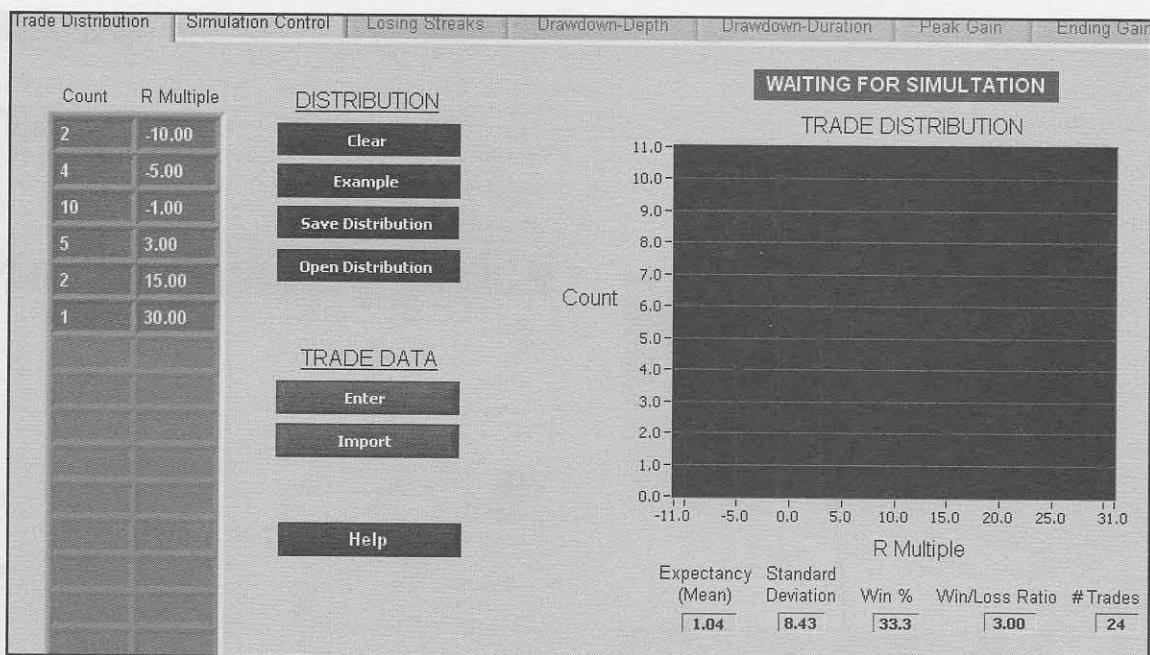


Image created from Know Your System software. Software not available for sale.

System 3-6: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	35.00			
Win/Loss Ratio	3.00			
Expectancy		0.21	1.05	1.89
Win %		28.7	33.4	38.1
Loosing Streaks			10	
Drawdown(R)		-75.7	-53.4	-31.1
Peak Gain (R)		54.7	128.0	201.3
Ending Gain (R)		21.0	105.0	188.9
Prob. Of Break Even or Higher (%)	89.8			
# Trades For Break Even (95%)	169			
95% Drawdown Duration (Months)	4.8			
Yearly Gain(R)	Not	Enough	Trades	
Avg Yearly Gain/Avg Drawdown	Not	Enough	Trades	

Image created from Know Your System software. Software not available for sale.

System 3-6: Results of Position Sizing Optimizer

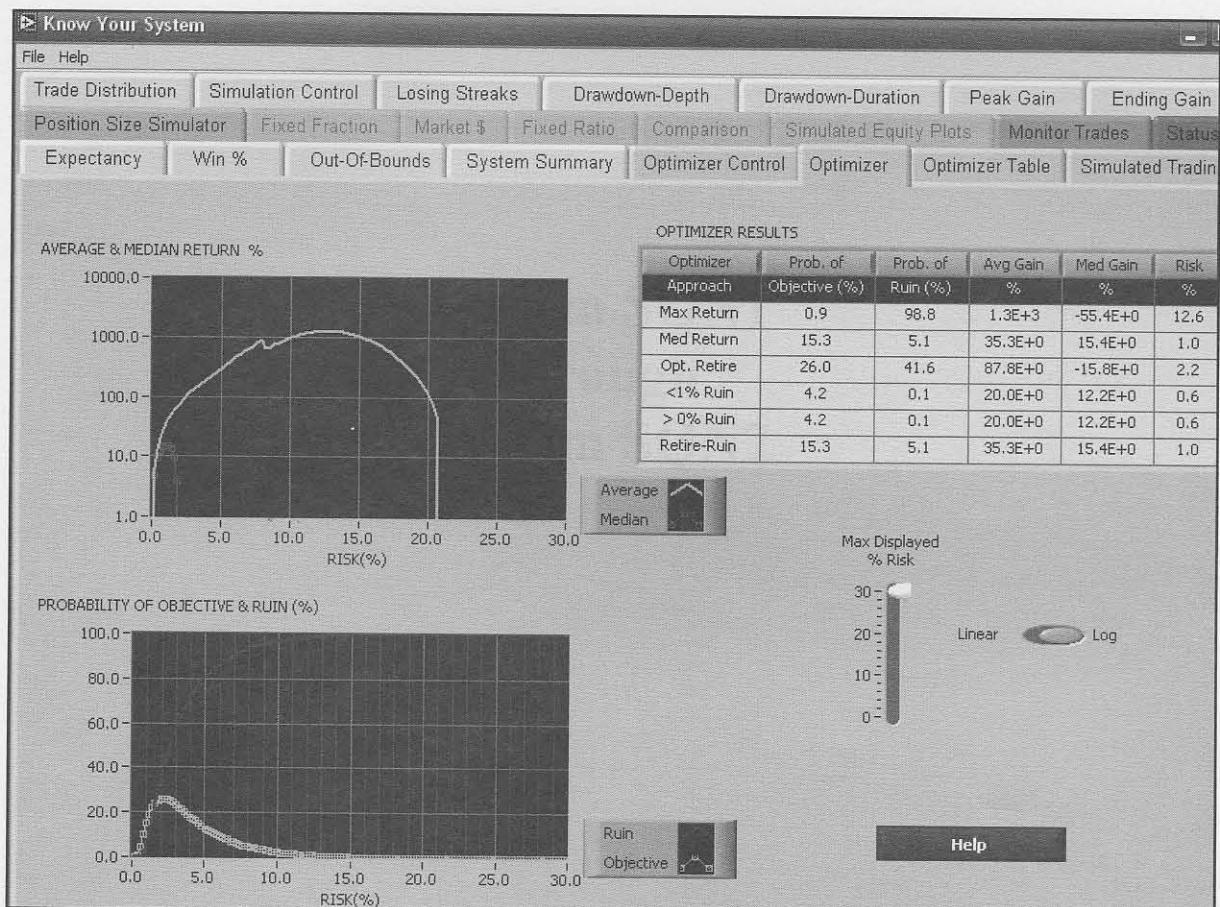


Image created from Know Your System software. Software not available for sale.

Appendix I

**System SQN1
through
System SQN7**

System SQN1: Expectancy and Standard Deviation

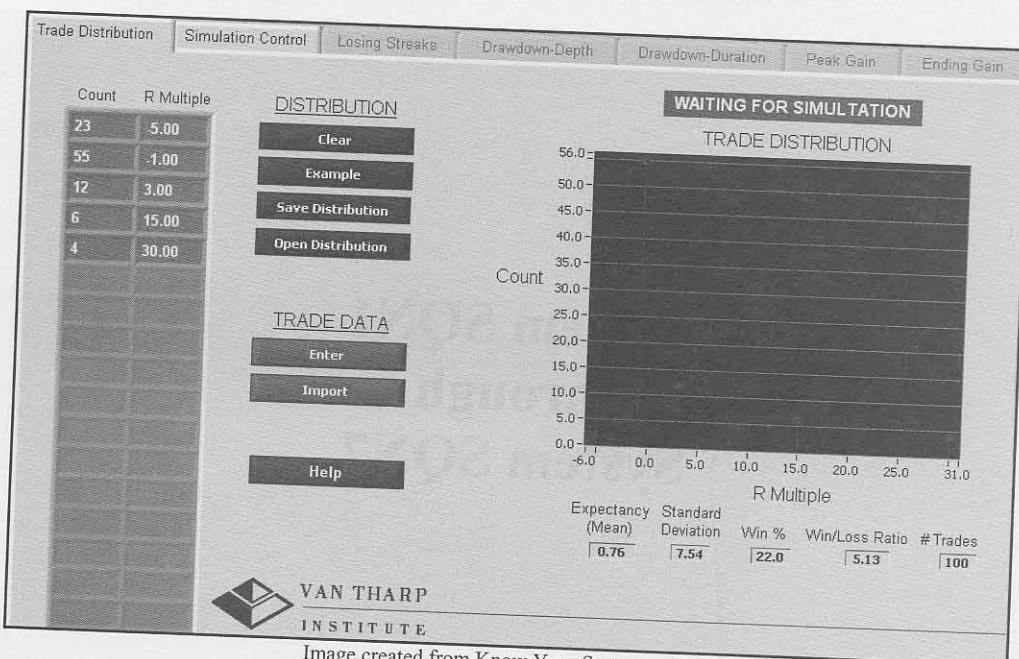


Image created from Know Your System software. Software not available for sale.

System SQN1: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	8.00			
Win/Loss Ratio	5.13			
Expectancy		0.01	0.75	1.49
Win %		17.8	22.0	26.1
Loosing Streaks			14	
Drawdown(R)		-69.8	-49.7	-29.5
Peak Gain (R)		35.4	98.8	162.1
Ending Gain (R)		0.7	75.0	149.4
Prob. Of Break Even or Higher (%)	85.0			
# Trades For Break Even (95%)	251			
95% Drawdown Duration (Months)	31.4			
Yearly Gain(R)	73.0			
Avg Yearly Gain/Avg Drawdown	1.5			

Image created from Know Your System software. Software not available for sale.

System SQN1: Results of Position Sizing Optimizer

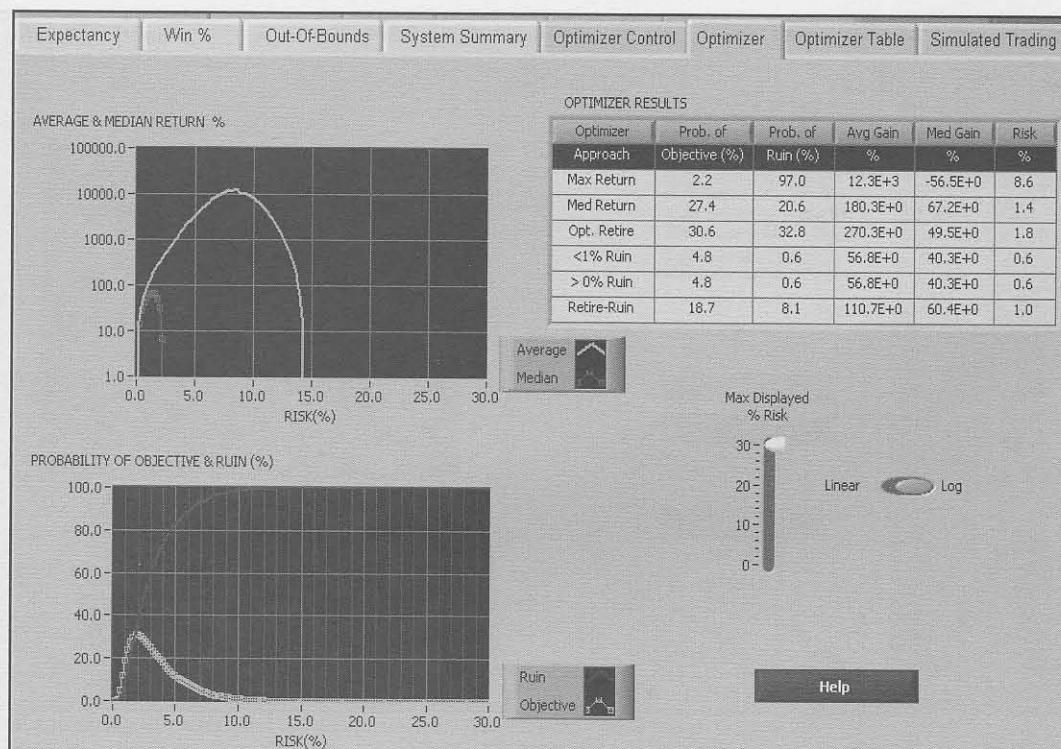


Image created from Know Your System software. Software not available for sale.

System SQN2: Expectancy and Standard Deviation



Image created from Know Your System software. Software not available for sale.

System SQN2: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	8.00			
Win/Loss Ratio	0.62			
Expectancy		0.16	0.32	0.47
Win %		67.5	72.0	76.5
Loosing Streaks			3	
Drawdown(R)		-14.9	-10.5	-6.2
Peak Gain (R)		21.2	35.1	49.1
Ending Gain (R)		16.4	31.9	47.4
Prob. Of Break Even or Higher (%)	97.7			
# Trades For Break Even (95%)	64			
95% Drawdown Duration (Months)	8.0			
Yearly Gain(R)	30.7			
Avg Yearly Gain/Avg Drawdown	2.9			

Image created from Know Your System software. Software not available for sale.

System SQN2: Results of Position Sizing Optimizer

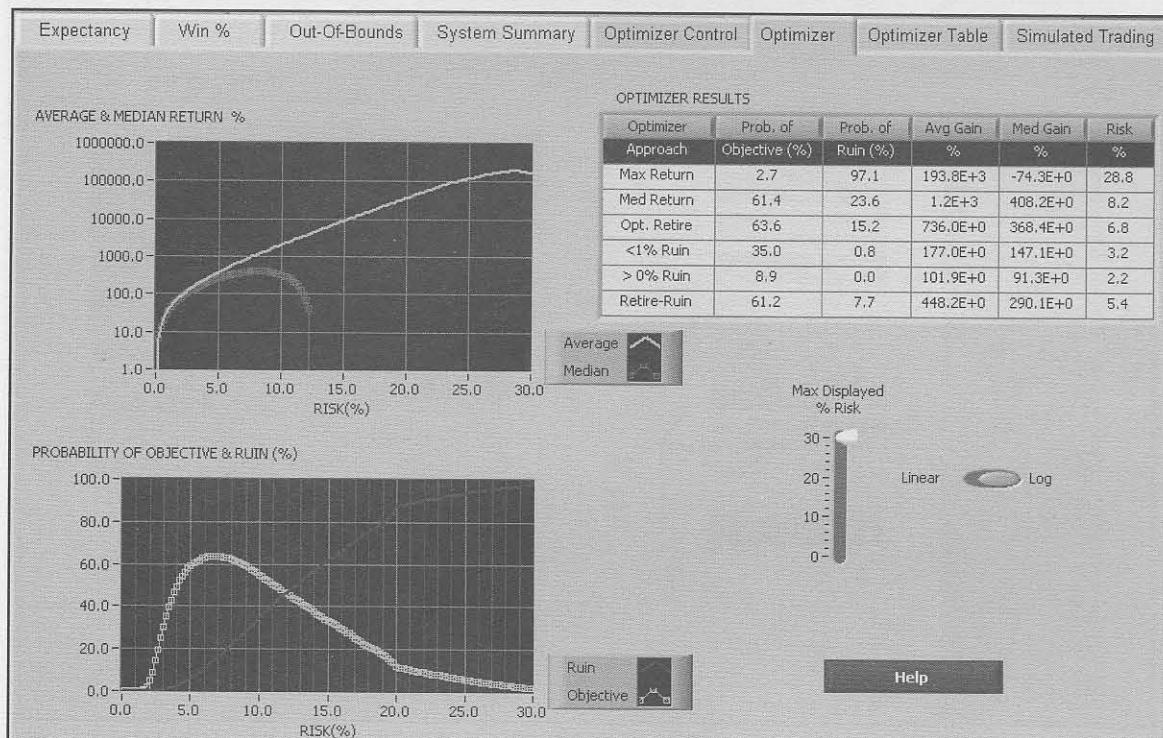


Image created from Know Your System software. Software not available for sale.

System SQN3: Expectancy and Standard Deviation

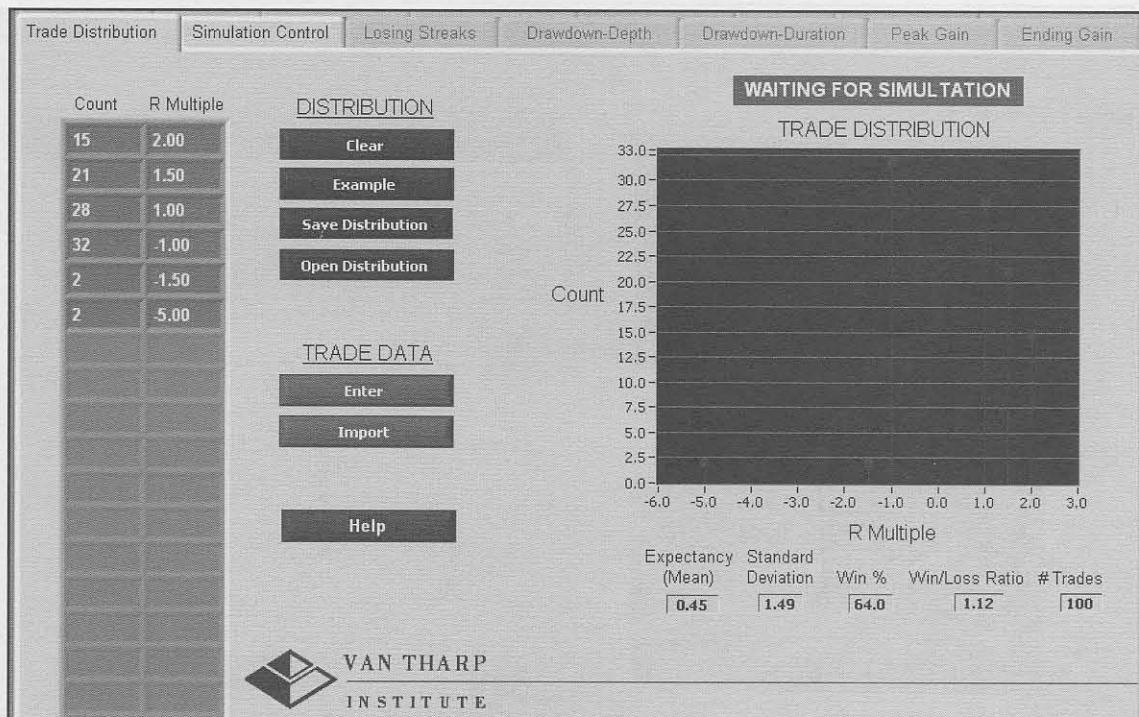


Image created from Know Your System software. Software not available for sale.

System SQN3: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	8.00			
Win/Loss Ratio	1.12			
Expectancy		0.30	0.45	0.59
Win %		59.2	64.0	68.8
Loosing Streaks			4	
Drawdown(R)		-11.1	-8.0	-4.8
Peak Gain (R)		32.9	46.3	59.8
Ending Gain (R)		30.4	44.6	58.7
Prob. Of Break Even or Higher (%)	99.8			
# Trades For Break Even (95%)	29			
95% Drawdown Duration (Months)	3.6			
Yearly Gain(R)	42.7			
Avg Yearly Gain/Avg Drawdown	5.4			

Image created from Know Your System software. Software not available for sale.

