## **Contents**

Foreword	XX The Scientific Approach
Preface	ilvx
	An Overview of the Trading Stra
Acknowledgments	XIXX-p-1: Formulate the Trading Strateg
Introduction	o Step 2: Translate the Rules into a Def
Introduction	
CHAPTER 1 On Trading Strates	Step 4: Optimize the Trading Strategy  Step 5: The Walk-Forward AMMy Saig
Why This Book Was Written	Step 6: Trade the System
Who Will Benefit from This Book?	Step 7: Evaluate Real-Time Performan
The Goals of This Book	
	10
The Lay of the Land	Oliaring 4 The Strategy De-
CHAPTER 2 The Systematic Tra	ading <i>Edge</i> 17
Discretionary Trading	Olagnostics 81
7 ft are million and an area and a second	
Raising the Bar	19 stimization
Verification	e Objective Function
Quantification	24
Risk and Reward	noltsmot24
The Performance Profile	26 Analysis
Objectivity	ZievisnA oilotra
Consistency	noisulano 29
Extensibility	. 32
The Benefits of the Historical Simu	lation
Positive Expectancy	34
	48 Three Principal Component
The Performance Profile	Entry and Exit
Proper Capitalization	- RUSK Management
Toper capitalization	Position Sizing

viii

A Measure of Real-Time Trading Performance	36
The Benefits of Optimization	37
The Benefits of the Walk-Forward Analysis	38
The Advantages of a Thorough Understanding	39
Confidence	40
Strategy Refinement	41
CHAPTER 3 The Trading Strategy Development	Process 43
Two Philosophical Approaches to Strategy Develop	ment 44
The Scientific Approach	44
The Path of Empirical Development	45
An Overview of the Trading Strategy Design Proces	
Step 1: Formulate the Trading Strategy	49
Step 2: Translate the Rules into a Definitive Form	49
Step 3: Preliminary Testing	50
Step 4: Optimize the Trading Strategy	51
Step 5: The Walk-Forward Analysis Step 6: Trade the System	52 53
Step 7: Evaluate Real-Time Performance	54
Step 8: Improving the System	55
CHAPTER 4 The Strategy Development Platforn	m 57
The Scripting Language	58
Diagnostics	59
Reporting	62
Optimization	68
The Objective Function	68
Speed	68
Automation	69
Walk-Forward Analysis	69
Portfolio Analysis	70
In Conclusion	17 neistency
CHAPTER 5 The Elements of Strategy Design	to attlemed e 73
The Three Principal Components of a Strategy	74
Entry and Exit	74
	74 Performan
Position Sizing	Harigao rago 75

Contents	ix
----------	----

An Overview of a Typical Trading S	strategy 500000 auguning 2575
A Trade Equals an Entry and an Exi	
Entry Filters	75 justed Continuous Contracts
The Management of Risk	Wolnik Test Window
Trade Risk	8 Statistical Requirements
Strategy Risk	8 Sample Size and Statistical Error
Portfolio Risk	84
The Management of Profit	85
The Trailing Stop	81
The Impact of Overnight Change on the	Frailing Stop 87
Profit Targets	87
The Impact of Overnight Change on Targ	et Orders 88
Position Sizing	8 The Bull Market
Advanced Strategies	Methods sbarket sbortam
Summary	June Cyciic Market
<b>CHAPTER 6</b> The Historical Simu	ulation 93
The Ferration Contra Overniting	Vindow Size and Model Life
The Barfarman Survey Su	94
The Performance Summary The Trade List	94
The Equity Curve	107
Performance by Period	100
a later a Tactabally will be at a stall a	oblight of alexant—notine it 109
The Importance of Accuracy	
Software Limitations	109
Rounding Issues Phantom Trades	109
Price Orders	111
Realistic Assumptions	HAPTER 8 Preibalmary Test
Price and Trade Slippage	It ification of Calculations and
Opening Gap Slippage	11. Siculations
Opening and Closing Range Slippage	of I rading Rules
Slippage Due to Size	III Summary
	Usoretical Expectations imited
Limit Moves	
M-1	
Historical Data	111 Multimarket and Multiperio 21 lecting the Basket
Balling Bratery Robust?	was Clarify and a series as a series of the
Cash Markets	ency teaT and
Futures Markets	121

X CONTENTS

The Continuous Contract	VT s to waivravc124
	3 ns elaup3 obs 124
Adjusted Continuous Contracts	2125 cm Filters
The Size of the Test Window	10 mamaganaM 126
Statistical Requirements	Nel 9 9 127
Sample Size and Statistical Error	olala yeatsu 127
How Many Trades?	129
Stability	129
Degrees of Freedom	got palling Trailing Stop
Frequency of Trading	131
Types of Markets	122
The Bull Market	132
The Bear Market	134
The Cyclic Market	135
The Congested Market	137
Efficient Markets	137
The Life Cycle of a Trading Strategy	140
Window Size and Model Life	141
<b>CHAPTER 7</b> Formulation and Specification	n 145
CHAITER 7 Formulation and Specification	
Formulate the Trading Strategy	145
Specification—Translate the Idea into a Testab	le
Strategy	147
Make a Vague Idea Precise	29uzzi ombruo 150
	C Acunding Issues
CHAIRFIED O. D. H	219b10 at 157
CHAPTER 8 Preliminary Testing	Roalistic Assumption
	social sheat bas so 158
Calculations	epsagil Cap Slippage
Trading Rules	159 Closing and Closing
In Summary	exi2 or eug apaggil 164
Theoretical Expectations	164 Significance of Sili
Preliminary Profitability	25VOM 1 166
The Multimarket and Multiperiod Test	of bus atmoved to 169
Selecting the Basket	169
Determining the Length of the Test Period	171 ck Prices
Segmenting the Data	171 Markets
The Test	172
The Results of the Test	177

