



# CSI TECHNICAL JOURNAL

DATA ♦ SOFTWARE ♦ SERVICE

Volume IX, Number 2

February 1993

\$10.00

## In This Issue

Designing Neural Networks to Predict Market Movement .....1

Automatic History is Still in Our Future .....3

Heady NASDAQ Levels Prompt Change-Truncated Index Now Available .....3

Programming Notes: 4.04 Bug & Faxmodem Support .....3

Super Trader's Almanac Insert .....3

Data Release Times .....3

Ask Customer Service .....4

Product Summary .....5

Editor: Sabrina Carle  
 Publisher: Commodity Systems, Inc.  
 Notice: The views and information expressed in this document reflect exclusively the opinions and experience of the author, Robert C. Pelletier. Neither CSI nor the author undertake or intend to provide tax advice or trading advice in any market or endorse any outside individual or firm. Readers should consult competent financial advisors or outside counsel before making any trading, software purchase, or investment decision. CSI does not stand behind or endorse the products of any outside firms.

Advertisements Enclosed: We have included advertisements for SuperCharts, a technical analysis program offered by Omega Research, Inc. and the Super Trader's Almanac.

CSI accepts advertisements to accompany our Technical Journal for the sole purpose of defraying postage costs.

©1993 Commodity Systems, Inc. (CSI), All Rights Reserved

## Designing Neural Networks to Predict Market Movement

The human brain, which has been referred to as the greatest computer of all, has become the model for intelligent computer systems for traders. So-called "neural networks" emulate the brain by processing cause and effect relationships. This month's Technical Journal will attempt to explain how the original work done by biomedical research teams has been modified and used in developing trading systems.

*"History's precious lessons are easily forgotten, but judging the future depends on re-learning them."*

The digital computer does not have the parallel processing capacity of the true neural network, but it is currently the key, nevertheless, which unlocks neural network analysis. It has helped to inspire the building of models in general because computers can be programmed to hold interactive structural relationships (*dynamic models*) in the areas of science and engineering. In neural networks, digital computers are called upon to model individual neurons and clusters of neurons. While neural network analysis was first used in the 1950s, it has only been applied to market trading systems in the last few years.

I hope to someday include neural network technology in forthcoming CSI works, so I have been studying what literature is available. My background is in statistical analysis, so this is a new area for me. The articles I've found in futures industry publications have, quite frankly, left me cold. Fortunately, several very good books have been written on the subject, and

I have learned a great deal in a short period of time. I would like to share a bit of my new-found knowledge. Many of you may already be ahead of me on the subject, but I suspect most readers will be covering new ground right along with me.

I would like to begin by pointing out that neural network modelling may not be that different from the timing system modelling many analysts use to follow markets. I find it

helpful to compare the neural net with things I already know about, so I'll relate neural networks to the statistical models I use and have discussed in this journal many times.

Model building requires that one deal with inputs, outputs and parameter control in deciding how the structuring should be accomplished. This is true of both neural network models and statistical models. Similar rules and restrictions must be followed in both areas.

In the neural network area, a key factor in building intelligence into the model is something called training. We provide input stimuli that we believe are important in the prediction of some required output. The training exercise, which usually takes a great deal of computer time, decides what is important to the prediction of various outputs. The model design is arranged such that feedback loops help to minimize the measurement of predic-

*(continued on Page 2)*

## Designing Neural Networks...

(continued from page 1)

tion error. Input stimuli that do little to contribute to the overall precision of the output estimates are given less weight than stimuli which do much to contribute to the results.

In the course of the training exercise, the neural network consumes parameters just as your general system timing model consumes them. It is important to limit the quantity of parameters in any model, simply because the more control one introduces into a model, the less predictive the model may become in practice. Neural network models can be overcontrolled just as easily as any other kind of system trading model. And,

in fact, you can easily over-generalize the model such that you can reduce the model's sensitivity to events of the past.

Obviously, a deterministic, equation-driven statistical model does not include the training session. I often refer to the neural network training session as the weighting session. This is where weights are applied to stimuli so as to minimize prediction error. Although the training can be flawed through over-generalization, it is an absolute requirement for neural networks, nevertheless.