System SQN3: Results of Position Sizing Optimizer

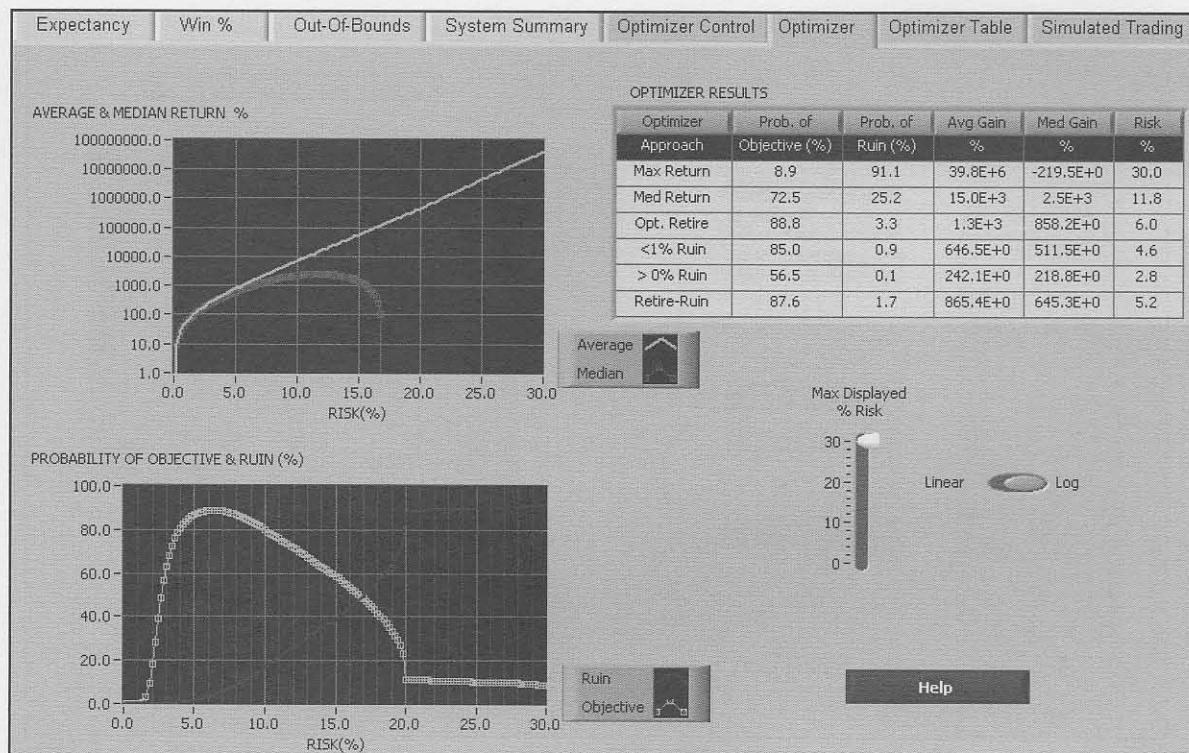


Image created from Know Your System software. Software not available for sale.

System SQN4: Expectancy and Standard Deviation

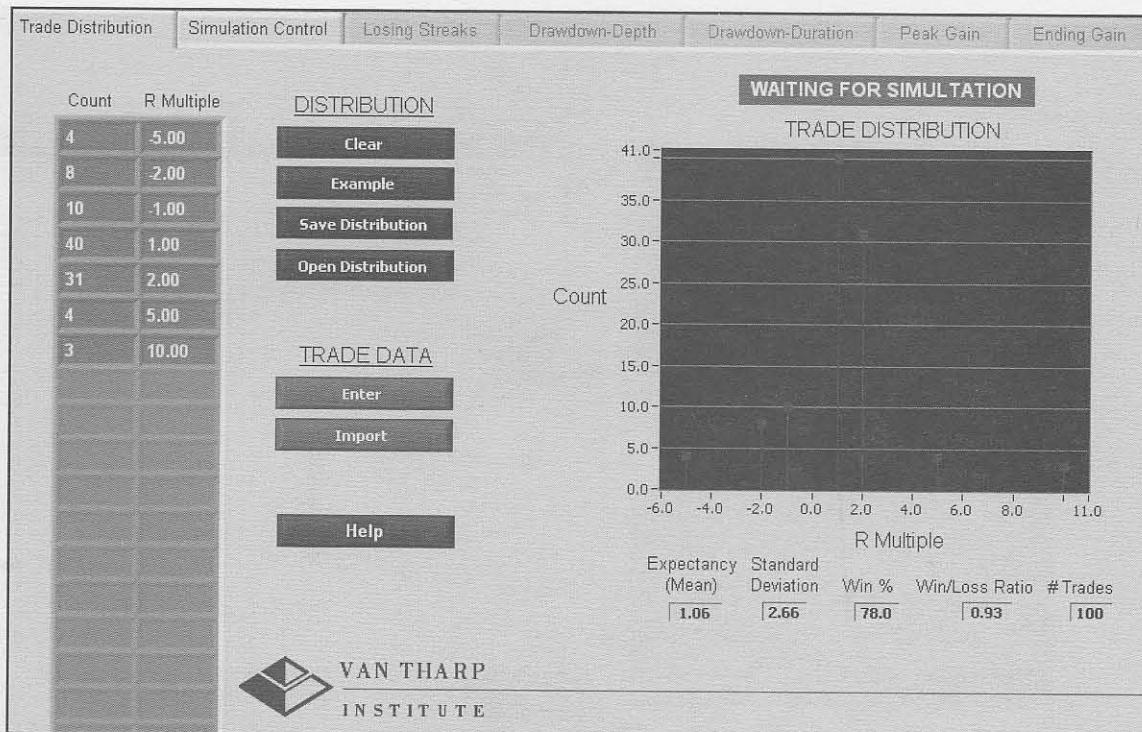


Image created from Know Your System software. Software not available for sale.

System SQN4: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	8.00			
Win/Loss Ratio	0.93			
Expectancy		0.82	1.06	1.30
Win %		73.8	78.0	82.2
Loosing Streaks			3	
Drawdown(R)		-12.0	-8.7	-5.5
Peak Gain (R)		83.5	107.4	131.4
Ending Gain (R)		81.8	106.1	130.4
Prob. Of Break Even or Higher (%)	100.0			
# Trades For Break Even (95%)	13			
95% Drawdown Duration (Months)	1.6			
Yearly Gain(R)	101.8			
Avg Yearly Gain/Avg Drawdown	11.7			

Image created from Know Your System software. Software not available for sale.

System SQN4: Results of Position Sizing Optimizer

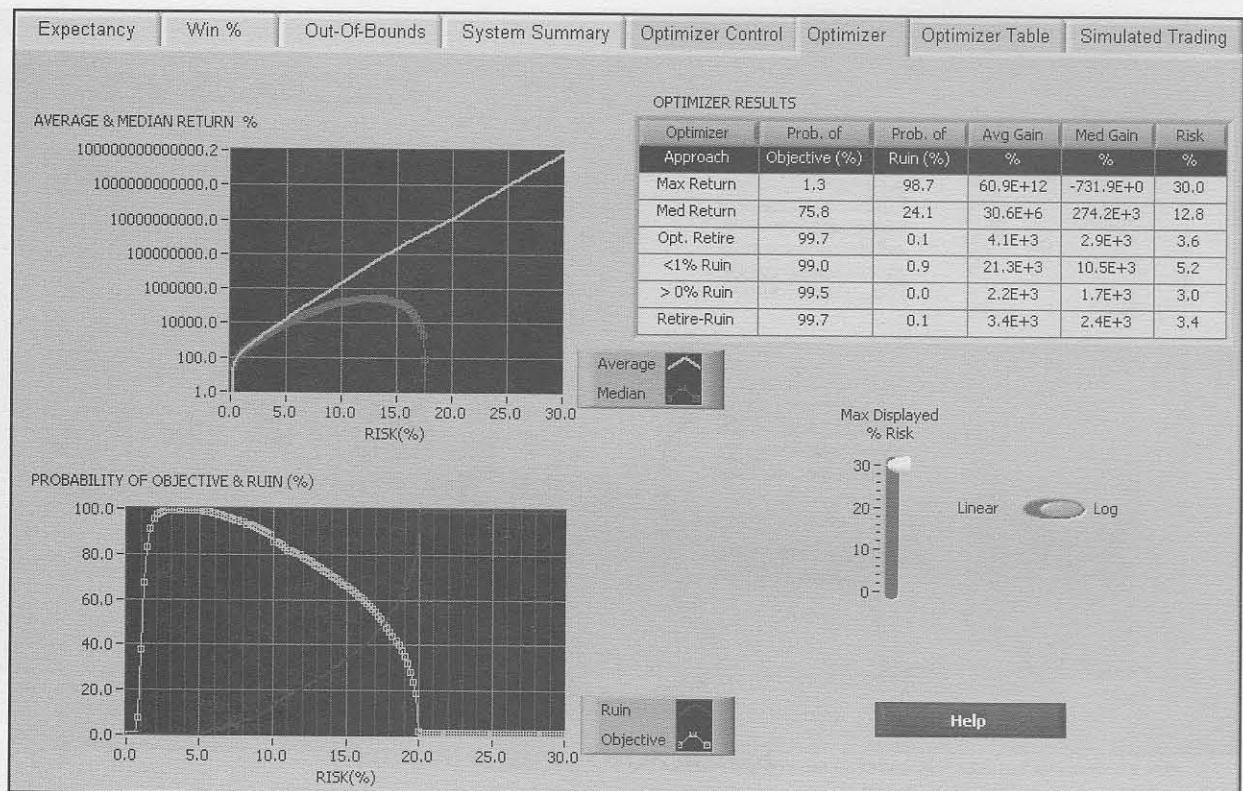


Image created from Know Your System software. Software not available for sale.

System SQN5: Expectancy and Standard Deviation

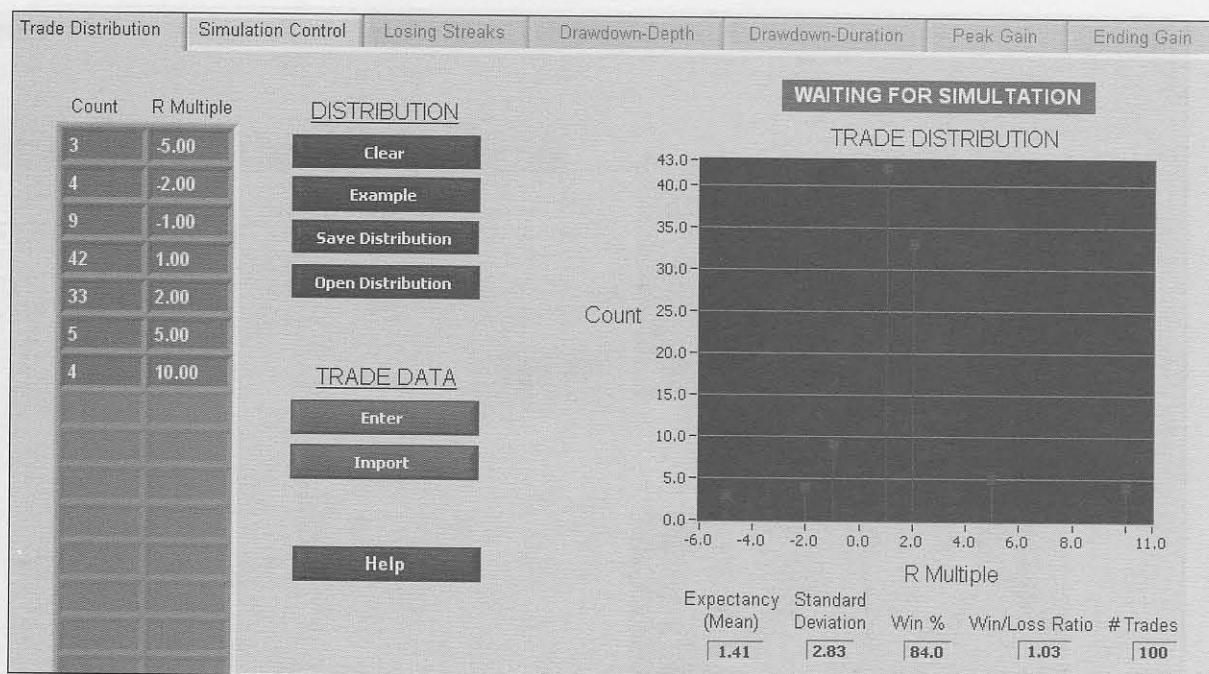


Image created from Know Your System software. Software not available for sale.

System SQN5: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	8.00			
Win/Loss Ratio	1.03			
Expectancy		1.16	1.41	1.65
Win %		80.3	84.0	87.6
Loosing Streaks			2	
Drawdown(R)		-9.3	-6.9	-4.4
Peak Gain (R)		116.9	141.5	166.0
Ending Gain (R)		116.0	140.7	165.4
Prob. Of Break Even or Higher (%)	100.0			
# Trades For Break Even (95%)	7			
95% Drawdown Duration (Months)	0.9			
Yearly Gain(R)	135.4			
Avg Yearly Gain/Avg Drawdown	19.7			

Image created from Know Your System software. Software not available for sale.

System SQN5: Results of Position Sizing Optimizer

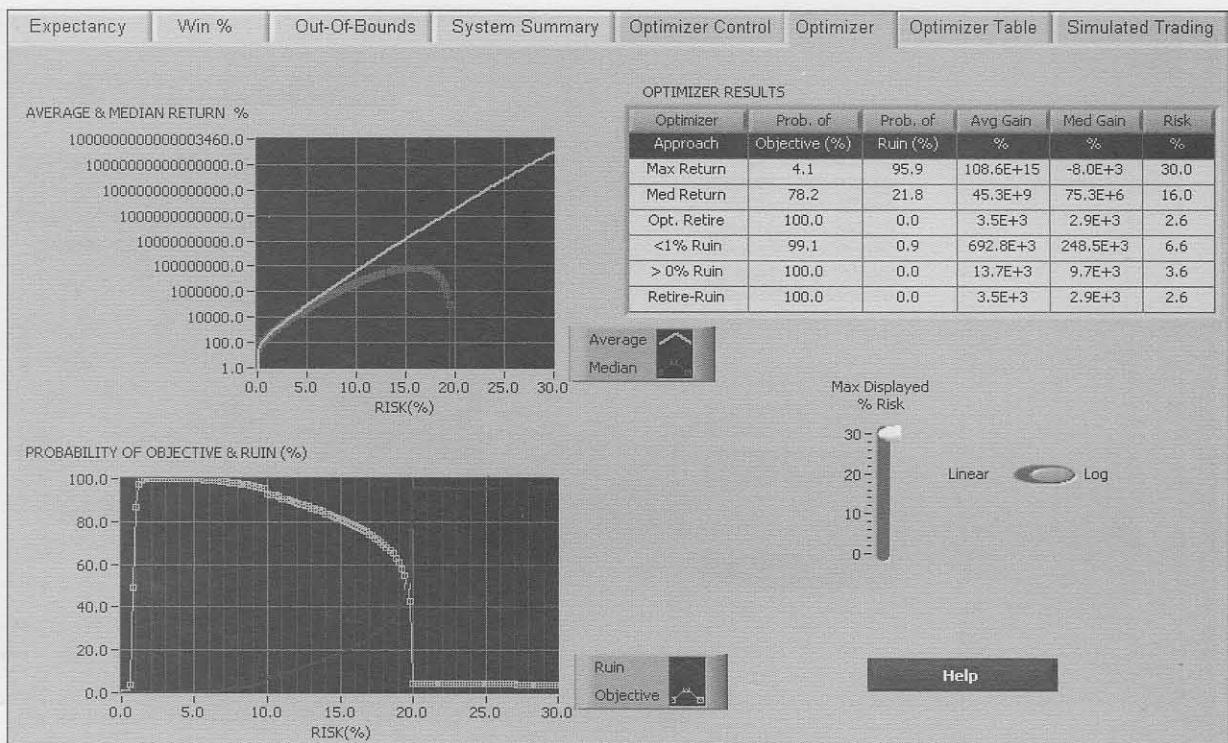


Image created from Know Your System software. Software not available for sale.

System SQN6: Expectancy and Standard Deviation



Image created from Know Your System software. Software not available for sale.

System SQN6: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	8.00			
Win/Loss Ratio	1.94			
Expectancy		1.90	2.19	2.48
Win %		78.1	82.0	85.8
Loosing Streaks			2	
Drawdown(R)		-7.1	-5.2	-3.3
Peak Gain (R)		190.3	219.2	248.2
Ending Gain (R)		189.7	218.7	247.8
Prob. Of Break Even or Higher (%)	100.0			
# Trades For Break Even (95%)	4			
95% Drawdown Duration (Months)	0.5			
Yearly Gain(R)	210.2			
Avg Yearly Gain/Avg Drawdown	40.5			

Image created from Know Your System software. Software not available for sale.

System SQN6: Results of Position Sizing Optimizer

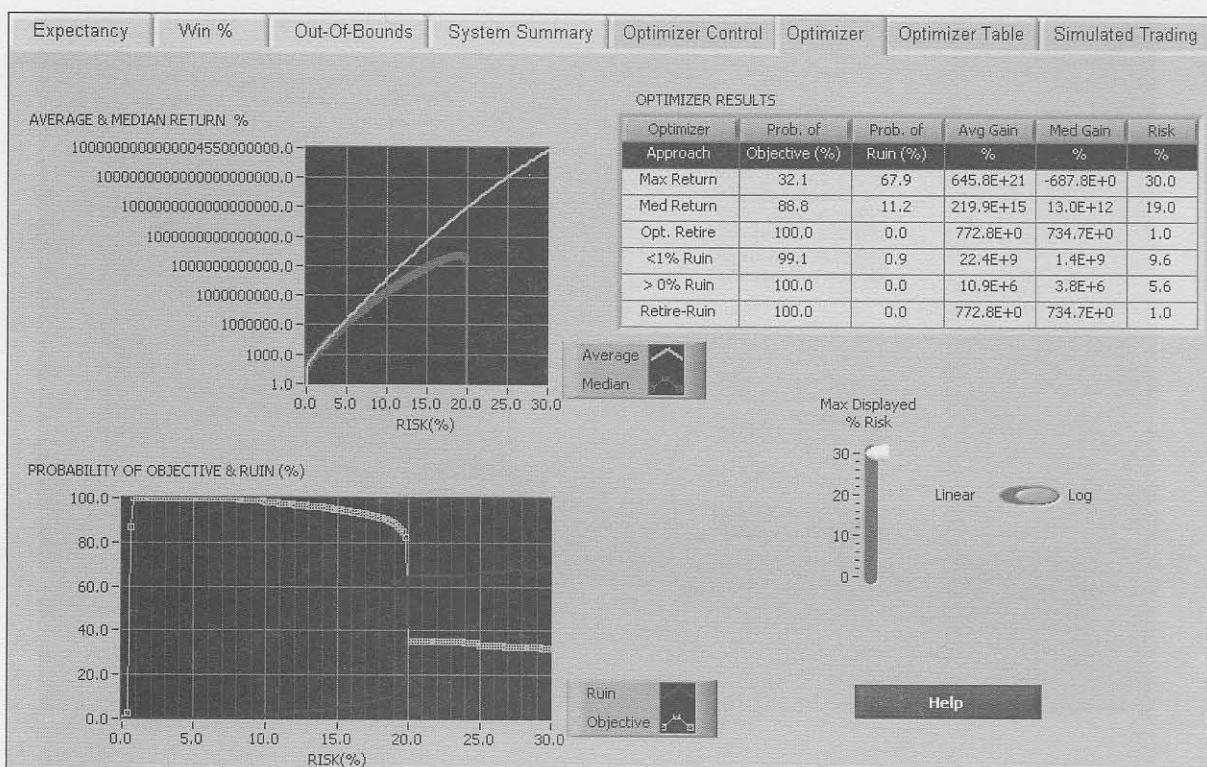


Image created from Know Your System software. Software not available for sale.

System SQN7: Expectancy and Standard Deviation

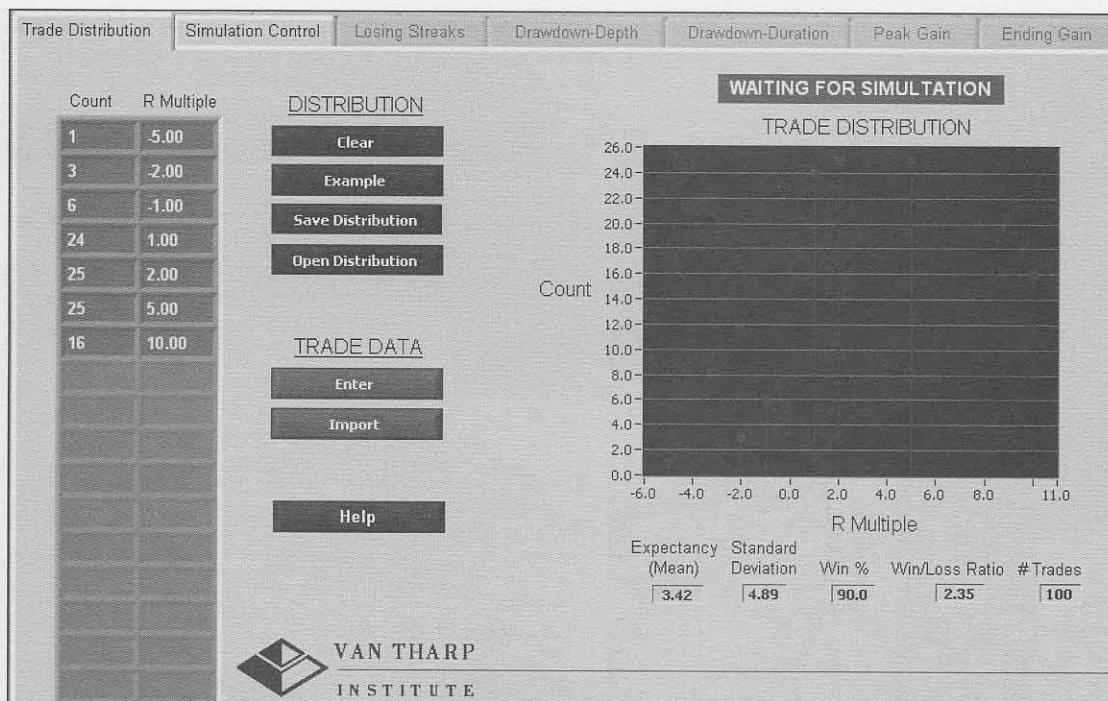


Image created from Know Your System software. Software not available for sale.