xi

CHAPTER 9 Search and Judgmen	trademassate aldella Resource of 179
Search Methods	180 assume the impact of Mark
The Grid Search	181
The Prioritized Step Search	185 Theory of Relevant Date
Hill Climbing Search Algorithms	188
Multipoint Hill Climbing Search	189
<b>Advanced Search Methods</b>	219 Markets 191
Simulated Annealing	193 Varieties of Market Condi
Genetic Algorithms	195
Particle Swarm Optimization	197 Role of the Walk-Forward
General Problems with Search Metho	
The Objective Function	201 xample of a Walk-Forward
A Review of a Variety of Evaluation M	lethods 203
	802ne Purpose of the Walk-Forward And
CHAPTER 10 Optimization	112 strategy Robust?
Optimization Contra Overfitting	213
A Simple Optimization	Taleiff entre 214
The Optimization Framework	216
The Parameters	216
The Scan Range	218
The Historical Sample	220
The Objective Function	ni na za vostava pribavi 222
The Optimization Evaluation	222
A Multimarket and Multiperiod Optin	nization 223
The Evaluation of the Optimization	225
The Robust Trading Strategy	225
The Robust Optimization	227 Naximum Drawdown and the Trad
The Statistically Significant Optimiza	tion Profile 227
The Distribution of the Optimization	
The Shape of the Optimization Profile	221
How Does the Strategy Respond to O	
Does the Strategy Deserve Further D	Antonia remain
CHAPTER 11 Walk-Forward Analys	is 237
Is the Trading Strategy Robust?	882 TER 13 The Many Face
<b>Robustness and Walk-Forward Efficie</b>	
The Cure for Overfitting	239

XII CONTENTS

A More Reliable Measure of Risk and	Return 241
<b>Assessing the Impact of Market Chan</b>	ges 241
The Best Parameter Set for Trading	242
The Theory of Relevant Data	243
Peak Performance	243 III Climbing Search Algorithms
Statistical Rigor	445 Jultipoint Hill Climbing Search
Shifting Markets	245 anced Search Methods
<b>The Varieties of Market Conditions</b>	245 Marted Annealing
The Walk-Forward	amilhogia siten 247
The Role of the Walk-Forward	noissimilgo maw elain 247
Setting up a Walk-Forward	248 248 Problems with Search
An Example of a Walk-Forward Test	250 Objective Function
The Walk-Forward Analysis	251 25 Variety of Evaluation
The Purpose of the Walk-Forward Analysis	essyT noiseulsvä elgi 252
An Example of a Walk-Forward Analysis	255
Is the Strategy Robust?	256
What Rate of Profit Should We Expect?	260
What Is the Risk?	261
<b>Walk-Forward Analysis and the Portfo</b>	olio 261
<b>CHAPTER 12</b> The Evaluation of Per	rformance 263
The Trading Strategy as an Investme	nt 263
The Dimension of Risk	noitsulava noitsalmiteo er264
Compare the Strategy to the Alternati	ives 264
<b>Maximum Drawdown and Trading Ris</b>	k 265
Maximum Drawdown in Context	vpeters palbert readon 267
Maximum Drawdown and the Trader	268
Maximum Run-up and the Trader	269
Traumy Capital and Kisk	2/0
NISK Aujusteu Keturii	212
Reward to KISK Ratio	2/3
Model Elliciency	2/3
Consistency	270
Patterns of Profit and Loss	277
CHAPTER 13 The Many Faces of Ox	verfitting 281
What Is Overfitting?	282 seems walk Forward
The Abuse of Hindsight	284 Cure for Overfitting

Contents	xiii
The Case of the Overfit Forecasting Model	286
The Case of the Overfit Trading Model	289
The Symptoms of an Overfit Trading Model	290
The Causes of Overfitting	291
Degrees of Freedom	292
Measuring Degrees of Freedom	292
Degrees of Freedom, Sample Size and Startup Overhead	293
Trade Sample Size	295
Optimization Error 1—Overparameterization	296
Optimization Error 2—Overscanning	297
The Big Fish in a Small Pond Syndrome	298
The Walk-Forward Test	298
CHAPTER 14 Trading the Strategy	301
3 X 799 for Bob, DUNN, and our clients. I am pleased to rep	
The Mental Aspects of Trading	
Return on Investment	505
Poor Strategy	303
Market Contraction Unseen Market Conditions	303
Unseen Market Conditions Superior Alternatives	304 305
Maximum Risk	305
Real-time and Evaluation Performance	308
decided the control of the ACO and the second state of the second	
Comparing the Evaluation and Trade Profile	310
Understanding the Test Profile	311
Performance Quirks	
The Windfall Profit	
The Losing Run	316
Flat Production	
In Conclusion	
Notes would of computing trading, and money management has a	319
Index	mm