The greatest power of neural networks lies in the input data, which for lasting and effective performance should be converted into a stationary form. The longer and more varied the past involving related elements of information, the more predictive your model may become. History's precious lessons are easily forgotten, but judging the future depends on re-learning them. A broad data base with substantial longevity and some innovative manipulation is as necessary for a thorough neural network analysis as it is for any general statistical analysis.

To reduce training time, a knowl-

edge if the fundamental forces for the mix of independent series is necessary. For example, to build a model that will predict pork belly prices requires knowing certain fundamental factors, such as:

1) Pork bellies come from live hogs after they achieve a mature slaughter weight.

2) A hog takes six or seven months to fatten from birth.

3) The gestation period of a hog.

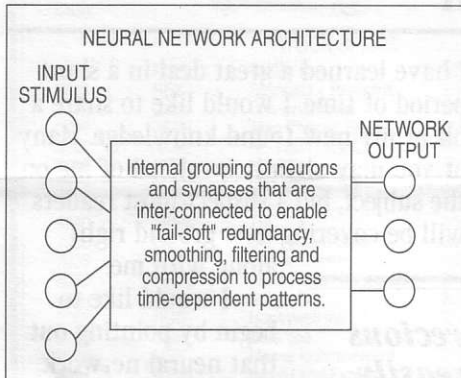
4) And of course, since hogs are fed corn, it is necessary to know how long corn must be fed to hogs to produce the raw material for pork bellies.

It is often said that input data preparation is 90% of the effort necessary to arrive at a neural network solution. Price inputs for neural networks are typically reduced from their numeric price per bushel or price-per-pound form into dimensionless quantities ranging from 0 to 1, -1 to 1, or  $-3\sigma$  to  $+3\sigma$ , etc. In addition, data for neural networks can be further enhanced through filtering and smoothing prior to the above compression step. These conditioning requirements simplify the matter of variable treatment by making equations that process the feedback loops easier to formulate.

Once the data is identified, filtered and reduced for processing, the model should be built to offer the maximum information possible. Some forms of the data can also be arranged to introduce long and/or short memories with respect to the prediction of one or more dependent variables. And neurons and synapses are arranged and grouped in a manner which fosters redundancy to promote fail-soft performance. Again, these are advantages of the neural network that do not necessarily exist in other forms of statistical analysis.

Neural networks are most often used by scientists in applications such

(continued on Page 5)



## Automatic History is Still in Our Future

After we announced and partially completed plans for automatic processing of phone history, a new, faster technique for preparing daily updates was conceived. The new method promises to significantly reduce the time each caller is connected to the CSI host computer, thus reducing telephone bills for CSI and our customers.

The automatic history programming is already present in 4.04 QuickTrieve®, but the mainframe programming effort has been rescheduled in favor of this change in portfolio creation. The fast file creation work should be completed in early February. We expect to allow auto-created history files (as described in the QuickTrieve 4.04 manual) before April 1, 1993.

These two enhancements to our system are evidence of our ongoing commitment to provide excellent service and value. We appreciate your patience in waiting for the automatic history and regret the delay. ♦

## Heady NASDAQ Levels Prompt Change-Truncated Index Now Available

On December 4th the NASDAQ Composite Index (5799 COMP) reached a new high that exceeded the 65535 limit for the QuickTrieve format. We have introduced a truncated series for this index which lets us report the NASDAQ's lofty new price territory to QuickTrieve users.

CSI number 5740 (symbol is COMPZ) replaces #5799 and reports the NASDAQ Composite index without the final digit. The conversion factor of 1 allows proper translation for analysis.

Anyone who has purchased number 5799 may request a free history on the truncated series to replace existing data. Please contact customer service to order. ♦

## Programming Notes:

### 4.04 Bug & Faxmodem Support

The programming staff wishes to report a bug in QuickTrieve version 4.04 involving the conversion of files to the CompuTrac format. If only one file is selected to convert from QuickTrieve to CompuTrac, the new CompuTrac file is not named correctly. To avoid the problem, simply select two or more files to convert. This bug will be omitted in QuickTrieve version 4.05, which will be released later this year.