System SQN7: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	8.00			
Win/Loss Ratio	2.35			
Expectancy		3.07	3.42	3.78
Win %		87.1	90.1	93.0
Loosing Streaks			2	
Drawdown(R)		-6.3	-4.5	-2.7
Peak Gain (R)		307.6	342.6	377.7
Ending Gain (R)		307.3	342.4	377.5
Prob. Of Break Even or Higher (%)	100.0			
# Trades For Break Even (95%)	2			
95% Drawdown Duration (Months)	0.2			
Yearly Gain(R)	328.3			
Avg Yearly Gain/Avg Drawdown	73.8			

Image created from Know Your System software. Software not available for sale.

System SQN7: Results of Position Sizing Optimizer

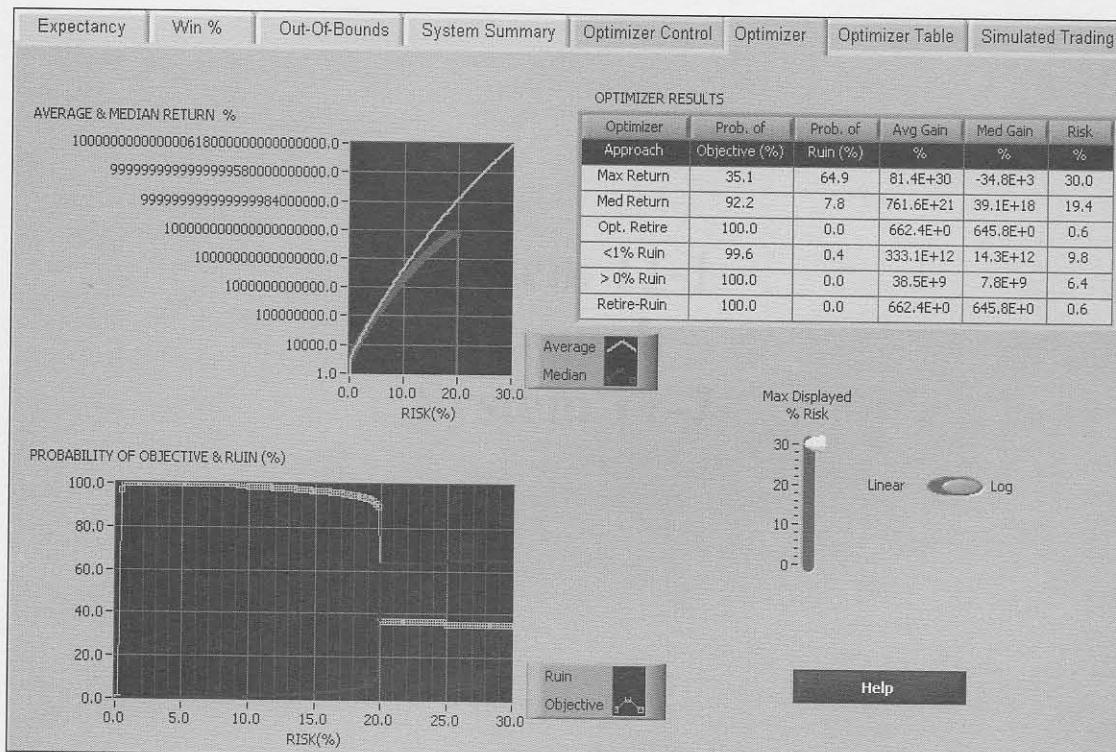


Image created from Know Your System software. Software not available for sale.

System SQN7: Results of Position Sizing Optimizer - Goal at 1000% and Ruin at 20%

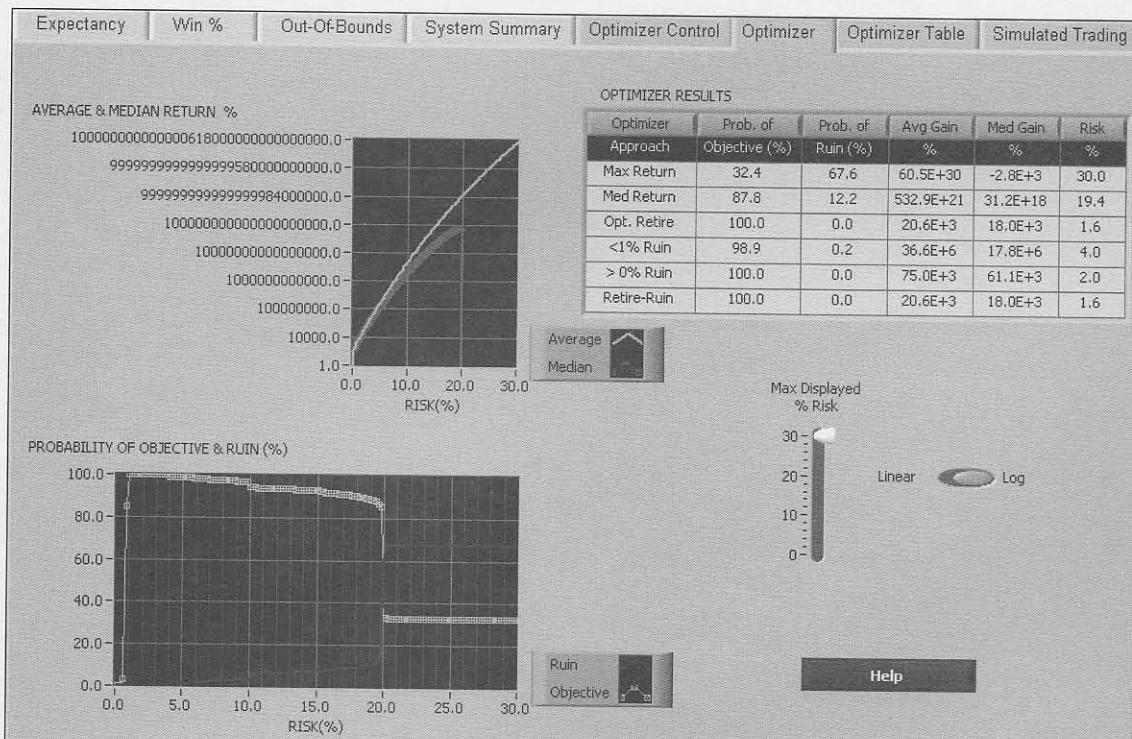


Image created from Know Your System software. Software not available for sale.

Appendix I

**System 11-1
through
System 11-7**

System 11-1: Expectancy and Standard Deviation

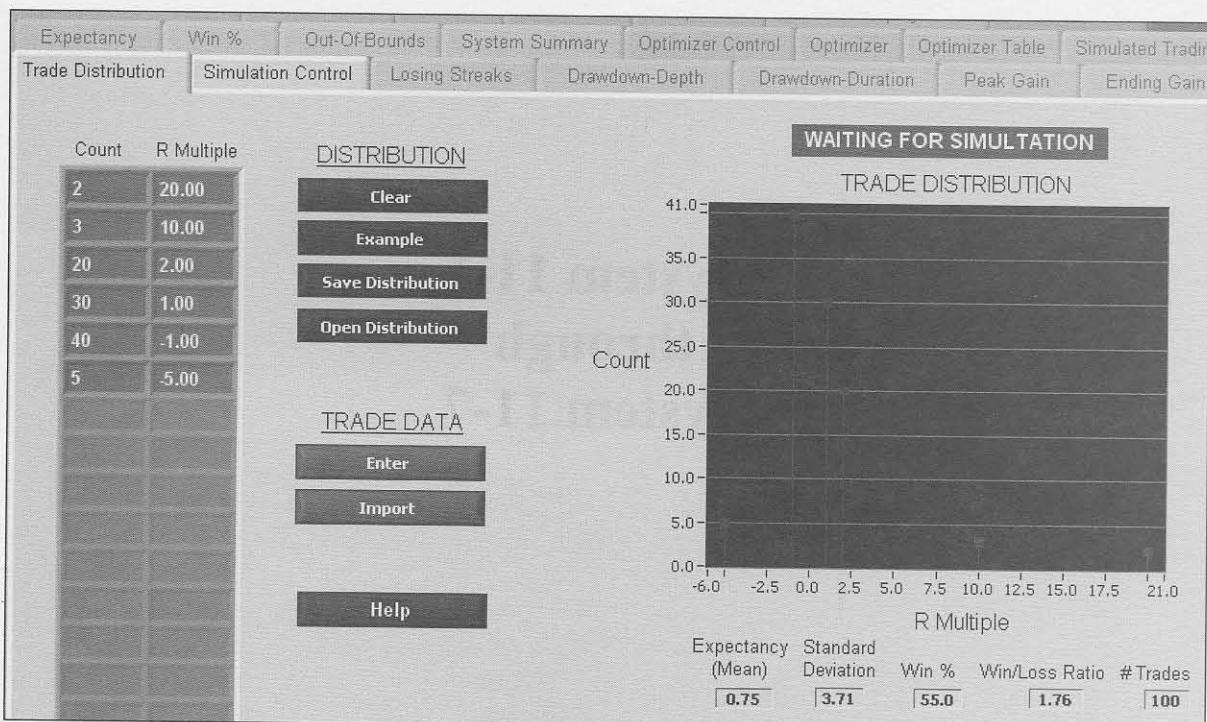


Image created from Know Your System software. Software not available for sale.

System 11-1: Summary Results

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	10.00			
Win/Loss Ratio	1.76			
Expectancy		0.38	0.75	1.11
Win %		50.0	55.0	60.0
Loosing Streaks			5	
Drawdown(R)		-19.2	-13.5	-7.9
Peak Gain (R)		44.1	78.7	113.2
Ending Gain (R)		38.4	74.5	110.7
Prob. Of Break Even or Higher (%)	98.8			
# Trades For Break Even (95%)	53			
95% Drawdown Duration (Months)	5.3			
Yearly Gain(R)	Not	Enough	Trades	
Avg Yearly Gain/Avg Drawdown	Not	Enough	Trades	

Image created from Know Your System software. Software not available for sale.

System 11-1: Results of Position Sizing Optimizer

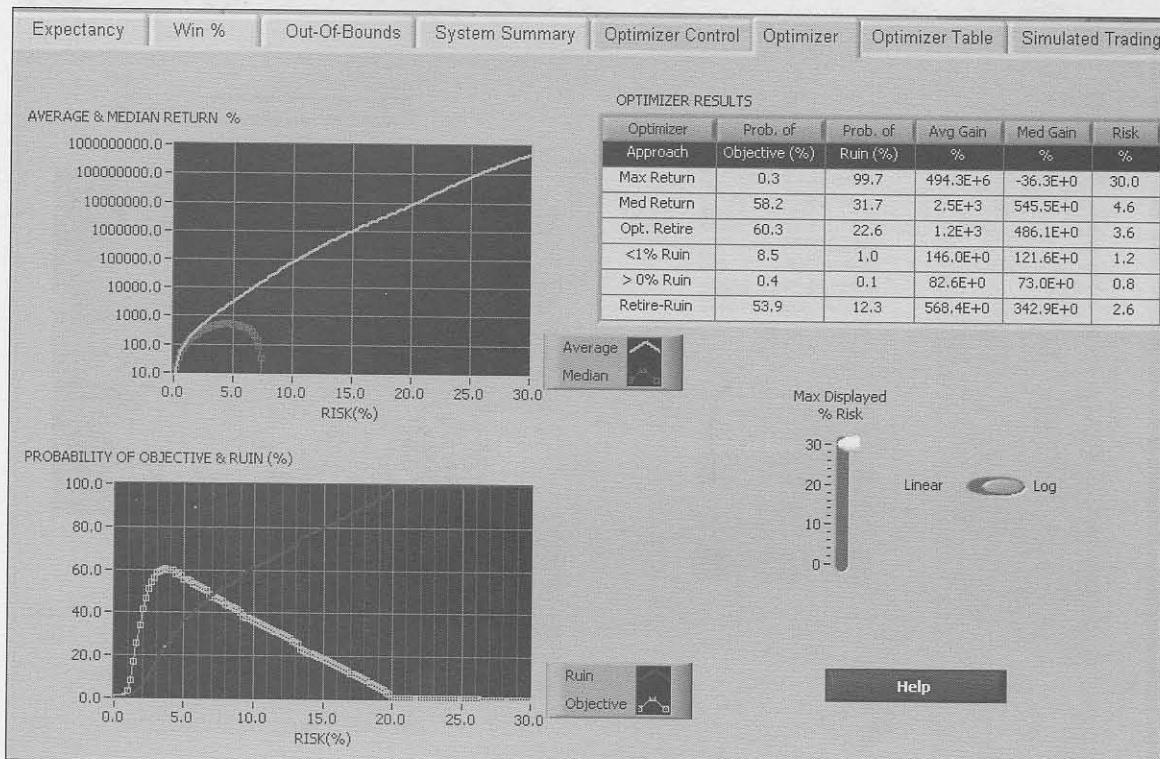


Image created from Know Your System software. Software not available for sale.

System 11-2: Expectancy and Standard Deviation

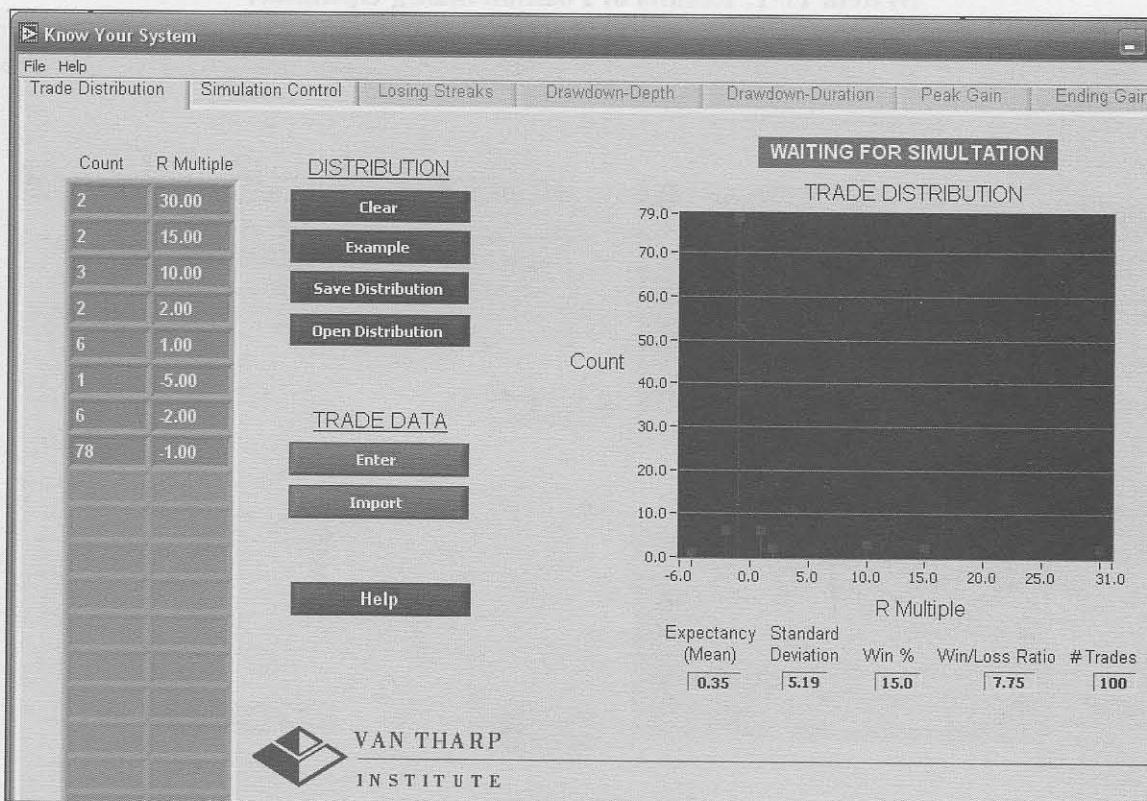


Image created from Know Your System software. Software not available for sale.

System 11-2: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	8.00			
Win/Loss Ratio	7.75			
Expectancy		-0.17	0.34	0.85
Win %		11.4	14.9	18.5
Loosing Streaks			19	
Drawdown(R)		-49.6	-35.6	-21.7
Peak Gain (R)		12.6	54.5	96.4
Ending Gain (R)		-16.9	34.2	85.4
Prob. Of Break Even or Higher (%)	73.4			
# Trades For Break Even (95%)	599			
95% Drawdown Duration (Months)	74.9			
Yearly Gain(R)	33.6			
Avg Yearly Gain/Avg Drawdown	0.9			

Image created from Know Your System software. Software not available for sale.

System 11-2: Results of Position Sizing Optimizer

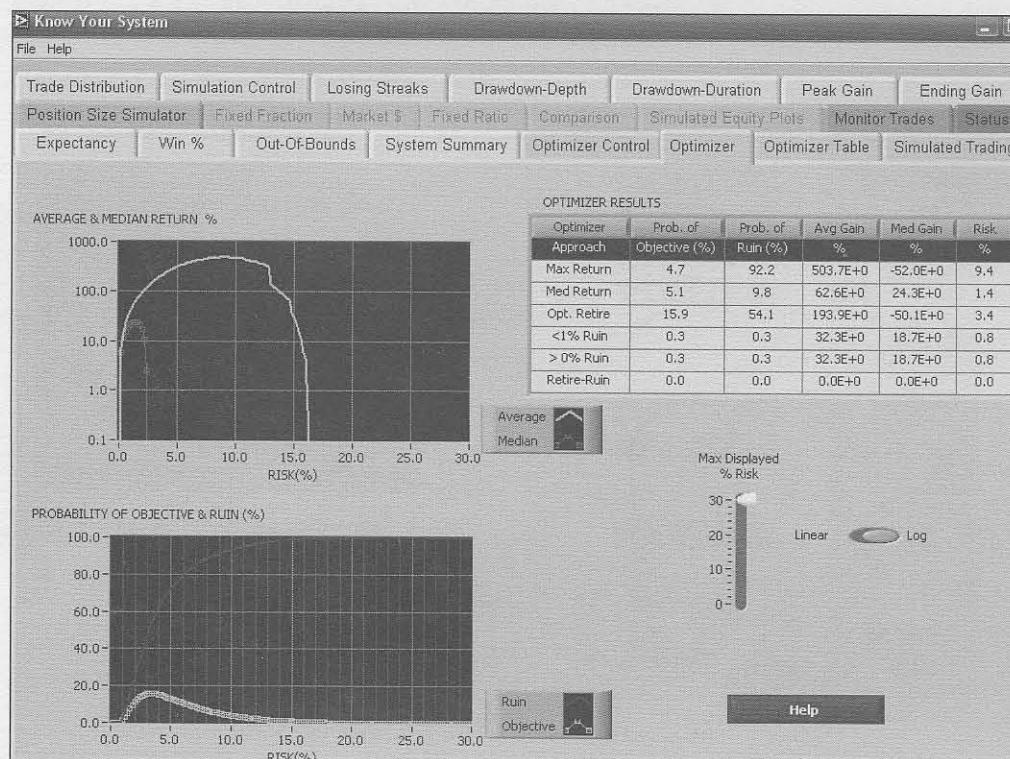


Image created from Know Your System software. Software not available for sale.

