

## Preface and Introduction

**QUANTITATIVE TRADING SYSTEMS** focuses on three topics:

- Quantitative analysis techniques as applied to stocks, mutual funds, exchange traded funds, futures contracts, and currencies.
- An introduction to the AmiBroker program.
- Design, testing, validation, and implementation of trading systems.

**EMPHASIS** is given to:

- Techniques that have mathematical grounding – for example, equations rather than chart patterns.
- Techniques that are mechanical and testable rather than discretionary.
- Selection of issues to be traded, optimal holding periods, and expected drawdowns.
- Analysis of entry methods, exit methods, stop placement, money management, and position sizing.
- Analysis of intermarket variables.
- Methods for broad market timing.
- Methods for validation of trading systems, including whether a trading system is sufficiently reliable to trade.

**THE AUTHOR, Dr. Howard Bandy:**

- Has university degrees in mathematics, physics, engineering, and computer science.
- Has specialized in artificial intelligence, applied mathematics, modeling and simulation.
- Was professor of computer science and mathematics, and a university dean.
- Designed and programmed a well-known program for stock selection and timing.
- Was a senior research analyst for a CTA trading firm.

**THE PROGRESSION** of trading system development that most people use is:

1. Invent, guess, read about, or buy a trading idea. Usually that means little more than an entry technique.

Then:

- 2A. Begin trading using the idea or system tomorrow.

The market lets them know whether it works or not.

- 2B. Program that idea into AmiBroker or some other language, test the idea using historical data, and evaluate whether it would have worked.

Try to improve the idea.

Probably repeatedly.

Either reject the idea or eventually begin trading.

The market lets them know whether it works or not.

The purpose of this book is to guide you through path 2B so that when you begin trading there is a higher likelihood that it is profitable.

### **WHAT YOU WILL FIND IN THIS BOOK**

- An introduction to many aspects of technical analysis and quantitative analysis. Emphasis is on removing the mystery from things that work that you should know about, and debunking things that do not work so you do not need to spend time finding them out for yourself.
- A thorough explanation of methods used to measure the goodness of a trading system, and useful metrics to incorporate into the objective function.
- Identification of the key aspects of trading system development, and techniques to incorporate them into your own trading systems.

- Detailed explanation of data splitting into in-sample and out-of-sample periods, and the proper use of each.
- Enough mathematical rigor to (hopefully) be convincing without being overwhelming.

#### **WHAT YOU WILL NOT FIND IN THIS BOOK**

- No Gann, no divergences, no chart patterns, no flags, no pennants, no trendlines, no Fibonacci retracements, no Elliott waves – nothing that relies on subjective judgment. All indicators and signals will be expressed in terms of unambiguous mathematical statements.
- No indicators or trading signals that change when additional data is received. All indicators and signals that are created will depend only on data already available.
- No guarantees of great wealth in a short time with little effort.
- No investment advice. This book is intended to be an educational text. Trading systems described are meant to be examples which readers can experiment with, expand, and develop for their own use. Neither the author nor the publisher will be held responsible for losses that result from application of the techniques described herein.
- No pricing for exotic derivatives. This is elementary quantitative analysis. The title was chosen to distinguish it from fundamental analysis and that part of technical analysis that focuses on subjective analysis.
- No vague statements. I am regularly frustrated by advertising or jacket copy that tells me a book explains 18 profitable trading systems in complete detail, only to find a few hand drawn charts, an incomplete set of vague entry rules, and no performance summary. It is my sincere hope that none of you feels this book falls into that category.

#### **COMMENTS ABOUT THE EXAMPLES**

The examples of AmiBroker statements, systems, and programs are intended to be educational. Whenever there was a decision to be made whether to write code that was clear and illustrative of the point being made, or efficient in terms of minimizing the number of lines of code or the execution time, the choice was always made in favor of the educa-

tional clarity rather than the computational efficiency. Experienced users of AmiBroker may wish to recode for execution efficiency. But, in my experience, if the program is clear and correct, recode it for efficiency only if the execution time is unacceptable.

Every example has been carefully checked and rechecked. Nevertheless, some errors are likely to slip through. With regard to AmiBroker code, refer to the AmiBroker documentation and help files. When in doubt, the AmiBroker compiler itself is the ultimate arbiter of correctness.

Readers should be able to reasonably replicate the results of the programs listed. Exact replication would require using exactly the same data.

## CONCEPTS AND TECHNIQUES

Many of the concepts and techniques described can be applied in many different applications. Usually, the concept or technique is described in detail, often including an example, when it is first mentioned. This book would be many pages longer than it is if every possible reference to every possible alternative was explained in detail. To save space, and to allow the focus to continue to be on new material as the book progresses, later references to concepts explained earlier may be mentioned briefly, or may be omitted completely, with the expectation that the reader will remember them and apply them as desired.

## ORGANIZATION OF TOPICS

It is difficult to describe all of the features of AmiBroker and all of the concepts of quantitative trading system design in a linear manner. Capabilities of the programs, techniques for using the programs, and concepts of trading system design are introduced in an interwoven manner, in what is hoped to be a more natural flow than a traditional user's manual.

This book is not intended to be a user's manual for any program. There are many features of AmiBroker that are not covered.