### Attention Fax Modem Users

Several QuickTrieve users have reported problems using our software with a faxmodem. We have found that the most popular of these, the Gateway 2000 Telepath FAXMODEM, can be used with QuickTrieve.

To operate this faxmodem with our software, set the modem switch to IRQ3, or if you are using version 4.03b.2 or higher, start the program with the QT /IRQ=5 command. An alternate dialog file may also be necessary for proper dialing. Contact customer service for instructions on changing your communications dialog file, or to request a new dialog file on diskette. ♦

## Super Trader's Almanac

The enclosed insert describing the Super Trader's Almanac introduces a fairly profound document that has a wealth of helpful information. The price isn't cheap, but the content and substance are substantial. If you happen to be a serious student of the markets, the two-volume set may be a worthy investment. ♦

## Data Release Times:

### 1:15 PM Eastern Time:

Pacific Rim commodities; SYDFE currencies, commodities, cash Industrial Index, cash metals and minerals; All TSE commodities including the TOPIX index; All TIFFE commodities, OSE Nikkei Index; All Tokyo commodities; HKFE Hang Seng Index; All SIMEX commodities. The LME cash platinum is also posted at this time.

### 4:30 PM Eastern Time:

CBOT Grains, Chicago Mercantile Commodities, Winnipeg, Minneapolis Grain Exchange, IMM Currencies, Kansas City Wheat, NY Sugar, NYMEX Potatoes, New York Metals and World Commodities, Philadelphia Currency Options, Coffee, Orange Juice, Cotton, Cocoa, CBOT Gold and Silver, Financial Instruments, LP Gas, CPI Index, LIFFE commodities and all overseas commodities not previously posted.

### 5:15 PM Eastern Time:

Stock Index Futures, Stock Indices, Stocks, and CSI Industrial PERPETUAL INDICES.

### 6:00 PM Eastern Time:

MidAmerica, the remainder of the commodity options, stock index options and mutual funds.

CSI's normal access time is after 5:50 p.m. eastern time. An early access surcharge applies if data is retrieved before that time. Discounted rates are available for retrieval during certain evening hours. Please refer to CSI's current price schedule for applicable charges and discounts.

## Ask Customer Service

**Each month in this column, our Customer Service staff addresses a topic of interest to CSI subscribers. A recent procedural change has raised many questions regarding the time of access for daily updates. Here is a recap:**

**Q.** *I must have called too early for my data yesterday, as I find some of my contracts are missing. How can I find out if I got my entire portfolio when I call for daily updates?*

**A.** After data distribution, you have the option of printing a data listing. If you print the listing, a distribution status will be included for each item on your data drive. Look for a MISS status, which indicates something was missing from the update. An item may be listed as missing if the contract recently expired, if it was deleted from your portfolio, or if its exchange was closed.

QuickTrieve version 4.04 offers several refinements in the data listing format, including the ability to exclude contracts that are not expected to be updated.

**Q.** *I called early to check on my commodities and, as expected, none of my stocks were updated. I called back at my normal time to get the stocks, but they were still missing. Why couldn't I get them on my second call?*

**A.** For the last six months or so we have provided automatic recreation of all portfolios. This means that every time you dialed into the data base, our host computer created a fresh, updated file. This procedure helped those callers who frequently call before the scheduled posting time for their data, but it unnecessarily and unacceptably slowed retrieval for others.

For the time being, we have reverted to our old system of setting files on the first call. Your first call to the computer determines what is available for the selected day and any subsequent calls for the same day produce exactly the same data set. If you find you are missing data on your first call (Update status = MISS), please call customer service

and ask them to reset your file. Your next call should yield a complete portfolio. We will probably reinstate automatic file creation in March, after we have completed work on speeding the process.

**Q.** *I would like to avoid making multiple calls to the data base to pick up my portfolio. How can I be sure everything is updated before I call?*

**A.** Although there are sometimes exceptions when data is late, we normally have everything ready by our scheduled posting times. If you always call after your latest market's scheduled release, chances are good you'll get everything on the first call. A summary of the posting schedule is listed on page 3 for your convenience. The same schedule is in the Data Resources Appendix of the QuickTrieve Manual.