System 11-3: Expectancy and Standard Deviation



Image created from Know Your System software. Software not available for sale.

System 11-3: Summary Results

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	8.00			
Win/Loss Ratio	2.81			
Expectancy		-0.02	0.34	0.70
Win %		30.2	35.0	39.8
Loosing Streaks			9	
Drawdown(R)		-26.5	-18.7	-11.0
Peak Gain (R)		11.9	44.0	76.0
Ending Gain (R)		-1.8	34.4	70.5
Prob. Of Break Even or Higher (%)	82.8			
# Trades For Break Even (95%)	272			
95% Drawdown Duration (Months)	34.0			
Yearly Gain(R)	33.6			
Avg Yearly Gain/Avg Drawdown	1.8			

Image created from Know Your System software. Software not available for sale.

System 11-3: Results of Position Sizing Optimizer

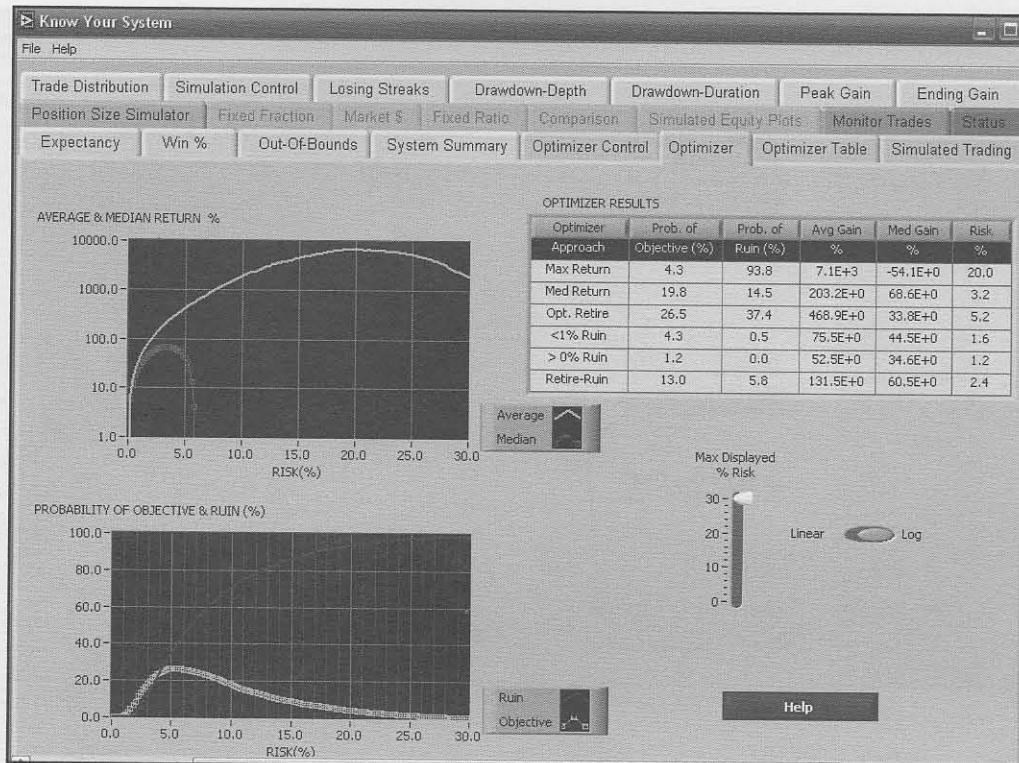


Image created from Know Your System software. Software not available for sale.

System 11-4: Expectancy and Standard Deviation

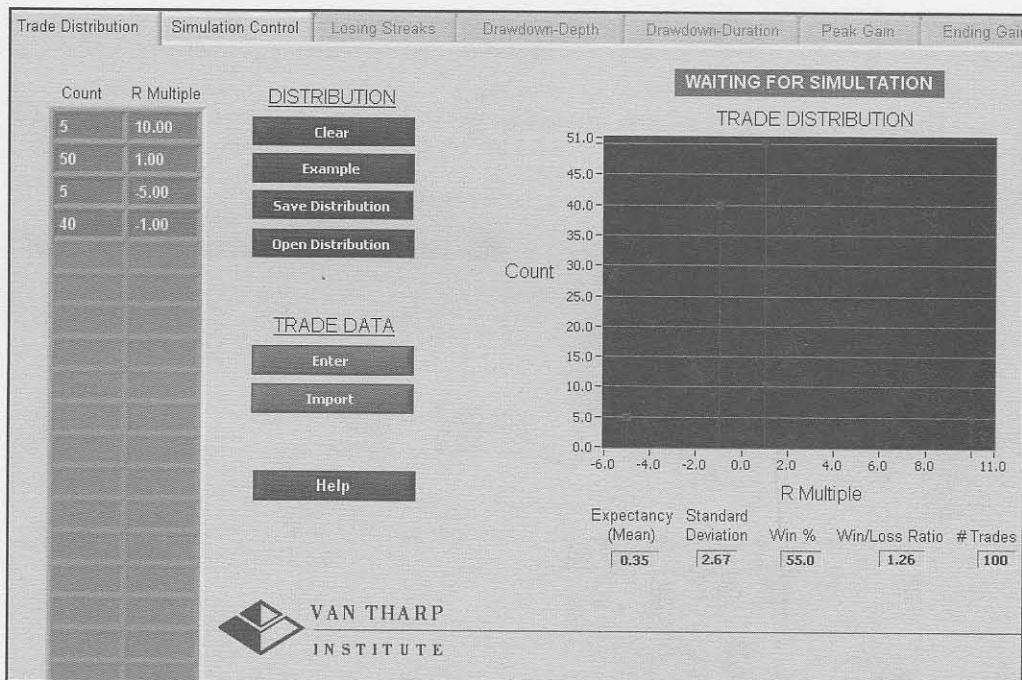


Image created from Know Your System software. Software not available for sale.

System 11-4: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	8.00			
Win/Loss Ratio	1.26			
Expectancy		0.09	0.36	0.63
Win %		50.0	55.0	59.9
Loosing Streaks			5	
Drawdown(R)		-22.9	-15.9	-9.0
Peak Gain (R)		18.3	42.1	65.9
Ending Gain (R)		8.8	35.7	62.5
Prob. Of Break Even or Higher (%)	91.9			
# Trades For Break Even (95%)	138			
95% Drawdown Duration (Months)	17.2			
Yearly Gain(R)	33.6			
Avg Yearly Gain/Avg Drawdown	2.1			

Image created from Know Your System software. Software not available for sale.

System 11-4: Results of Position Sizing Optimizer

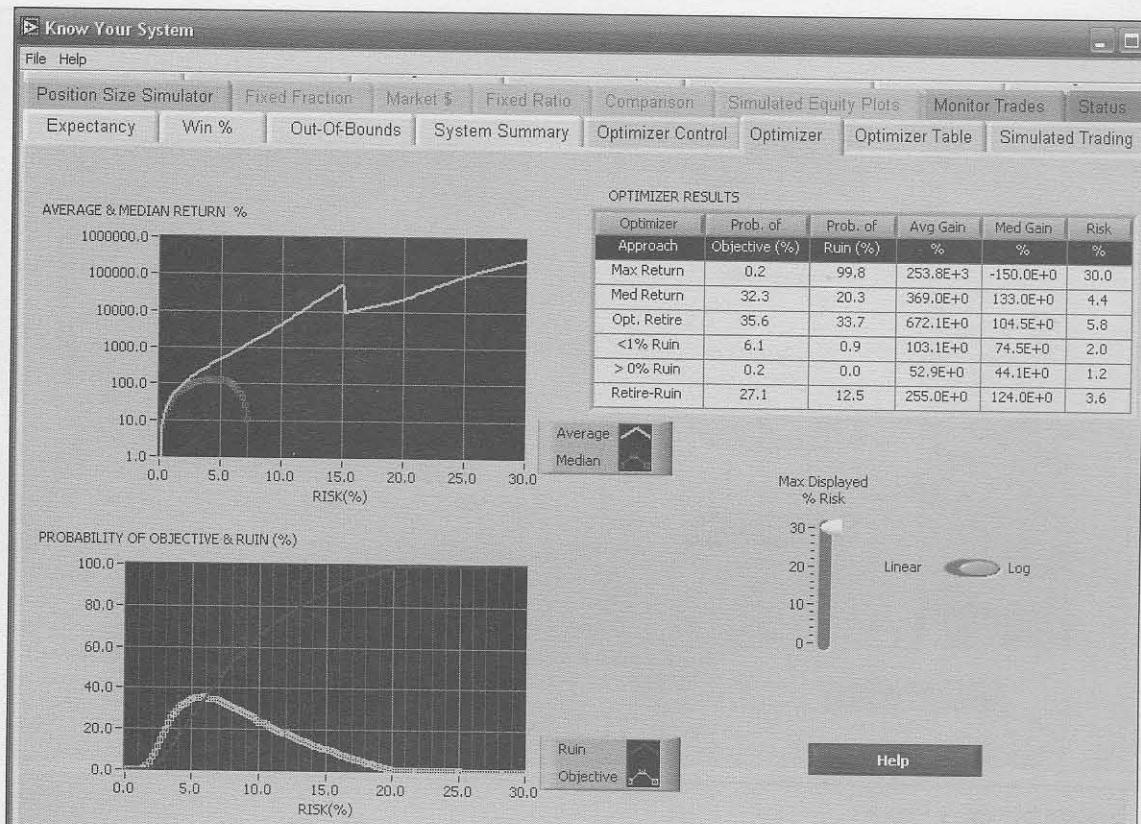


Image created from Know Your System software. Software not available for sale.

System 11-5: Expectancy and Standard Deviation

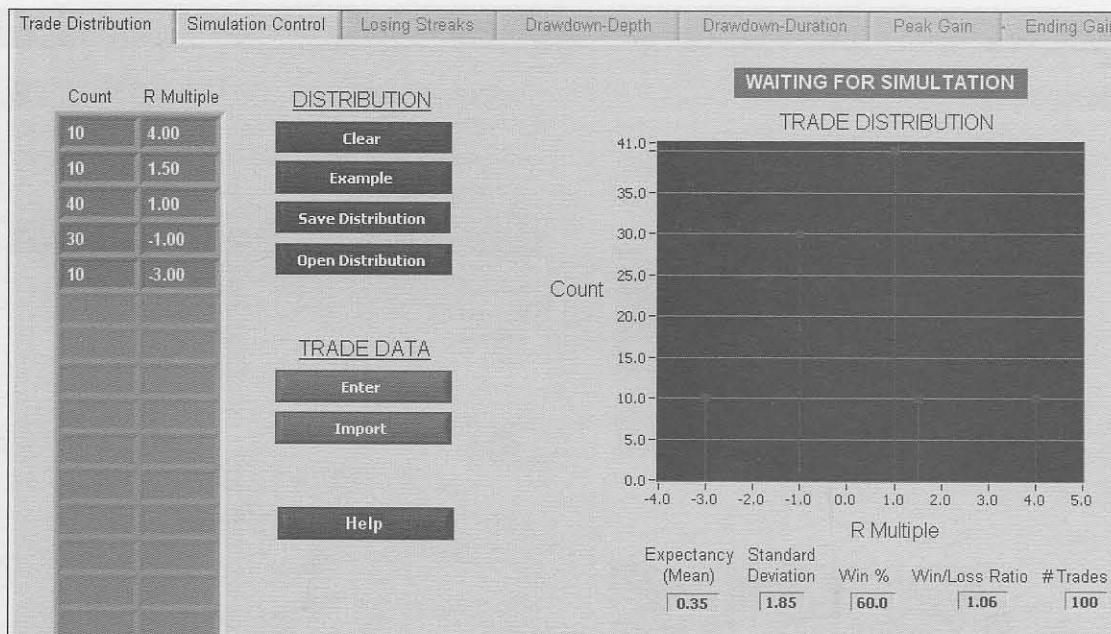


Image created from Know Your System software. Software not available for sale.

System 11-5: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	8.00			
Win/Loss Ratio	1.06			
Expectancy		0.17	0.35	0.53
Win %		55.1	60.0	64.9
Loosing Streaks			5	
Drawdown(R)		-15.7	-11.2	-6.8
Peak Gain (R)		21.9	38.5	55.0
Ending Gain (R)		16.6	34.8	53.0
Prob. Of Break Even or Higher (%)	97.6			
# Trades For Break Even (95%)	73			
95% Drawdown Duration (Months)	9.1			
Yearly Gain(R)	33.6			
Avg Yearly Gain/Avg Drawdown	3.0			

Image created from Know Your System software. Software not available for sale.

System 11-5: Results of Position Sizing Optimizer

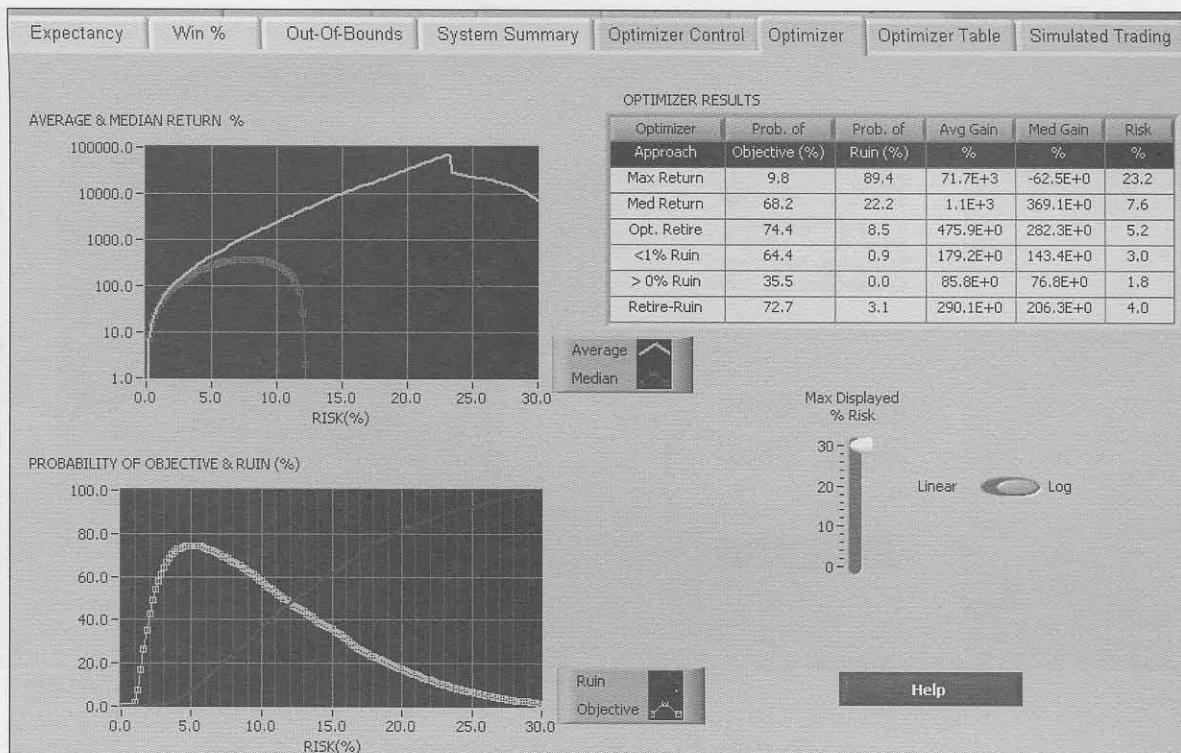


Image created from Know Your System software. Software not available for sale.

System 11-6: Expectancy and Standard Deviation



Image created from Know Your System software. Software not available for sale.

System 11-6: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	8.00			
Win/Loss Ratio	0.41			
Expectancy		0.19	0.35	0.51
Win %		76.0	80.0	84.0
Loosing Streaks			3	
Drawdown(R)		-15.4	-11.0	-6.6
Peak Gain (R)		23.7	38.4	53.1
Ending Gain (R)		19.1	35.2	51.3
Prob. Of Break Even or Higher (%)	98.4			
# Trades For Break Even (95%)	60			
95% Drawdown Duration (Months)	7.5			
Yearly Gain(R)	33.6			
Avg Yearly Gain/Avg Drawdown	3.0			

Image created from Know Your System software. Software not available for sale.

System 11-6: Results of Position Sizing Optimizer

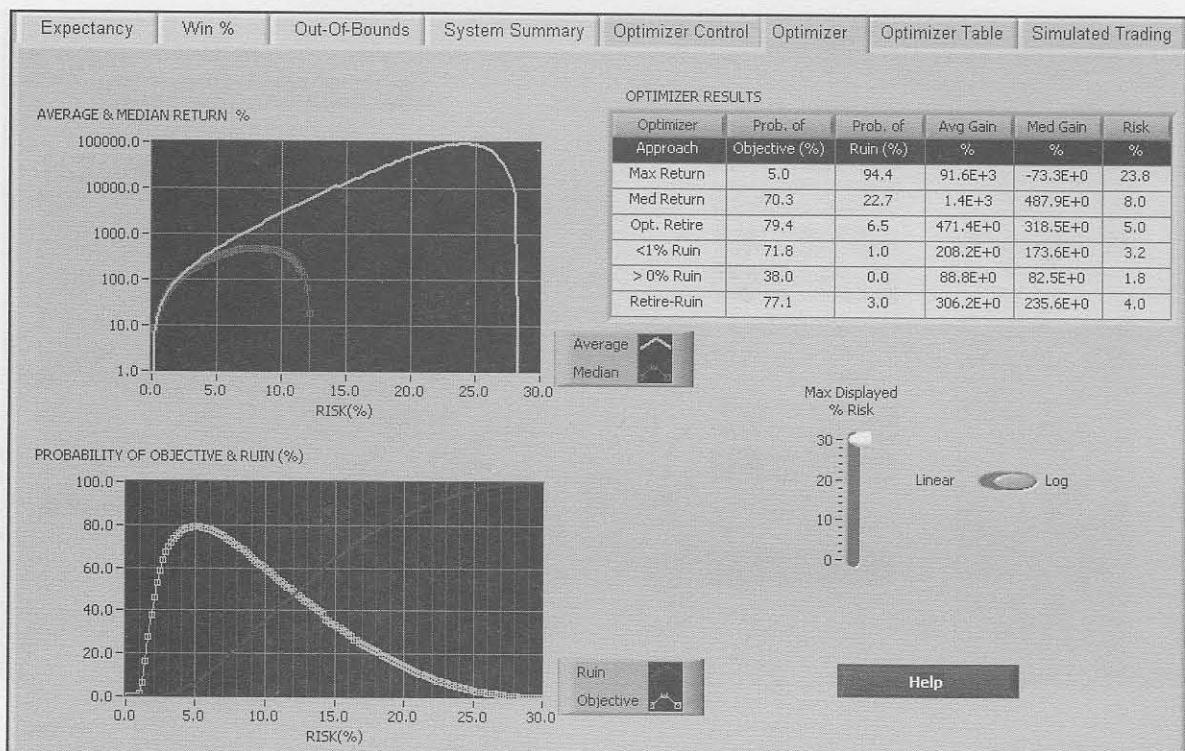


Image created from Know Your System software. Software not available for sale.

