Contents

Preface xi
Acknowledgments xiv

PART I Revenue Models of High-Frequency Trading 1

CHAPTER 1 High-Frequency Trading and Existing Revenue Models 3
What Is High-Frequency Trading? 3
Why High-Frequency Trading Is Important 5
Major High-Frequency Trading Firms in the United States 6
Existing Revenue Models of High-Frequency Trading Operations 8
Categorizing High-Frequency Trading Operations 9
Conclusion 10

CHAPTER 2 Roots of High-Frequency Trading in Revenue Models of Investment Management 13
Revenue Model 1: Investing 14
Revenue Model 2: Investment Banking 17
Revenue Model 3: Market Making 18
Revenue Model 4: Trading 18
Revenue Model 5: Cash Management 19
Revenue Model 6: Mergers and Acquisitions 20
Revenue Model 7: Back-Office Activities 20
vi

CONTENTS

Revenue Model 8: Venture Capital 20
Creating Your Own Revenue Model 21
How to Achieve Success: Four Personal Drivers 22
Conclusion 27

CHAPTER 3 History and Future of
High-Frequency Trading
with Investment Management 29

Revenue Models in the Future 30
Investment Management and Financial Institutions 31
High-Frequency Trading and Investment Management 32
Technology Inventions to Drive Financial Inventions 34
The Ultimate Goal for Models and Financial Inventions 34
Conclusion 37

PART II Theoretical Models as Foundation of
Computer Algos for High-Frequency Trading 39

CHAPTER 4 Behavioral Economics Models on
Loss Aversion 41

What Is Loss Aversion? 41
The Locus Effect 41
Theory and Hypotheses 45
Study 1: The Locus Effect on Inertia Equity 49
Study 2: Assumption $A_1$ and $A_2$ 51
General Discussion 53
Conclusion 55

CHAPTER 5 Loss Aversion in Option Pricing:
Integrating Two Nobel Models 57

Demonstrating Loss Aversion with Computer Algos 57
Visualizing the Findings 59
Computer Algos for the Finding 61
Explaining the Finding with the Black-Scholes Formula 63
Conclusion 64
Contents

CHAPTER 6 Expanding the Size of Options in Option Pricing 65

The NBA Event 66
Web Data 67
Theoretical Analysis 69
The NBA Event and the Uncertainty Account 72
Controlled Offline Data 77
General Discussion 80
Conclusion 82

CHAPTER 7 Multinomial Models for Equity Returns 85

Literature Review 87
A Computational Framework: The MDP Model 89
Implicit Consumer Decision Theory 94
Empirical Approaches 102
Analysis 1: Examination of Correlations and a Regression Model 102
Analysis 2: Structural Equation Model 106
Contributions of the ICD Theory 111
Conclusion 115

CHAPTER 8 More Multinomial Models and Signal Detection Models for Risk Propensity 117

Multinomial Models for Retail Investor Growth 117
Deriving Implicit Utility Functions 131
Transforming Likeability Rating Data into Observed Frequencies 140
Signal Detection Theory 143
Assessing a Fund's Performance with SDT 146
Assessing Value at Risk with Risk Propensity of SDT for Portfolio Managers 147
Defining Risk Propensity Surface 148
Conclusion 149
CONTENTS

CHAPTER 9 Behavioral Economics Models on Fund Switching and Reference Prices 151

What Is VisualFunds for Fund Switching? 151
Behavioral Factors That Affect Fund Switching 152
Theory and Predictions 157
Study 1: Arbitrary Anchoring on Inertia Equity 164
Study 2: Anchor Competition 166
Study 3: Double Log Law 169
Conclusion 179

PART III A Unique Model of Sentiment Asset Pricing Engine for Portfolio Management 181

CHAPTER 10 A Sentiment Asset Pricing Model 185

What Is the Sentiment Asset Pricing Engine? 185
Contributions of SAPE 187
Testing the Effectiveness of SAPE Algos 190
Primary Users of SAPE 191
Three Implementations of SAPE 191
SAPE Extensions: TopTickEngine, FundEngine, PortfolioEngine, and TestEngine 193
Summary on SAPE 194
Alternative Assessment Tools of Macro Investor Sentiment 194
Conclusion 200

CHAPTER 11 SAPE for Portfolio Management—Effectiveness and Strategies 201

Contributions of SAPE to Portfolio Management 202
Intraday Evidence of SAPE Effectiveness 203
Trading Strategies Based on the SAPE Funds 206
Case Study 1: Execution of SAPE Investment Strategies 206
Case Study 2: The Trading Process with SAPE 214
Case Study 3: Advanced Trading Strategies with SAPE 217
Contents

Creating a Successful Fund with SAPE and High-Frequency Trading 221
Conclusion 223

PART IV New Models of High-Frequency Trading 225

CHAPTER 12 Derivatives 227

What Is a Derivative? 228
Mortgage-Backed Securities: Linking Major Financial Institutions 229
Credit Default Swaps 230
Options and Option Values 231
The Benefits of Using Options 234
Profiting with Options 234
New Profitable Financial Instruments by Writing Options 236
The Black-Scholes Model as a Special Case of the Binomial Model 237
Implied Volatility 238
Volatility Smile 238
Comparing Volatilities over Time 239
Forwards and Futures 240
Pricing an Interest Rate Swap with Prospect Theory 241
Behavioral Investing Based on Behavioral Economics 243
Conclusion 244

CHAPTER 13 Technology Infrastructure for Creating Computer Algos 245

Web Hosting versus Dedicated Web Servers 245
Setting Up a Dedicated Web Server 246
Developing Computer Algos 248
Jump-Starting Algo Development with PHP Programming 256
Jump-Starting Algo Development with Java Programming 266
Jump-Starting Algo Development with C++ Programming 273
Jump-Starting Algo Development with Flex Programming 274
Jump-Starting Algo Development with SQL 274