**Q.** *Do I pay more for daily updates if I have to call back for missing contracts?*

**A.** That depends on how often you do it. We allow 26 updates in a month (which typically has 21 trading days) at no extra charge. If you call more than 26 times during the billing period, expect to pay more. If you frequently experience problems with missing data, you should discuss the problem with a customer service representative. It is rare for a problem on our end to require users to make extra calls. It is likely that you need to modify your dialing habits or perhaps make arrangements to get a second portfolio for the items that are released later. ♦

## Designing Neural Networks...

(continued from page 2)

as speech synthesis, pattern recognition, vision and robotics, but they clearly have a place in the investment industry where the input stimulus is represented by stochastic time series. In the financial market trading area, the model will typically measure how accurately a price can be predicted within one to perhaps three days. This is done by minimizing a sum of the squares of error.

Louis Mendelsohn (*see sidebar*) has developed some neural network products in the financial area (Vantage Point Software) which are used by many CSI customers. I do not have any first-hand experience with these products, but they obviously are generating a great deal of interest. Mendelsohn offers four products, each of which requires seven intermarket independent variable time series. All of

these products use CSI's statistically stationary Perpetual® Contract data. Mr. Mendelsohn obviously concluded early in his work that stochastic stationarity was a necessary requirement to drive his neural net model.

I feel that CSI is already ahead of the balance of the data industry because for two decades our Perpetual Contract data has proved to be a viable form of input. Neural networks work well with such data. Certainly, there is much to learn about this new method of market analysis. As it becomes appropriate, I look forward to contributing more on this subject in the future that will help our readers stay current with today's newest technology. ♦

*Bob Pelletier*

### Neural Network Resources:

NATURALLY INTELLIGENT SYSTEMS by Maureen Caudill and Charles Butler (Massachusetts Institute of Technology, 1990)

NEURAL NETWORKS ALGORITHMS, APPLICATIONS and PROGRAMMING TECHNIQUES, by James A. Freeman and David M. Skapura (Addison-Wesley Publishing Co., 1991)

NEURAL NETWORKS Theory and Applications, edited by Richard J. Mammone and Yehoshua Zeevi (Academic Press, 1991)

Mendelsohn Enterprises, 25941 Apple Blossom, Wesley Chapel, FL 33544. (813) 973-0496 or (800) 732-5407

## CSI Software Product Summary

- QuickRetrieve®/QuickManager®** - To retrieve, manage & edit data; includes Alert Calendar: Unrestricted use \$99, Daily data user \$39 and 4.04 Upgrade \$25
- QuickPlot®/QuickStudy®** - Charting & analysis software (requires QT/QM) \$156 Currently on sale @ \$99
- Trade Data Manager™** - Macintosh downloader & accounting program; includes 1st month of updates \$99
- Trader's Money Manager™** - Introductory price \$499 (a \$200 savings)
- Trading System Performance Evaluator™** - Computes your system's capital requirements \$199
- TraDesk™** - Traders' complete accounting system-(price varies with number of accounts) Starting @ \$399/Unrestricted use \$299/Daily data user or 12-month lease starting @ \$22/Mo.
- Seasonal Index Value Pack** - Ten years of history for 33 popular commodities \$444
- Daily Updates** - Starting at \$10.80 per month
- CSI News Journal** - Aug. 1990 to present \$35/Yr. or \$5/Reprint
- CSI Mailing List** - \$200/1,000 names (CSI users omitted)

CHECK     MASTERCARD     VISA

AMOUNT ENCLOSED \$ \_\_\_\_\_

CARD # \_\_\_\_\_

EXP. DATE \_\_\_\_\_

NAME \_\_\_\_\_

DAY PHONE (\_\_\_\_) \_\_\_\_\_

ADDRESS \_\_\_\_\_

SIGNATURE \_\_\_\_\_

USER ID#: \_\_\_\_\_

5 1/4" DISK     3 1/2" DISK

02/93

All prices subject to change without notice.

QuickRetrieve, QuickManager, QuickPlot and QuickStudy are registered trademarks. Perpetual Contract is a registered service mark. Trading System Performance Evaluator, Trader's Money Manager and TraDesk are trademarks of Commodity Systems, Inc. CSI is a licensor of Trade Data Manager, which is trademarked by James McClure.