System 11-7: Expectancy and Standard Deviation

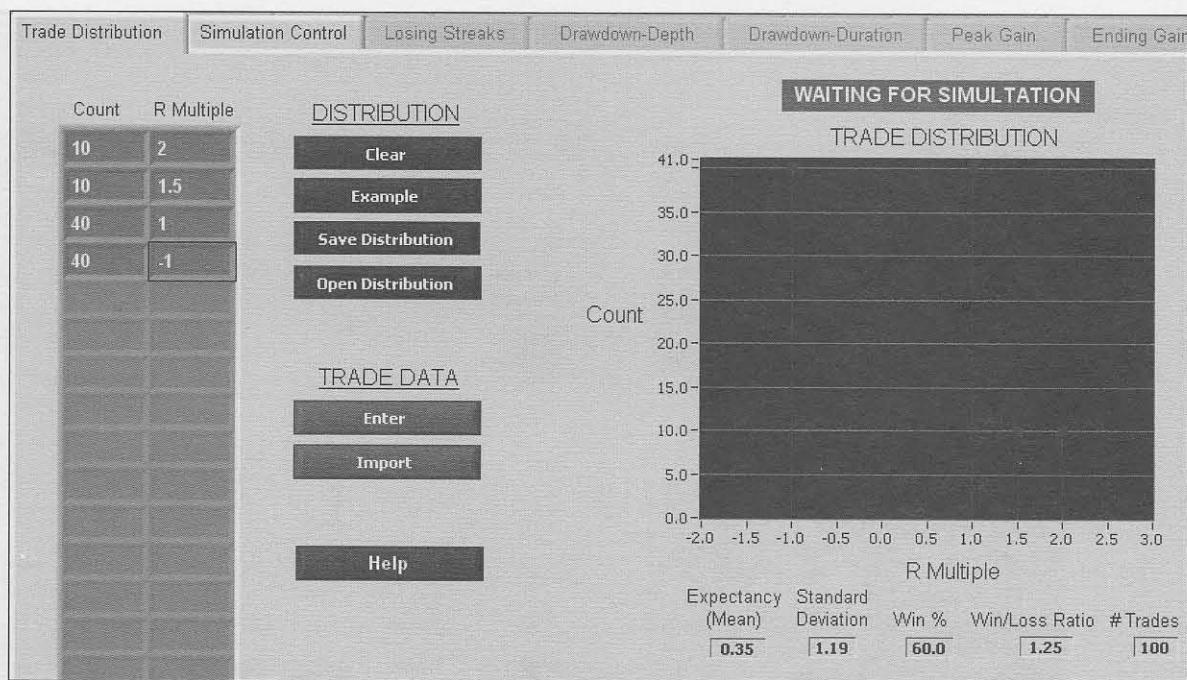


Image created from Know Your System software. Software not available for sale.

System 11-7: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	8.00			
Win/Loss Ratio	1.25			
Expectancy		0.24	0.35	0.46
Win %		55.1	60.0	64.9
Loosing Streaks			5	
Drawdown(R)		-7.7	-5.6	-3.6
Peak Gain (R)		25.6	36.4	47.2
Ending Gain (R)		23.7	35.0	46.3
Prob. Of Break Even or Higher (%)	100.0			
# Trades For Break Even (95%)	28			
95% Drawdown Duration (Months)	3.5			
Yearly Gain(R)	33.6			
Avg Yearly Gain/Avg Drawdown	5.9			

Image created from Know Your System software. Software not available for sale.

System 11-7: Results of Position Sizing Optimizer

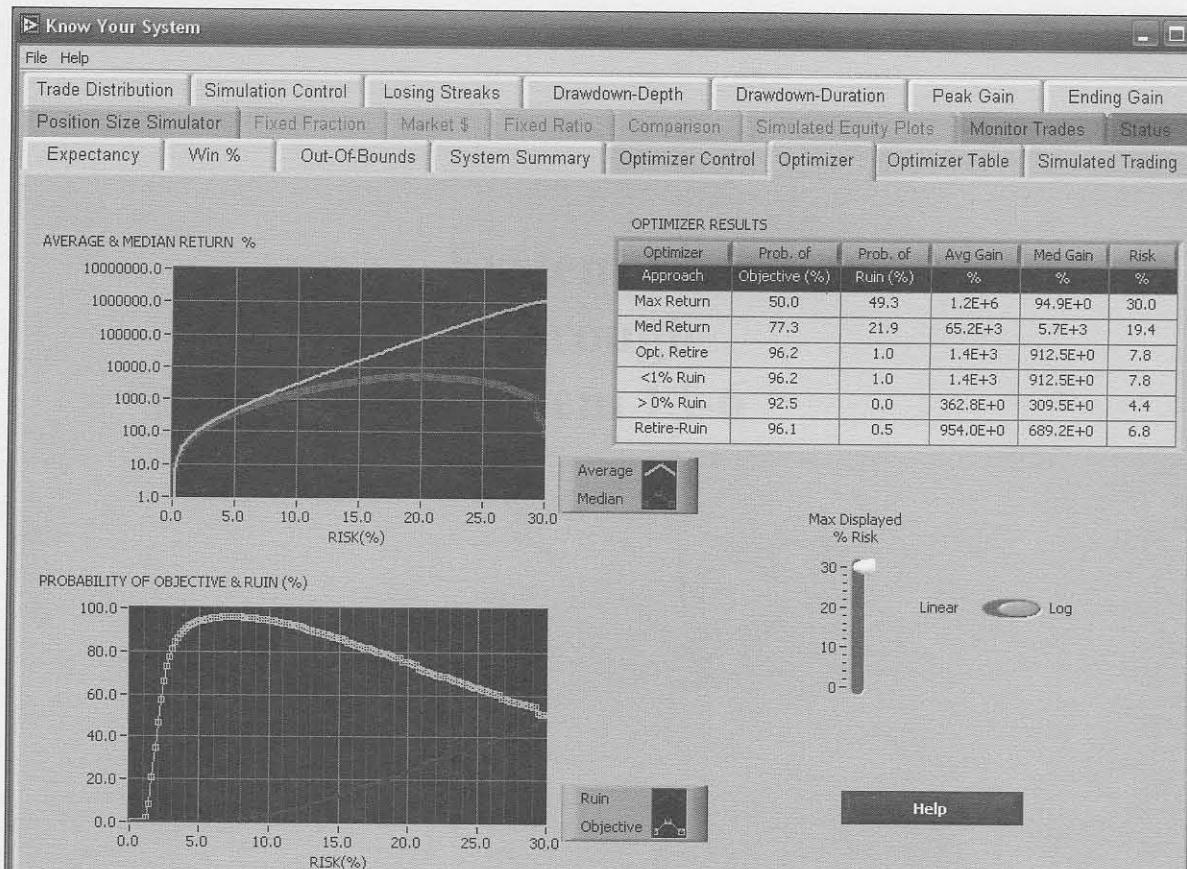


Image created from Know Your System software. Software not available for sale.

Appendix I

**System 13-1
through
System 13-6**

System 13-1: Expectancy and Standard Deviation

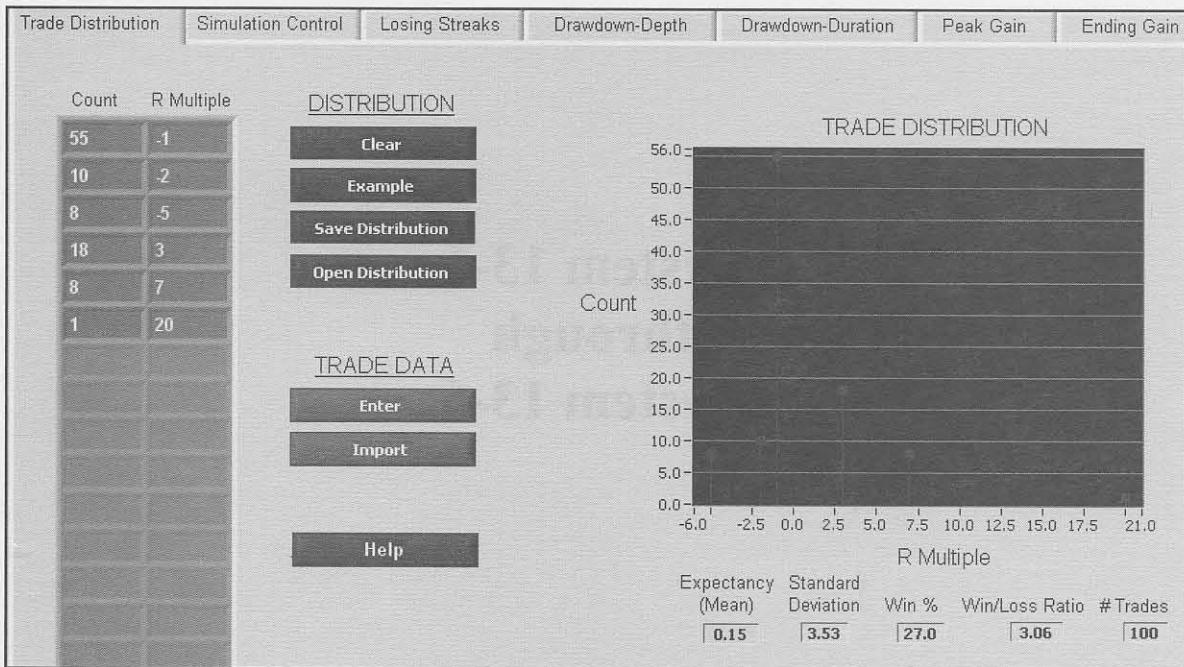


Image created from Know Your System software. Software not available for sale.

System 13-1: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	8.00			
Win/Loss Ratio	3.06			
Expectancy		-0.21	0.15	0.50
Win %		22.6	27.0	31.4
Loosing Streaks			12	
Drawdown(R)		-45.9	-32.0	-18.2
Peak Gain (R)		7.0	33.3	59.6
Ending Gain (R)		-20.9	14.5	49.9
Prob. Of Break Even or Higher (%)	65.5			
# Trades For Break Even (95%)	1512			
95% Drawdown Duration (Months)	189.0			
Yearly Gain(R)	14.4			
Avg Yearly Gain/Avg Drawdown	0.4			

Image created from Know Your System software. Software not available for sale.

System 13-1: Results of Position Sizing Optimizer

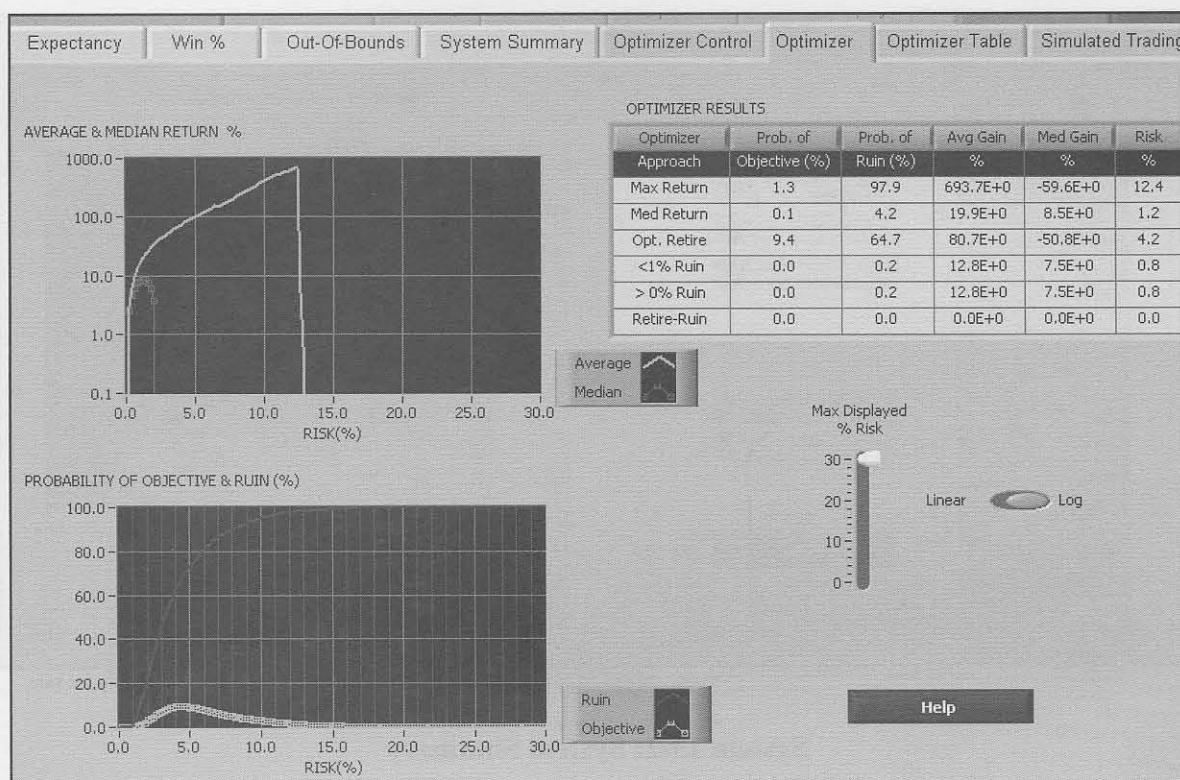


Image created from Know Your System software. Software not available for sale.

System 13-2: Expectancy and Standard Deviation

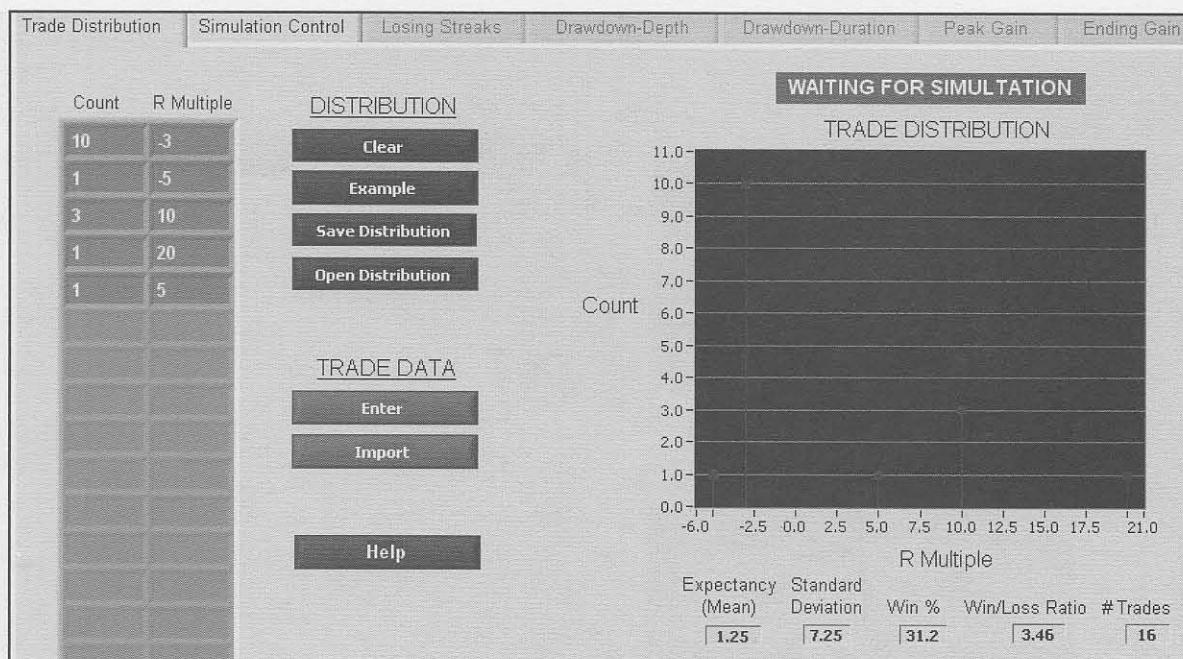


Image created from Know Your System software. Software not available for sale.

System 13-2: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100,00			
Avg # Trades Per Month	8.00			
Win/Loss Ratio	3.46			
Expectancy		0.54	1.26	1.98
Win %		26.6	31.3	35.9
Loosing Streaks			10	
Drawdown(R)		-57.2	-41.2	-25.2
Peak Gain (R)		75.0	140.6	206.2
Ending Gain (R)		53.9	125.8	197.6
Prob. Of Break Even or Higher (%)	96.4			
# Trades For Break Even (95%)	81			
95% Drawdown Duration (Months)	10.1			
Yearly Gain(R)	120.0			
Avg Yearly Gain/Avg Drawdown	2.9			

Image created from Know Your System software. Software not available for sale.

System 13-2: Results of Position Sizing Optimizer

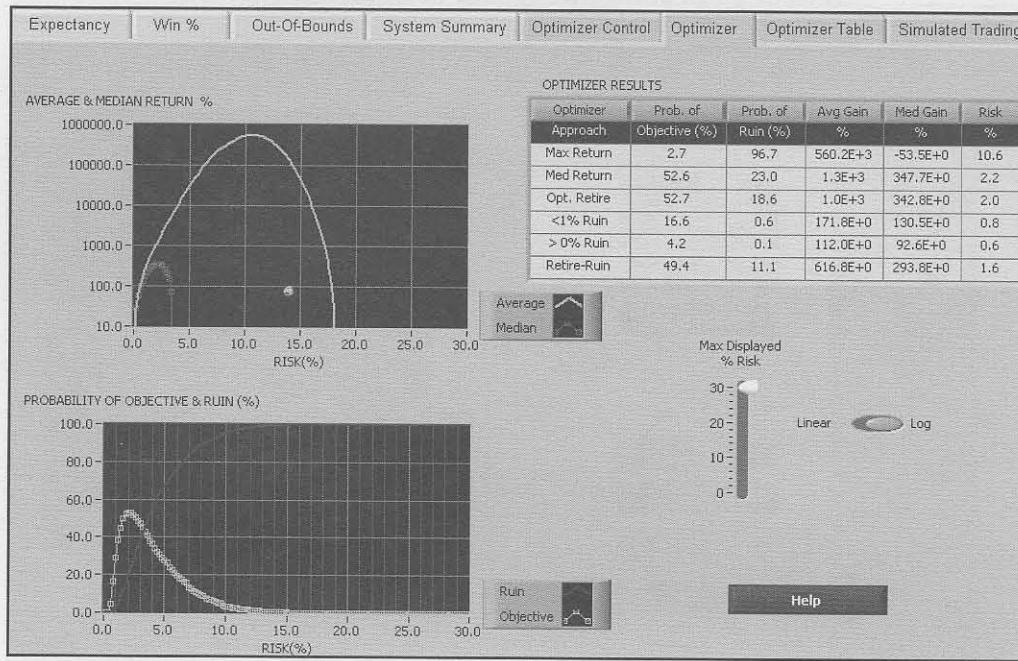


Image created from Know Your System software. Software not available for sale.

System 13-3: Expectancy and Standard Deviation

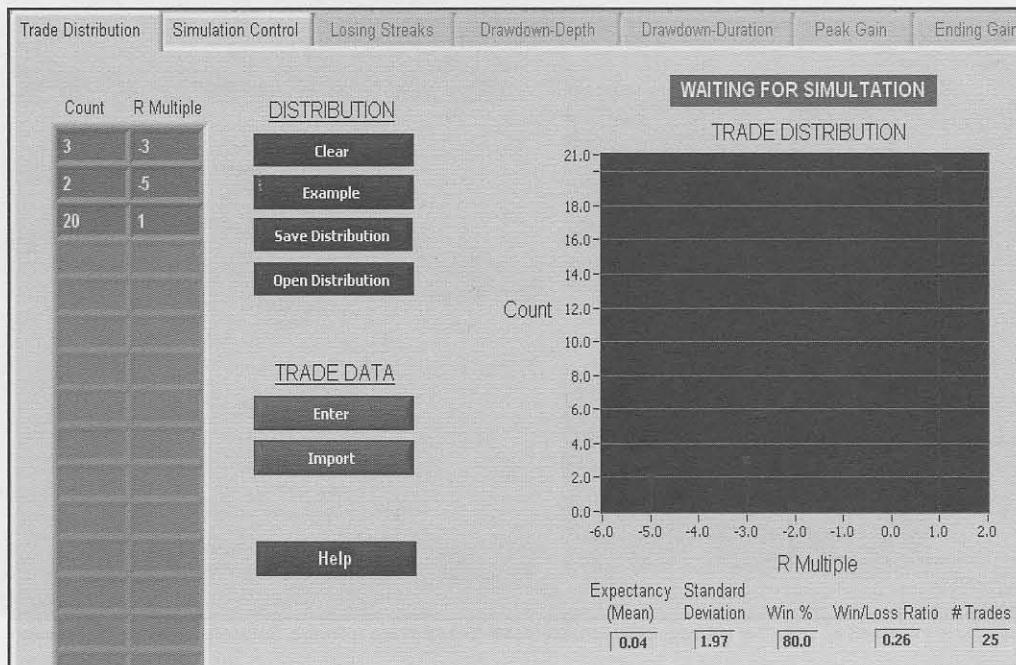


Image created from Know Your System software. Software not available for sale.

System 13-3: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	8.00			
Win/Loss Ratio	0.26			
Expectancy		-0.16	0.04	0.24
Win %		76.0	80.0	84.0
Loosing Streaks			3	
Drawdown(R)		-32.0	-21.8	-11.7
Peak Gain (R)		4.6	16.9	29.2
Ending Gain (R)		-16.0	3.9	23.7
Prob. Of Break Even or Higher (%)	60.6			
# Trades For Break Even (95%)	6603			
95% Drawdown Duration (Months)	825.4			
Yearly Gain(R)	3.8			
Avg Yearly Gain/Avg Drawdown	0.2			

Image created from Know Your System software. Software not available for sale.

