

# Contents

Chapter 1 – Introduction .....	11
Goal .....	12
Major Changes .....	12
Decisions and Uncertainty .....	12
Trading and Investing .....	13
Technical Analysis and Fundamental Analysis .....	14
Efficient Market Hypothesis .....	14
Fundamental Analysis .....	15
Technical Analysis .....	16
Many Trading Techniques .....	17
Why Traders Stop Trading .....	17
The Scientific Method .....	19
Software Engineering .....	21
Data Science .....	21
Trading System Development .....	22
Each Side of the Flowchart is a System .....	23
System = Model + Data .....	24
Models in General .....	25
An Example Model .....	26
Subjectivity and Objective Functions .....	26
The Data .....	28
Synchronization .....	30
Stationarity .....	30
The Signal and the Noise .....	31
Every Model-Data Combination is a System .....	32
Data Series are Not Interchangeable .....	33
Development .....	33
The Process .....	34
Distributions .....	35
Stay High on the List .....	38
Assume Nothing About the Distribution .....	38
Position Sizing .....	38
Risk Tolerance .....	39
Dynamic Position Sizing .....	40
CAR25—Universal Objective Function .....	41
Estimating Future Performance .....	41
Trader Psychology .....	42

Confidence .....	42
Skill Set .....	44
Monte Carlo—Briefly .....	45
Why This is So Hard .....	45
Summary .....	48
Chapter 2 — Risk .....	49
Definitions .....	49
Drawdown Defined .....	50
Frequency of Action .....	51
Holding Period Tolerance .....	51
Trade Exits .....	52
Manage Weekly? .....	53
Maximum Adverse Excursion (MAE) .....	53
Maximum Favorable Excursion (MFE) .....	53
Accumulated MAE (AMAE) .....	54
Bad Stuff Can Happen .....	54
Mark-to-Market Equivalence .....	56
Quantifying Risk Tolerance .....	57
Account Size .....	57
Forecast Horizon .....	57
Maximum Drawdown .....	58
Degree of Certainty .....	58
A Chart Illustrating Risk Tolerance .....	58
Tail Risk and Black Swans .....	60
Producing the CDF for Estimate of Risk .....	60
Backtest Equity Curve .....	61
Trade at Full Fraction .....	62
Allocate a Portion to Risk Free .....	63
Estimating Profit Potential .....	64
Sidebar—Calculating CAR .....	65
Trade Quality .....	66
Example System .....	66
Market Research .....	72
Risk and Profit Potential .....	73
Simulation Outline .....	74
Drawdown as a Function of Holding Period .....	78
Profit Potential .....	79
Risk in Being Short .....	80
What the Prospector Found .....	82
Which Issues are “Best?” .....	84
Holding Longer .....	84
Chapter 3 — Trading System Development .....	89
The Model .....	90
Models and the Premises .....	91
What I Would Like to Know .....	93

Traditional Development Platforms .....	93
Machine Learning Platforms .....	95
Interchangability .....	96
Impulse and State Signals .....	97
Learning .....	100
Objective Function .....	100
The Population and the Sample .....	102
Parameters .....	104
Choosing Hyperparameters .....	104
In-sample Data Length .....	106
Out-of-sample Data Length .....	106
Longer Holding Periods .....	107
Number of Data Points .....	107
Indicators .....	108
Ideal Indicator .....	108
Fuzzy Indicator .....	110
Realistic Indicator .....	111
Transformations .....	112
Out-of-Range Values .....	113
Entries .....	115
Exits .....	116
Backtesting and Optimization .....	120
Dimensions in a Search Space .....	121
Global Optimum .....	122
Exhaustive Search .....	122
Non-Exhaustive Search .....	123
Things to Watch For .....	123
Optimization and the Curse of Dimensionality .....	124
Number of Alternatives to Evaluate .....	124
Validation .....	125
Walk Forward Testing .....	126
Even Walk Forward Can Fool You .....	128
Chapter 4 – Summary and Important Concepts .....	129
Appendix A – Fundamental Analysis .....	141
Appendix B – Data Sources .....	145
Appendix C – Development Platforms .....	149
Appendix D – Bibliography .....	155
Index .....	161