System 13-3: Results of Position Sizing Optimizer

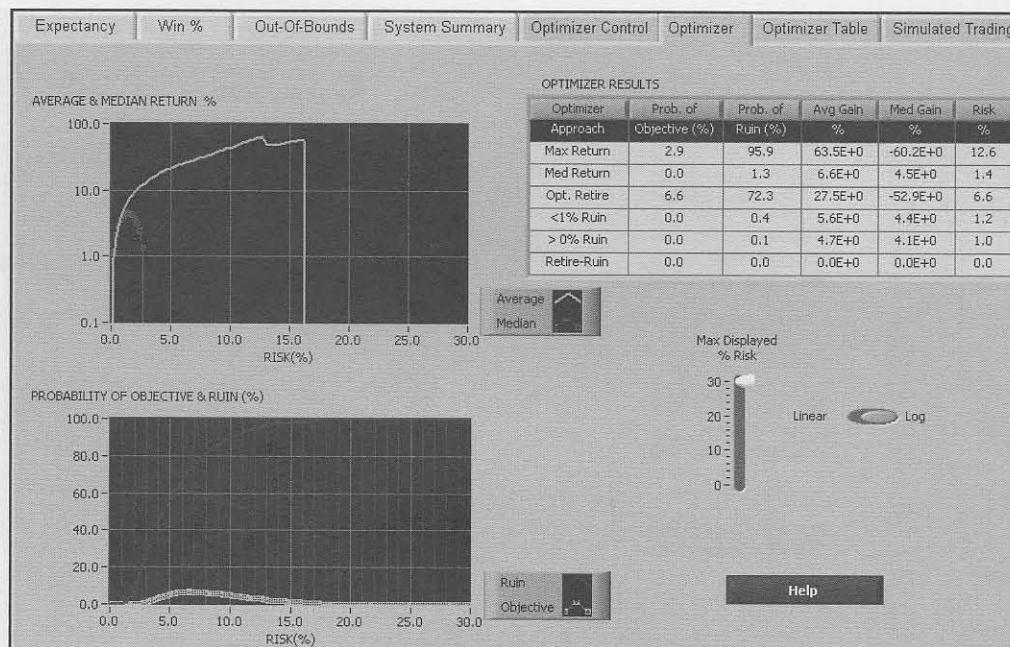


Image created from Know Your System software. Software not available for sale.

System 13-4: Expectancy and Standard Deviation

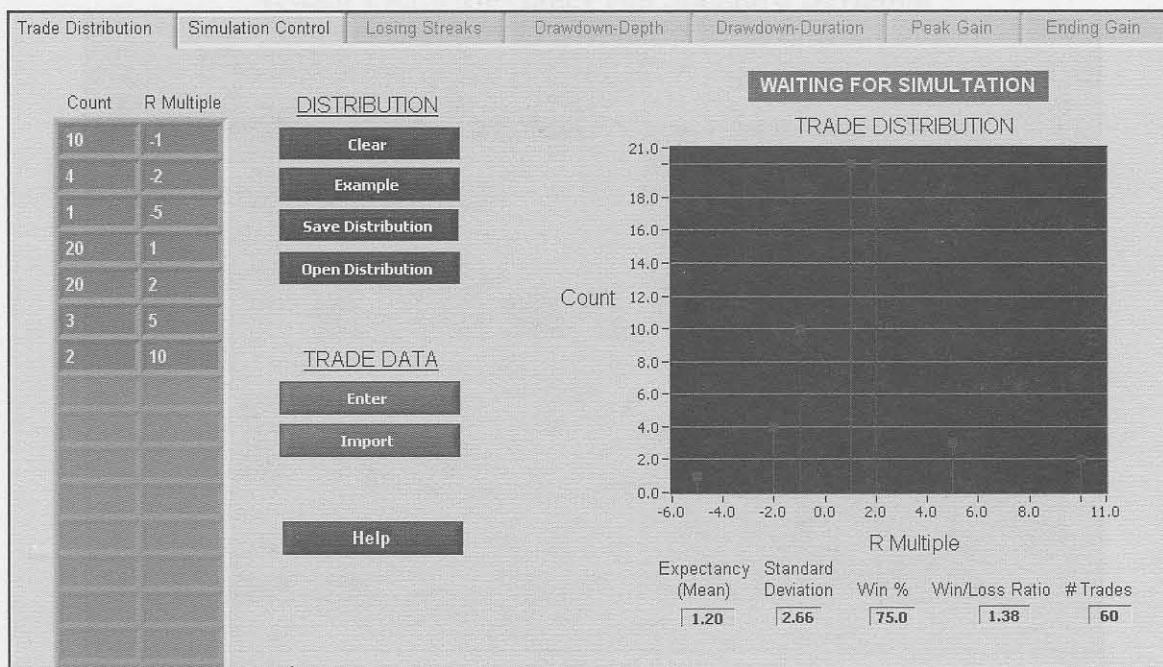


Image created from Know Your System software. Software not available for sale.

System 13-4: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	8.00			
Win/Loss Ratio	1.38			
Expectancy		0.96	1.20	1.44
Win %		70.7	75.0	79.4
Loosing Streaks			3	
Drawdown(R)		-9.1	-6.7	-4.3
Peak Gain (R)		97.5	121.1	144.7
Ending Gain (R)		96.5	120.2	144.0
Prob. Of Break Even or Higher (%)	100.0			
# Trades For Break Even (95%)	9			
95% Drawdown Duration (Months)	1.1			
Yearly Gain(R)	115.2			
Avg Yearly Gain/Avg Drawdown	17.3			

Image created from Know Your System software. Software not available for sale.

System 13-4: Results of Position Sizing Optimizer

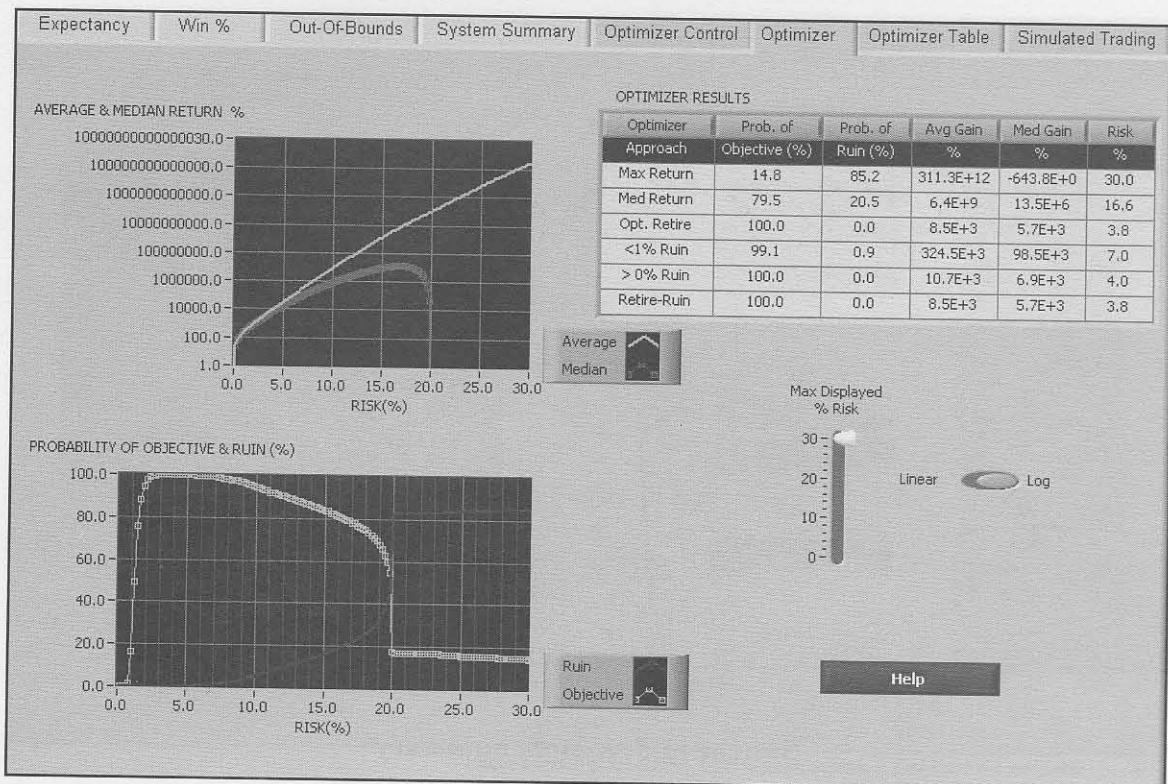


Image created from Know Your System software. Software not available for sale.

System 13-5: Expectancy and Standard Deviation



Image created from Know Your System software. Software not available for sale.

System 13-5: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	100.00			
Avg # Trades Per Month	8.00			
Win/Loss Ratio	0.27			
Expectancy		-0.28	-0.07	0.13
Win %		72.8	77.0	81.3
Loosing Streaks			3	
Drawdown(R)		-38.9	-26.6	-14.2
Peak Gain (R)		1.6	11.6	21.6
Ending Gain (R)		-27.5	-7.3	12.9
Prob. Of Break Even or Higher (%)	38.6			
# Trades For Break Even (95%)	1876			
95% Drawdown Duration (Months)	234.5			
Yearly Gain(R)	-7.4			
Avg Yearly Gain/Avg Drawdown	-0.3			

Image created from Know Your System software. Software not available for sale.

System 13-5: Results of Position Sizing Optimizer

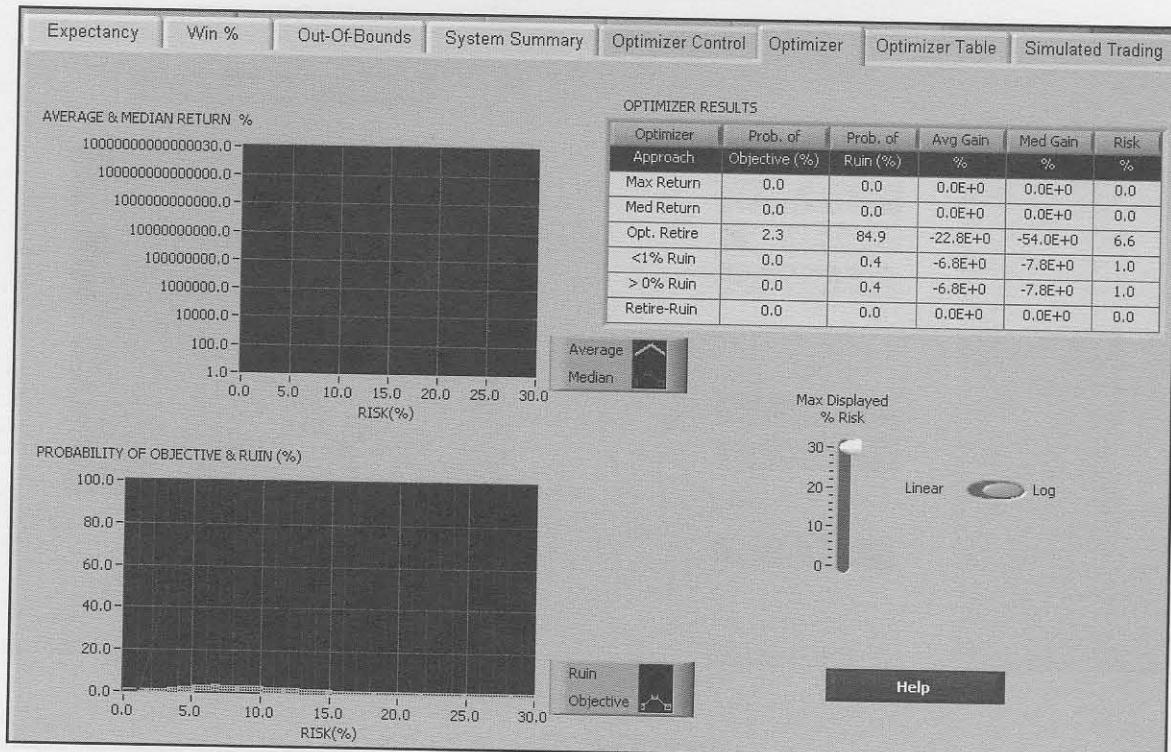


Image created from Know Your System software. Software not available for sale.

System 13-6: Expectancy and Standard Deviation

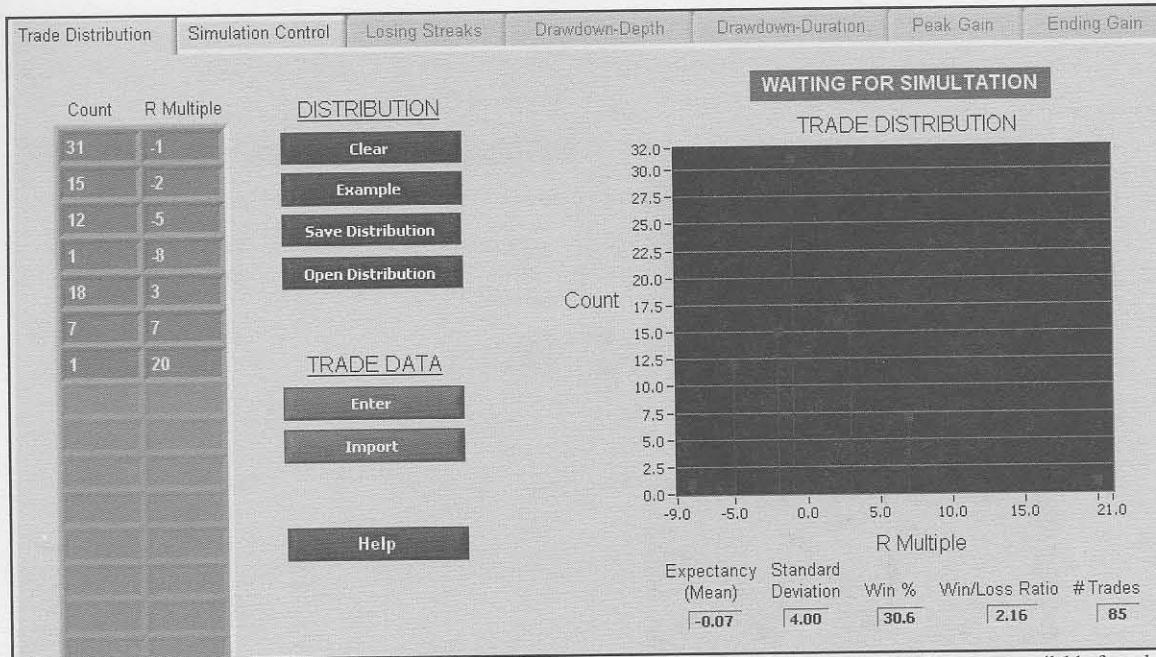


Image created from Know Your System software. Software not available for sale.

System 13-6: System Summary

System Summary Results				
TradeSim Variable	Value	Avg -Sigma	Avg	Avg +Sigma
# Trades	50.00			
Avg # Trades Per Month	10.00			
Win/Loss Ratio	2.16			
Expectancy		-0.64	-0.08	0.48
Win %		24.1	30.5	37.0
Loosing Streaks			8	
Drawdown(R)		-45.0	-31.3	-17.6
Peak Gain (R)		0.2	17.6	35.0
Ending Gain (R)		-31.8	-3.9	23.9
Prob. Of Break Even or Higher (%)	44.0			
# Trades For Break Even (95%)	8743			
95% Drawdown Duration (Months)	874.3			
Yearly Gain(R)	Not	Enough	Trades	
Avg Yearly Gain/Avg Drawdown	Not	Enough	Trades	

Image created from Know Your System software. Software not available for sale.

System 13-6: Results of Position Sizing Optimizer

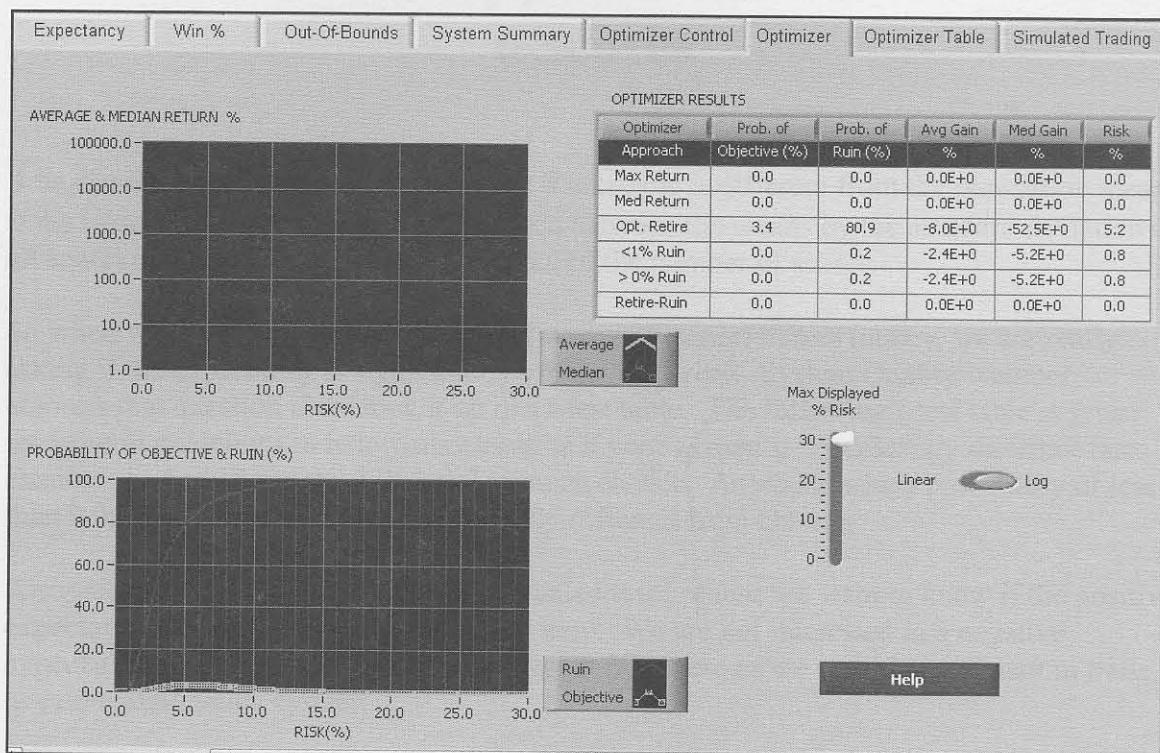


Image created from Know Your System software. Software not available for sale.

Appendix II

Appendix II

t-Scores

The classical statistical test to determine if a sample is different from the population mean is the t-test. Here you divide the difference between the means by the standard deviation of all scores and multiply it by the square root of the number of scores.

So when we are asking if an expectancy (average R score) makes money, we are really asking if the expectancy is significantly greater than zero. System Quality Number answers that question if we look it up in a t-test table. The following t-test table is given for general guidelines to help you determine if your system is significantly different from chance. And we'll use the 0.05 level to mean chance. Anything with a probability of less than 0.05% will be considered significantly different from chance.

Also this will be what is known as a one-tailed test because we want to know if the positive expectancy is significantly different from zero. We are not interested in a negative expectancy score that is significantly different from zero as we would never want to trade a negative expectancy system.

The following table will give you the guidelines you need to determine if your System Quality Number is significant. I've also added in the 0.25 level so that if your system isn't significantly different from zero at the 0.05 level, you can at least see where it is at.

Is Your System Going to Make Money? System t-score Test				
Number of Trades	.25 Level	.05 Level	.025 Level	.01 Level
10	0.703	1.833	2.262	2.821
15	0.692	1.761	2.145	2.624
20	0.688	1.729	2.093	2.539
25	0.685	1.711	2.064	2.492
30	0.683	1.699	2.045	2.462
41	0.681	1.684	2.021	2.423
61	0.679	1.671	2.000	2.390
121	0.677	1.658	1.980	2.358
Infinite	0.674	1.645	1.960	2.326

So let's say you have a sample of 100 trades with R-multiples. You plug the information into the formula and determine that your System Quality Number is 1.85. What can you say about it?

First, 100^1 trades isn't in the table, so let's use a lesser number, 61. Sixty-one trades at the 0.05 level has a t-score of 1.671 associated with it. Your number is bigger than that, so you can definitely say that it is significantly different from zero at the 0.05 level. However, at the 0.025 level, you need a score of 1.980 to be significant. Thus, your system is significant at the 0.05 level, but not at the 0.025 level. But remember I said that scores above 2.0 would be fairly rare.

Incidentally, the t-score assumes that you have a normal distribution in your sample. That assumption is not true for most systems, especially those that include some large R-multiples. Thus, the t-score is at best a rough estimate for you

¹ 61 trades have $(N-1)$ degrees of freedom, so you'd look up the number associated with 60 degrees of freedom. In our example, the number for 100 trades is the number associated with 99 degrees of freedom.

Glossary

algorithm A rule or set of rules for computing. A procedure for calculating a mathematical function.

anti-martingale strategy A position sizing strategy in which position size is increased when one wins and decreased when one loses.

asset allocation The procedure by which many professional traders decide how to allocate their capital. Due to the lotto bias, many people think of this as a decision about which asset class (such as energy stocks or gold) to select. However, its real power comes when people use it to tell them “how much” to invest in each asset class. Thus, it is really another term for position sizing.

average true range (ATR) The average over the last X days of the true range, which is the largest of the following: (1) the distance between today’s high and today’s low, (2) the distance between today’s high and yesterday’s close, or (3) the distance between today’s low and yesterday’s close.

backtesting The process of testing a trading strategy on prior time periods, usually with just one instrument at a time. Instead of applying a strategy to a future time period, which could take years, a trader can do a simulation of his or her trading strategy on relevant past data in order to gauge its effectiveness. Most technical analysis strategies are tested with this approach.

band trading A style of trading in which the instrument being traded is thought to move in a range of price. When the price gets too high (i.e., overbought), you can assume that it will go down. When the price gets too low (i.e., oversold), you can assume that it will probably move up.

bearish Of the opinion that the market will be going down in the future.

best-case example A situation that represents the best of possible outcomes. Many books show you illustrations of their key points about the market (or indicator) that appear to perfectly predict the market. However, most examples of these points are not nearly as good as the one that is selected, which is known as a “best-case example.”

bias The tendency to move in a particular direction. This could be a market bias, but most of the biases discussed in this book are psychological biases.

breakout A move up or down from a consolidation or band of sideways movement.

bullish Of the opinion that the market will be going up in the future.

call option The right to buy the underlying instrument at a particular price until the expiration date. It is a right to buy, but not an obligation.

capitalization The amount of money in the underlying stock of a company.

commissions Fees that you pay a broker to trade in the market.

commodities Physical products that are traded at a futures exchange. Examples of such products are grains, foods, meats, and metals.

congestive range See *consolidation*.

consolidation A pause in the market during which prices move in a limited range and do not seem to trend.

contract A single unit of a commodity or future. For example, a single unit or contract of corn is 5,000 bushels. A single unit of gold is 100 ounces.

core equity One of the three ways of measuring your equity. In this particular case, you subtract the allocation of each position and assume that it is gone until the position is closed. What remains, upon which to base your position sizing for other positions, is your core equity.

dampening factor A term developed by Ryan Jones for describing how to lower your position sizing after losses. It refers to a number whereby you move delta down at a faster rate than you moved it up. (See *delta*).

delta In fixed ratio position sizing, delta refers to the factor by which you determine how you add bigger positions. In fixed ratio position sizing one increases a position size by one unit as a function of some fixed ratio of the account, which Ryan Jones calls *delta*.

delta down Delta can be used to both increase and decrease position sizing with fixed ratio position sizing. Refers to decreasing the position sizing based upon a fixed ratio of the account called delta.

delta up Delta can be used to both increase and decrease position sizing with fixed ratio position sizing. Refers to increasing the position sizing based upon a fixed ratio of the account called delta.

disaster stop A stop-loss order to determine your worst-case loss in a position. See *stop-loss order*.

discretionary trading Trading that depends on the instincts of the trader as opposed to a systematic approach. The best discretionary traders are those who develop a systematic approach and then use discretion in their exits and position sizing to improve their performance.

diversification Investing in independent markets to reduce the overall risk.

down-quiet One of the six types of markets in which the price is going down, and the market shows little day-to-day movement.

down-volatile One of the six types of markets in which the price is going down, but the market shows a lot of up and down movement, as opposed to a down-quiet market.

drawdown A decrease in the value of your account because of losing trades or because of “paper losses” that may occur simply because of a decline in value of open positions.

entry That part of your system that signals how or when you should enter the market.

equal units model A position sizing model in which you purchase an equal dollar amount of each position.

equities Stocks secured by ownership in the company.

equity The value of your account.

equity crossover A form of position sizing in which the position sizing changes based upon your equity moving above or below some average.

equity curve The value of your account over time, illustrated in a graph.

equity model The method you use to determine your equity in anti-martingale position sizing. Three such methods are presented in this book: total equity, core equity, and reduced total equity.

exit That part of your trading system that tells you how or when to exit the market.

expectancy How much you can expect to make on average over many trades. Expectancy is best stated in terms of how much you can make per dollar you risk. Expectancy is the mean R of an R -multiple distribution generated by a trading system.

expectunity A term used in this book to express expectancy multiplied by opportunity. For example, a trading system that has an expectancy of $0.6R$ and produces 100 trades per year will have an *expectunity* of $60R$.

false positive Something that makes an erroneous prediction.

fixed ratio position sizing A method in which position sizing is altered to some ratio of your account, called delta, rather than some percentage of your account.

floor trader A person who trades on the floor of a commodities exchange. Locals tend to trade their own account, while pit brokers tend to trade for a brokerage company or a large firm.

forex The foreign exchange. A huge market in foreign currencies made by large banks worldwide. Today there are also much smaller companies that allow you to trade forex, but they take the side of the bid-ask spread opposite from you.

futures A contract obligating its holder to buy a specified asset at a particular time and price. When commodity exchanges added stock index contracts and currency contracts, the term *futures* was developed to be more inclusive of these assets.

gambler's fallacy The belief that a loss is due to occur after a string of winners and/or that a gain is due to occur after a string of losers.

gap An area on a price chart in which there are no trades. Normally this occurs between the close of the market on one day and the open of the market on the next day. Lots of things can cause this, such as an earnings report coming out after the stock market has closed for the day.

generalized ratio position sizing In this method you simply adjust the speed at which position sizing increases with FRPS.

group heat Each group, be it a sector of stocks or a grouping of commodities, will tend to move together. Thus, it is important to control the total open risk in any one group, known as the group heat.

gunslinger Someone who makes high-risk trades or investments.

hit rate The percentage of winners you have in your trading or investing. Also known as the *reliability of your system*.

holy grail system A mythical trading system that perfectly follows the market and is always right, producing large gains and zero drawdowns. No such system exists, but the real meaning of the Holy Grail is right on track: it suggests that the secret is inside you.

indicator A summary of data presented in a supposedly meaningful way to help traders and investors make decisions.

initial risk The difference between your stop level and your entry price when you open a position in the market. It is usually referred to as R in this book.

investing A buy-and-hold strategy that most people follow. If you are in and out frequently or you are willing to go both long and short, then you are trading.

judgmental heuristics Shortcuts that the human mind uses to make decisions. These shortcuts make decision making quick and comprehensive, but they lead to biases in decision making that often cause people to lose money.

leverage The relationship between the amount of money one needs to put up to own something and its underlying value. High leverage, which occurs when a small deposit controls a large investment, increases the potential size of profits and losses as a percentage of equity.

limit move A change in price that reaches the limit set by the exchange in which the contract is traded. Trading usually is halted when a limit move is reached.

limit order An order to your broker in which you specify a limit to the price of the instrument. If your broker cannot get this price or better, the order is not executed.

liquidity The ease and availability of trading in an underlying stock or futures contract. When the volume of trading is high, there is usually a lot of liquidity.

long Owning a tradable item in anticipation of a future price increase. Also see *short*.

low-risk idea An idea that has a positive expectancy and is traded at a risk level that allows for the worst possible situation in the short term so that one can realize the long-term expectancy.

margin The percentage of the total price of something that an exchange requires you to have in order to open and hold a position in the market. It is usually set by the exchange that controls the trading of that particular market.

marked to market Open positions that are credited or debited funds based on the closing price of that open position during the day. If you have an open position, it's considered to be worth whatever the closing price is at the end of the day.

market maker A broker, bank, firm, or individual trader that makes a two-way price to either buy or sell a security, currency, or futures contract.

market order An order to buy or sell at the current market price. Market orders are usually executed quickly, but not necessarily at the best possible price.

market's money A form of position sizing in which your core equity is sized at a conservative level while profits (market's money) are sized at a more aggressive level. In other words, market's money refers to your profits in the market.

martingale strategy A position sizing strategy in which the position size increases after you lose money. The classic martingale strategy is where you double your bet size after each loss.

maximum adverse excursion (MAE) The maximum loss attributable to price movement against the position during the life of a particular trade.

maximum/minimum ending equity When you simulate a position sizing strategy, two of the data points that you probably will keep track of are the minimum and maximum amounts of money that you have in your account at the end of each run of the simulation. When the simulation is complete, the maximum and minimum from all of the simulations is known as the maximum and minimum ending equity, respectively.

maximum mean return When you do a number of simulations, you want to know the mean (average) return of each simulation. The largest of these is known as the maximum mean return.

maximum median return. When you do a number of simulations, you want to know the median (half are above and half are below) return of each simulation. The largest of these is known as the maximum median return.

mean The average or the sum of all of the numbers divided by the total number of numbers.

mechanical trading A form of trading in which all actions are determined by a computer with no additional human decision making.

median The middle point of a sequence of numbers arranged in sequence. In other words, half the numbers are above the median and half the numbers are below it.

modeling The process of determining how some form of peak performance (such as top trading) is accomplished and then passing that knowledge on to others.

money management A term that has been frequently used to describe position sizing but that has so many other connotations that people fail to understand its full meaning or importance. For example, the term also refers to (1) managing other people's money, (2) controlling risk, (3) managing one's personal finances, and (4) achieving maximum gain.

monte carlo simulation A simulation that determines the probability of trading results based on multiple trials.

moving average A method of representing a number of price bars (that is, showing the high, low, open, and close in a specific period of time) by a single average of all the price bars. When a new bar occurs, that new bar is added, the last bar is removed, and a new average is then calculated.

multiple-tier position sizing Changing the value of your position sizing variable multiple times when some performance criterion is met.

negative expectancy system A system in which you will never make money over the long term. For example, all casino games are designed to be negative expectancy games. Negative expectancy systems also include some highly reliable systems (that is, those with a high hit rate) that tend to have occasional large losses.

objectives What you wish to accomplish as a trader with your account or your system. Objectives can be stated in terms of the desired goal, the worst-case drawdown to be avoided, or some combination of the two. There are many ways of thinking about objectives, probably as many ways as there are traders. The purpose of position sizing is to help you meet your objectives.

open position value The price of an open position multiplied by the current number of units that you own.

open risk The difference between the current price and the value of the stop for all positions that you have open in the market. It's another word for portfolio heat.

opportunity See *trade opportunity*.

optimal *f* A method for determining position sizing developed by Ralph Vince that depends upon the worst-case loss you have experienced to date. The method uses iteration to determine position sizing.

optimal position size The best position sizing method to achieve your objectives.

optimal target risk percentage The optimal portfolio heat divided by the number of trades you're likely to have on.

optimal retire The position sizing percentage that gives you the largest probability of reaching your stated goal.

optimize To find those parameters and indicators that best predict price changes in historical data. A highly optimized system usually does a poor job of predicting future prices.

option The right to buy or sell an underlying asset at a fixed price up to some specified date in the future. The right to buy is a *call option*, and the right to sell is a *put option*.

parabolic An indicator that has a U-shaped function, similar to a parabola. Because it rises at an increasing rate over time, it is sometimes used as a trailing stop that tends to keep one from giving back much profit. In addition, a market is said to be parabolic when it starts rising almost vertically as many high-tech stocks did in 1999, sometimes doubling each month.

paradigm shift A change from one way of thinking to another. It's a revolution, a transformation, a sort of metamorphosis. It does not just happen, but rather it is driven by agents of change.

peak-to-trough drawdown Maximum drawdown from the highest equity peak to the lowest equity trough prior to reaching a new equity high.

percent margin model A position sizing strategy that is based upon the margin set by the exchange in order to determine your position sizing.

percent risk model A position sizing model in which position sizing is determined by limiting the risk on the position to a certain percentage of your equity.

percent volatility model A position sizing model in which position sizing is determined by limiting the amount of volatility (which is usually defined by the average true range) in a position to a certain percentage of your equity.

portfolio heat The total open risk in your portfolio at any given time. This generally should not exceed 20%.

position sizing The most important of the six key elements of successful trading. This term, coined by Dr. Tharp in *Trade Your Way to Financial Freedom*, refers to the part of your system that really determines whether or not you'll meet your objectives. This element determines how large a position you will have throughout the course of a trade. In most cases, algorithms that work for determining position size are based on one's current equity.

positive expectancy A system (or game) that will make money over the long term if played at a risk level that is sufficiently low. It also means that the mean of a distribution of R-multiples is a positive number.

postdictive error An error that is made when you take into account future data that you should not know. For example, if you buy on the open each day, based on knowing that the closing price is up, you will have the potential for a great system, but only because you are making a postdictive error.

prediction A guess about the future. Most people want to make money through guessing future outcomes. Analysts are employed to predict prices. However, great traders make money by “cutting losses short and letting profits run,” which has nothing to do with prediction.

price/earnings (P/E) ratio The ratio of the price of a stock to its earnings. For example, if a \$20 stock earns \$1 per share each year, it has a price/earnings ratio of 20. The average P/E of the S&P 500 over the last 100 years has been about 17.

psychological loss A loss as a result of your natural biases and psychology (usually larger than 1R).

put option The right to sell the underlying instrument at a predetermined price up to a specific expiration date. It is the right to sell, but not the obligation.

R-multiple Expression of trading results in terms of the initial risk. All profits and losses can be expressed as a multiple of the initial risk (R) taken. For example, 10R is a profit that is 10 times the initial risk. Thus, if your initial risk is \$10, then a \$100 profit would be a 10R profit. When you do this, any system can then be described by the R-multiple distribution that it generates. That distribution will have a mean (expectancy) and standard deviation that will characterize it.

R-value The initial risk taken in a given position, as defined by one’s initial stop loss.

random An event determined by chance. In mathematics, a number that cannot be predicted.

reduced total equity One of the three equity models. In this case, you subtract out any allocation that you make for new positions, but when you raise your stops, you add back any amount that would be saved by raising your stops. The resulting number is your reduced total equity, which is then used to determine position sizing.

reliability How accurate something is or how often it wins. Thus, “60 percent reliability” means that something wins 60 percent of the time.

resistance An area on a chart up to which a stock can trade but cannot seem to exceed for a certain period of time.

retire Determines the trading goal (i.e., the retire amount).

retire-less-ruin. The probability of reaching our goal less the probability of having our worse case drawdown.

retracement A price movement in the opposite direction of the previous trend, usually a price correction.

reward-to-risk ratio The average return on an account (on a yearly basis) divided by the maximum peak-to-trough drawdown. Any reward-to-risk ratio over 3 that is determined by this method is excellent. It also might refer to the size of the average winning trade divided by the size of the average losing trade.

risk The difference in price between the entry point in a position and the worst-case loss that one is willing to take in that position. For example, if you buy a stock at \$20 and decide to get out if it drops to \$18, then your risk is \$2 per share. Note that this definition is much different than the typical academic definition of *risk* as the variability of the market in which you are investing.

rollovers Moving a futures contract into the next most liquid trading month when the contract expires.

round trip The process of both getting into and exiting a futures contract. Futures commissions are usually based on a round trip as opposed to being based on charges for both getting in and getting out.

ruin The amount of drawdown in your account at which you would stop trading.

scaling-in A form of position sizing in which you keep adding to the position size based upon certain pre-determined criteria until you reach some maximum level.

scaling-out A form of position sizing in which you reduce your size when the open risk or open volatility exceeds a pre-determined level. The purpose is to maintain a constant risk, or volatility, in your account.

Sharpe ratio A ratio developed by Nobel Laureate William F. Sharpe to measure risk-adjusted performance. It is calculated by subtracting the risk-free rate from the rate of return for a portfolio and dividing the result by the standard deviation of the portfolio returns.

short Not actually owning an item that you are selling. If you were using this strategy, you would sell an item in order to be able to buy it later at a lower price. When you sell an item before you have actually bought it, you are said to be *shorting* the market.

sideways-quiet One of the six types of markets in which the price moves very little over time and the market also shows little day-to-day movement.

sideways-volatile One of the six types of markets in which the price moves very little over time, but the market shows a lot of day-to-day movement.

slippage The difference in price between what you expect to pay when you enter the market and what you actually pay. For example, if you attempted to buy at 15 and you end up buying at 15.5, then you have a half point of slippage.

specialist A floor trader assigned to fill orders in a specific stock when the order has no offsetting order from off the floor.

speculating Investing in markets that are considered to be very volatile and thus quite “risky” in the academic sense of the word.

standard deviation The positive square root of the expected value of the square of the difference between some random variable and its mean. A measure of variability that has been expressed in a normalized form.

step up/step down function A mathematical function that has a fixed way to move up or move down in value.

stop (stop loss, stop order) An order that turns into a market order if the price hits the stop point. It's typically called a *stop* (or *stop-loss order*) because most traders use it to make sure they sell an open position before it gets away from them. It typically will stop a loss from getting too big. However, since it turns into a market order when the stop price is hit, you are not guaranteed that you'll get that price. It might be much worse. Most electronic brokerage systems will allow you to put a stop order into their computer. The computer then sends it out as a market order when that price is hit. Thus, it does not go into the market where everyone might see it and look for it.

support The price level that, historically, a stock has had difficulty falling below. It is the area on the chart at which buyers seem to come into the market.

swing trading Short-term trading designed to capture quick moves in the market.

system A set of rules for trading. A complete system will typically have (1) some setup conditions, (2) an entry signal, (3) a worst-case disaster stop loss to preserve capital, (4) a profit-taking exit, and (5) a position sizing algorithm. However, many commercially available systems do not meet all of these criteria. A trading system might also be described by the R-multiple distribution it generates.

system quality number (SQN) A method used in this book to determine the quality of a system. It is based upon the statistical t-score. The System Quality Number is also used as a basis for determining how to position size to meet your objectives.

tick A minimum fluctuation in the price of a tradable item.

total equity One of the three equity models that determines the value of your account by your cash and the total value of your open positions in the market.

trade distribution The manner in which winning and losing trades are achieved over time. It will show the winning streaks and the losing streaks.

trade opportunity One of the six keys to profitable trading. It refers to how often a system will open a position in the market.

trading Opening a position in the market, either long or short, with the expectation of either closing it out at a substantial profit or cutting losses short if the trade does not work out.

trading cost The cost of trading, which typically includes brokerage commissions and slippage, plus the market maker's cost.

trailing stop A stop-loss order that moves with the prevailing trend of the market. This is typically used as a way of exiting profitable trades. The stop is only moved when the market goes in your favor. It is never moved in the opposite direction.

trend following The systematic process of capturing extreme moves in the market with the idea of staying in the market as long as the market continues its move.

two-tier position sizing Position sizing that starts at some level and then moves to another level when some predetermined criteria are met.

units per fixed amount of money model A position sizing model in which you typically buy one unit of everything per so much money in your account. For example, you might buy one unit (i.e., 100 shares or one contract) per \$25,000.

up-quiet One of the six kinds of markets in which the price is moving up, but the day-to-day activity of the market is not active.

up-volatile One of the six kinds of markets in which the price is moving up, and the day-to-day activity of the market is fairly active.

validity How "real" something is. Does it measure what it is supposed to measure? How accurate is it?

variability The possible range of outcomes for a given event.

volatility The range of prices in a given time period. A high-volatility market has a large range in daily prices, whereas a low-volatility market has a small range of daily prices. This is one of the most useful concepts in trading.

win rate The percentage of closed trades in which you make money.

worst-case scenario A situation that represents the least desirable of possible outcomes. Typically, you need to plan for the possibility that this might happen through the proper use of position sizing. This will usually guarantee that you will survive as a trader.

Index

- 123 Model, 43, 119 (*See also* Safe Strategies for Financial Freedom)
- Adaptive Reasoning Model, 251
- Adaptrade, 248–249
- Amibroker, 250–251, 263–264
- Anderla, George, 57
- Anderson, Chris, 44, 185–186, 203, 221, 236, 275, 297
- Anti-martingale strategies, 101, 112
- Asset allocation, 79, 93–94, 98, 118–120, 197, 296 (*See also* Position sizing)
- Athena, 235–236, 245, 268, 274
- Backtesting, 32, 41, 44, 223, 227, 250, 256, 262, 287–289
- Bandy, Howard B., 251, 264
- Bank trader, 121–122, 268
- Bankers Trust, 122
- Barton, DR, 213
- Basso, Tom, 97, 127, 130, 195–197, 218, 260, 280
- Bear market, 34, 43, 52, 56, 119
- Behavioral finance, 70, 280
- Berkshire Hathaway, 6
- Bet size, 87, 109, 148, 219, 272, 286
FRPS and, 162–164, 168–172, 174, 177–178, 180–183, 223–224
maximum, 91, 185
optimal (*See* Optimal bet size)
position sizing and, 112, 205–206, 210, 216, 218
- Big picture, 10, 71, 122
- Black Monday, 35, 266
- Bloomberg, 67
- Bolotin, Bob, 262, 264
- Boroson, Warren, 67
- Brinson, G., 93, 98
- Buckets, 23
- Buffett, Warren, 5, 66–68, 70, 281
- Bull Charts, 246
- Bull market, 49, 52, 228
- CNBC, 67, 94
- CNNfn, 67
- CompuVision, 245–246
- Core equity, 97–98, 104, 108, 111, 149, 153, 155, 185, 191–192
- Correlated positions/trades, 41, 114, 182, 197–198, 233, 289
implications, 54, 185, 190, 194, 223, 277, 282–283
- Course Update 23a, 160
- CPR model, 79, 93, 95, 107, 272–273
- Cramer, Jim, 94
- Crouchy, M., 22
- Daily range, 42, 101, 105, 109–110
- Dampening factor, 163, 171–172, 175, 184, 193, 198, 297
- Darst, David, 94, 98
- Definitive Guide to Futures Trading*, 206, 219
- Delta, 161–164, 171–174, 184, 186, 223, 297
- FRPS simulations and, 167–170, 174–177, 179–180, 182
- Deutsche Bank, 122
- DOS, 235, 258
- Dow Jones, 6, 69–70, 119
- Downs, Ed, 252, 264
- Dr. Tharp's Efficiency System, 31
- Drawdowns, 22, 70, 221, 223–224, 228–234, 294, 297
- FRPS and, 164, 166–168, 170–178, 180–186
- position sizing and, 83, 100, 106–107, 109, 112, 149, 152, 187–199
- position sizing software and, 236, 245–247, 252–253
- position sizing strategies to avoid and, 211, 215–217
- questions about, 267, 269, 273–274, 280, 287–289
- random entry system and, 124–130, 133, 138–140, 142, 147–148
- system evaluation and, 26–30, 34, 41, 44–49, 55–56
- Druz, Dave, 115, 122
- Eckhardt, William, 58, 76, 129, 149
- Elliot Wave, 69, 248–249
- Enron, 13

- Equal leverage model (*See* Equal units model)
Equal units model, 79, 99, 102–103, 246, 272
Equity crossover, 117, 295
Equity model, 79, 97–98, 108, 219
position sizing and, 104–105, 158, 195, 295
Essentials of Risk Management, The, 22
ETF Workshop (*See* Ken Long)
Excel, 20, 22, 120, 136, 184, 195, 231
trading software using, 236–238, 260
Expectancy, 3, 9, 20, 98, 222, 225, 231–233
biases and, 59, 89
calculations, 21
formula, 18–19
FRPS and, 165, 167–168, 186
low-risk ideas and, 82
objectives and, 135–136, 139, 142
position sizing and, 65, 70, 85, 93, 95, 109, 203, 214, 217
position sizing software and, 237, 240, 243, 246, 249, 253
questions about, 265–267, 269, 270, 278, 283, 287
review of, 292–293, 296
SQN and, 36–39, 55
system evaluation and, 25, 27–28, 30–33, 41, 48, 56, 142–148
Expectunity, 25–26, 30–31
- Faith, Curtis, 84, 92, 117, 122, 264, 279
Fidelity Brokerage, 256–257, 263
Financial Analysts Journal, 93, 98
Financial Freedom through Electronic Day Trading, 85
Fixed fractional position sizing (*See* Percent risk)
Fixed ratio position sizing, 133, 150, 161–165, 167–171, 182–183, 246–247, 274–275, 297
advantages and disadvantages of, 185–186
assumptions about, 171, 173
checklist to trade, 183–185
Chris Anderson and, 203, 221, 223–224, 233
simulations of, 174–181
Fooled by Randomness, 265
Fortune Magazine, 5
Fox Business News, 67
Frailey, Fred, 67
- Gain to drawdown ratio, 48, 170–171, 188
Galai, D., 22
Gambler's fallacy, 81, 86, 207
General Electric, 6, 65
Generalized ratio position sizing, 183, 247
Golden rules of trading, 1, 3, 5, 7–8, 59–60, 63
review of, 291, 295
Group control, 79, 113
Group heat, 35, 239
GRPS (*See* Generalized ratio position sizing)
Gunslinger, 110
- Holding period return, 216–217
Holy grail, 31–32, 71, 91
Horton, DR, 114
How to Pick Stocks, 67
How to Pick Stocks like Warren Buffett, 66
HPR (*See* Holding period return)
- IBM, 16–17, 65, 105, 110, 121, 292
IITM retirement portfolio, 54
INC factor, 172–173, 184
Initial risk, 6, 14–17, 55, 228, 286–287, 291–292
examples, 11–13
expectancy and, 19
FRPS and, 163, 167, 172–174, 177–178, 182
the golden rules of trading and, 8
position sizing and, 64–66, 99, 114, 156, 159, 194–195, 213
Investing Smart: How to Pick Winning Stocks with Investor's Business Daily, 67
- Johari, Mahesh, 148
Jones, Ryan, 107, 161–163, 184, 186, 223–224
- Jones, W. Randall, 67
Judgmental heuristics, 57–58, 70, 95, 265
Judgmental shortcuts (*See* judgmental heuristics)
- Kahneman, Daniel, 8
Kelly Criterion, 91–92, 137, 150, 212, 218, 269–270, 297
formula, 214–215
position sizing software and, 247, 252
- Know Your System, 236, 260, 268

- Law of small numbers, 72, 74
Leverage, 35, 74, 114–116, 151, 197, 247
CPR model and, 79
equal units model and, 102–104
questions about, 271, 273, 279, 288–289
Lipschutz, Bill, 121–122
Long vs. short positions, 79, 116
Long, Ken, 31–32, 238, 264
Lots of input bias, 66–67
Lotto bias, 58, 60, 139, 294
Low-risk idea, 79, 82, 266, 269, 294
- Marble game (*See* Marbles)
Marbles, 44–45, 93–94, 121, 183, 206, 224–229, 232–233, 280
Margin, 79, 110–112, 163, 229, 233, 247
calls, 100, 106, 109
position sizing and, 99, 102, 104–105, 114, 116
questions about, 274–275, 282, 286, 289
Mark, R., 22
Market System Analyzer, 117, 247, 249
Market types, 34, 43, 49, 52, 55
down, 34, 42–43, 49, 52–56
quiet, 31, 34, 42–43, 49–56, 198, 227
sideways, 31, 34, 43, 49, 52–55, 227
up, 31, 34, 42–43, 49, 52–55
volatile, 31, 34, 42–43, 49–55, 227
Market Wizards, The, 85
Market's money, 95, 97, 219, 275, 295–296
position sizing and, 149, 151–155, 183, 185–188, 191–193
position sizing software and, 246–247, 252, 259–260
Martin, Brad, 213
Martingale strategy, 112, 117, 150, 197–199, 203, 205–211, 218, 297
Mastermind forums, 203
Mathematics of Gambling, The, 219
Maximum return, 116, 138, 247
Mechanica, 235, 258–261, 263–265
Meritage Homes, 114
MetaStock, 245–246
Michael Sivy's Rules for Investing: How to Pick Stocks like a Pro, 67
Microsoft, 6, 120, 237
Money management, 83–85, 92, 94
position sizing software and, 235, 246, 262
questions about, 267–269, 271, 283, 286–287, 289
- Money management (*Cont.*):
Ralph Vince and, 107, 215–216, 219
Monte Carlo simulation, 43–44, 161, 209–210, 245–247, 252–253, 259, 298
Morgan Stanley, 94
Mrkvicka, Edward, 67
MTPredictor, 248–249, 263
Multiple-tier position sizing, 193, 198
- NASDAQ, 34, 49, 96, 119
Navallier, Louis, 103, 295
Need to be right, 60–63, 86, 139, 294
New Market Wizards, The, 58, 121
Nirvana Systems, 251–252, 264
North Carolina State University, 221
Not enough money bias, 91
- Objectives, 3, 9, 49, 54–55, 221–222, 231, 295–296
biases and, 71, 76
FRPS and, 161, 183–184, 186
meeting your, 131, 133, 135–150, 152–155
money management versus, 84–85
position sizing and, 41, 44, 94–95, 107, 110, 118, 191–193, 199
position sizing strategies to avoid and, 212, 217–219
position sizing software and, 247, 250
questions about, 266–267, 269–271, 275–280, 282–287, 289
SQN and, 35–36, 230
Omnitrader, 251–252, 263–264
Once we think we've got it bias, 74
One up, back one, 208–209, 218, 271
Open risk, 127, 156–160, 195–196, 199, 286
Open volatility, 195–196, 199
Optimal bet size, 91, 136–137, 139, 142, 149, 207, 234, 269
calculations, 140–141, 144–146, 192, 218
formula, 214
Mahesh Johari and, 148
Optimal *f*, 138, 149–150, 156, 212, 215–219, 247, 252, 289, 297
Optimal fixed fraction, 215–216
Optimal goal switch, 191
Optimal retire, 144, 192
Optimal risk, 140–141, 144–146, 150, 192, 215, 218
Optimal target risk percentage, 150–152, 185, 191

- Paper trading, 172–174, 178, 184, 223, 278
Paradigm shift, 29, 137
Pattern bias, 59, 70, 72–74
PE ratios, 56
Peak Performance Course for Traders and Investors, 10
Peak-to-trough drawdown, 45–46, 128, 187–188, 194, 216, 274
Percent gain bias, 64
Percent margin model, 79, 99, 104
Percent risk, 20, 79, 140, 165, 189
 win rate and, 212, 214–215, 218
Percent risk model, 99, 107–109, 127–128, 130, 140, 161–162, 164, 194
 Chris Anderson and, 223–224, 233–234
 simulations, 166–167, 169–170, 174–183, 185–186
 software, 239–240, 247, 249–250, 252–253, 259
 questions about, 272–273, 275, 277, 284–285
Percent volatility, 79, 207
Percent volatility model, 99, 105, 108, 128, 130, 246
 position sizing software and, 249–250, 253, 259
 questions about, 273–274, 284
Pick Stocks like Warren Buffett, 66
Pick Winning Stocks, 67
Poloron, 5
Portfolio heat, 35, 137, 140, 145, 277, 279, 286, 295
 maximum, 151–152, 215
 optimal, 150–151
 position sizing and, 79, 114–117, 119
 position sizing software and, 239, 246, 249, 252, 259
 random entry system and, 123, 125, 128–129
 risk level and, 193–194
 SQN and, 150, 185, 189–191, 198
Portfolio managers, 59, 79, 94, 98, 103, 253–254, 269
 being fully invested, 118, 120–121, 268
 the game and, 93
Portfolio money management, 216, 219
Position sizing, 3, 7, 55–56, 201, 203, 291, 294–298
 avoiding ruin and, 187–189, 191–196, 198–199
 the basics, 77–79, 81–85, 93–95, 97–98
Position sizing (*Cont.*):
 biases and, 70–71, 73, 76, 86–87, 89, 91
 Chris Anderson and, 44, 221–225, 227–228, 230, 233–234
 core models, 99–110, 112–114, 116–122
 expectancy and, 19
 FRPS and (*See* Fixed ratio position sizing)
 the golden rules of trading and, 8–9
 SQN and, 30–31, 34–36
 profit objectives and, 41, 131–139, 141–144, 146–150, 153, 156, 158–159
 random entry system and, 123–130
 software, 235–239, 244–259, 263
 strategies to avoid, 205–213, 215, 218–219
 questions about, 265–286, 288, 290
PowerST, 262–264
Premcor, 66
Price shock, 35, 115, 183, 186, 270, 279, 289, 293
Prospect Theory, 8
Pruden, Hank, 239
Psychological biases, 3, 57, 79, 85–86, 91, 205, 294, 297
Psychological loss, 31, 147
Pulte, 114

Quantitative Trading Systems, 251, 264

Random entry system, 123–124, 129–130, 156, 160, 235
Ranking, 24–26, 28–31, 98, 108, 146, 167, 197, 266, 293
Rate of information, 57
Reduced core equity model, 98
Reduced total equity model, 97–98, 104, 108, 156–157
Regression toward the mean, 206–207, 211, 218
Reiss, Thorsten, 238, 264
Retire, 140–141, 144–145, 192, 218, 267, 282
Retire less ruin, 144–145, 147
Retire-ruin, 140–141, 144–146, 192
Reward-to-risk ratio, 3, 66, 107, 109–110, 113, 198, 229–230, 266
Risk, 3, 7–8, 83–85, 222–224, 227–231, 233–234
 biases and, 61–66, 74, 87–91
 CPR model and, 95–96
 initial (*See* Initial risk)
 low-risk (*See* Low-risk idea)

- Risk (*Cont.*):
objectives and, 135–141, 144–167, 169–186
percent risk (*See* Percent risk)
position sizing and, 93, 97–102, 105–122, 188–199, 205, 207, 210–216, 218–219
position sizing software and, 239–240, 246–250, 252–253, 258–260
questions about, 245–279, 282–289
R-multiples and, 11–22
Ralph Vince and, 81–82
random entry system and, 123, 126–130
review of, 291–292, 294–295, 297
system quality and, 26, 31, 55
R-multiples, 3, 222, 224–31, 233
basics, 11–17, 19–22
biases and, 62–66, 70, 76, 89
the golden rules of trading and, 8–10
objectives and, 139, 142–143, 145, 147–149
position sizing and, 115, 135–136, 150, 155, 165, 183–184
position sizing strategies to avoid and, 208, 213, 217
position sizing software and, 235–237, 240–241, 245–249, 251–254, 259, 263
questions about, 266–269, 271–273, 278, 285, 287–288
review of, 291–293, 298
system evaluation and, 23–24, 26, 30, 32–34, 36–39
Ross, Joe, 212–213, 218
Ruin, 9, 34, 81, 142, 148–149, 234
position sizing and, 150, 164, 186–191, 193, 198–199, 211–215
probability of, 140–141, 144–146, 151, 165–171, 173–174, 176–183, 192, 218
questions about, 265, 267–268, 275, 277, 279, 283–284, 287
risk of, 84, 116–117, 129, 147, 163, 246
worst-case drawdown and, 152, 184
Ruin level, 140, 189–192, 198
S&P 500, 43, 49–53, 228, 251, 265, 280, 295
biases and, 74
position sizing and, 104, 119–120, 122–124, 163, 171–172, 182, 186
price shocks and, 35
Safe Strategies for Financial Freedom, 43, 85, 119
Samples (representative), 76, 124, 138, 225–227, 232, 244, 266
expectations and, 20–21, 41–45, 47–48, 54–55, 206–207
objectives and, 149–150, 172
systems, 23–24, 30–31, 135, 140–141, 146, 218
trades, 9, 14, 17–18, 27, 32–36, 148, 216–217
Scaling in, 95, 149, 156–159, 186, 195, 213, 286, 296
position sizing software and, 235, 246–247, 249–250, 252–253, 256, 259
random entry system and, 123–124, 129–130
Scaling out, 130, 158–159, 194–196, 199, 286
position sizing software and, 246–247, 249–252, 256, 259
random entry system and, 123–124, 127–128
Scalper, 171
Schwager, Jack, 76, 85, 92, 122, 197, 199, 218
Secrets of the Masters Trading Game, 9, 44–46, 87, 184, 194, 236, 244–245
Secular bear, 52, 56
Secular bull, 52
Sensory/detail orientation, 71
Sethna, Dhun, 67
Seykota, Ed, 9, 115, 122, 149
Sharpe ratio, 247
Sivy, Michael, 67
Sjuggerud, Steve, 31, 35, 54, 114, 119
Spear, Bob, 235, 258, 260–261, 264
Special Report on Money Management, 235, 271
SQN (*See* System Quality Number)
Standard deviation, 3, 8–9, 48, 70, 232, 267, 292–293
the markets and, 50, 52
position sizing and, 165, 217
position sizing software and, 237, 246, 249
SQN and, 28–30, 32–33, 36–38, 135
system evaluation and, 55, 142–143, 146–147, 231
variability and, 20–21
Stator Financial Management, 238–239, 264
STdev (*See* Standard deviation)
Stockcharts.com, 244

- StockTickr, 240–244, 264
Streaks, 22, 44–48, 55, 265–266, 294
 biases and, 86–87, 90–92
 exposure and, 101
 position sizing and, 149, 205–207, 209–211, 216, 219
Super Traders, 233
Swing Trading Workshop, 213
System evaluation, 3
System Quality Number, 9–10, 28, 33, 55, 232, 234, 292–293
 biases and, 66, 70, 76
 FRPS and, 164–165, 167, 174, 179, 183, 185
 the markets and, 53–54
 meeting your objectives and, 133, 135–136, 142–152, 154, 230
 position sizing and, 110, 115–116, 188–190, 197–199, 217
 position sizing software and, 236–237, 239, 249
 questions about 267, 270–271, 276, 278–279, 281–287
 system evaluation and, 28, 33, 35–39, 43–44, 55–56, 221, 227–228
System validity, 34, 167
- Taleb, Nicholas, 265
Tasks of Trading, 239
Ten tasks of trading, 10, 149
Terminal Wealth Relative, 216–217
Tharp's Thoughts, 31, 52, 119, 122, 239
Turtles, The, 117, 129, 150, 252, 273, 280
Thorp, Edward, 214, 219
Toll Brothers, 114
Total equity, 15, 85, 99, 108, 154, 157, 192, 195–196, 278, 282
Total equity model, 97–98, 104–105, 107–108
Total risk, 11–12, 19, 116, 123, 185, 189–190, 193, 195
 CPR model and, 95–96
 examples of, 14–17, 20–21
 exposure, 107–108, 110, 115, 155–158, 292
 questions about, 269, 272–274, 279
Trade Your Way to Financial Freedom, 18, 66, 68, 85, 123, 148, 224, 245, 250, 263, 275–276, 281
TradeSim, 245–246, 264
TradeStation, 222, 228, 232, 248, 257
- Trading Blox, 252–256, 263–264
Trading frequency, 229–230, 232–233
Trading Game, The, 107, 161, 164, 186, 223
Trading Recipes, 19, 235, 258–259
Transaction costs, 14–15
Trendstat, 260
True Wealth (See Steve Sjuggerud)
T-score, 28, 33–34, 39, 44
Tversky, Amos, 8
Two-tier position sizing, 191–193, 198, 234, 297
- TWR (See Terminal Wealth Relative)
- Units per fixed amount of money, 99, 101, 274, 295
- Valero, 66, 111
Van Rijswijk, Leo, 238, 264
Variability, 19–20, 49, 93–94, 175
 position sizing and, 93–94, 178
 standard deviation and, 8–9, 22, 50, 55, 147
 system evaluation and, 28–29, 143
Vick, Timothy, 67
Vince, Ralph, 81, 86, 92, 107, 137, 150, 212, 215–216, 219, 289
- Volatility, 11, 49–52, 101–102, 295
 position sizing and, 79, 99, 103–110, 112, 114, 116, 156–157, 159, 195–196, 199, 207
 position sizing software and, 245–246, 249–250, 252–253, 259
 questions about, 270, 272–275, 284–285, 287
 random entry system and, 123–124, 127–130
- Wall Street, 11, 35, 67, 69, 79, 281
Way of the Turtle, 84, 92, 117, 122, 280
Wealth Lab, 256–257, 263
Wilder, J. Welles, 249
Williams, Larry, 150, 206–209, 219, 247, 289
Win rate, 23–25, 30, 38, 90, 266, 294
 percent risk and, 212, 214
 position sizing and, 142–143, 146, 165, 167, 207
WorldCom, 13
World's Greatest Stock Picks of All Time, 67
- XLQ, 236, 238, 264