In This Issue

Market Analysis Takes on a New Dimension (With Neural Networks and Chaos)

Move over point and figure charts, bar charts, trend lines, and the like. You may have served traders of previous decades well, but the savvy trader of the '90s is ready for more sophisticated and fruitful methods of market forecasting. Ever since the introduction of the mainframe computer in the 1950s, market analysis has been stepping forward with improvements which include regression, statistical correlation analysis and, for the sophisticated trader, multi-variable correlation tools. The personal computer has brought (by way of toolkit programs) moving average crossover studies, RSI, channel breakout, etc. ad nauseam to the hands of the individual investor. Unfortunately, through many an unexpected margin call and loss of trading funds, investors have found that these tools do not provide all the answers, nor do they guarantee success.

On the brighter side, the technological advances of the 1990s have introduced many varieties of newer tools and many new markets on which to apply them. Where the focus of the past was on linear market analysis, the newer and conceptually complex technical innovations of the present make use of brute force computer power to solve problems. Neural networks, chaos theory, fuzzy logic, and exotic filtering methods are now at the leading edge in obtaining fruitful analytical results.

### Now and The Past - The Analytical Difference

How do these relatively new ideas differ from, say, the proven methods of multiple correlation models that were (and still are) promoted by nearly every business school in the country? The answer lies in the nature and shape of the process being modeled. Newer technologies such as neural networks - as applied to time series, chaos in market analysis and fuzzy logic do not require the general mathematical simplification of linearity, nor do they necessarily require the general rules of independence.

The assumption of linearity, which is frequently used in mathematics to reduce complexity, has been applied in most technical analysis methods for the past few decades. However, as the CSI Technical Journal of April 1994 suggests, the assumption of linearity is often an oversimplification that does not fit practical time series analysis. The neural network performs an exercise on pre-conditioned data that hypothesizes a broad range of coincidental properties that may be useful for predictive purposes. The network
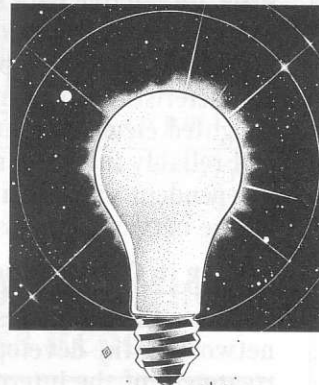
> *"The objective of chaos theory is to uncover the simple rules and laws that lead to the complex result one wishes to study."*

processor searches a curvilinear range of possible approaches in an attempt to find a workable solution.

The absence of linearity notwithstanding, are the newer tools worthy of the hype and promise industry literature has bestowed upon them? The answer is very definitely "yes." They can be of unprecedented benefit in producing trading plans when used correctly.

A neural network is an exercise wherein 90% of the effort involves conditioning input data into a form where all interdependent inputs can appear in a similar and comparable scale. Interactive data sets are observed to measure positively or negatively correlated performance characteristics over time. Patterns of weighted elements that consistently and reliably infer the movement of a dependent variable are examined by the network processor.

Adding in Chaos Principles

Chaos theory relates to the neural network in the development and treatment of the interdependent elements of input. No single input is required to exist in an independent state and each input may alternately, at seemingly random points, take on causal or resulting (non-causal) properties, depending upon the sequence and relationship of other elements at given points in time. Such interdependent relationships are the norm when exploring neural networks. Chaos is often thought of as a science where complexity is derived from very simple laws or norms. Turning the time crank and allowing very simple rules to prevail can generate an impossibly complex result. The objective of chaos theory is to uncover the simple rules and laws that lead to the complex result one wishes to study.

Misused Applications of Neural Networks

As discussed in the September 1993 CSI Technical Journal, neural networks can be misused with less-than optimal results. The September '93 article discouraged use of neural networks to select from among several types of price-determines-price studies to decide which is most appropriate at random times when trading a particular market. Given a single market and no other independent market data, the use of a neural network to tell when it is appropriate to employ RSI, stochastics, channel breakout, etc. is most likely not a fruitful application of a neural network. The reason for this is that all of these methods measure the same sort of momentum movement in price. The similarities are quite simply too significant to accurately measure a particular preference with any reliable level of significance. This is but one example of the many ways very similar, dependent data can be incorrectly used as independent variables feeding a neural network.

Factoring in Computer Power

What is actually needed in such an application is input that classifies multiple interdependent market sources to determine the impact of groups of inputs on the direction of the proposed dependent variable. Neural networks and chaos principles can be combined to accomplish this end. The computer power helps to search out relationships that worked in the past (the training period), and will hold up in a virgin test period and verify the training-period result.

The faster computer power available today is the key resource making the technology of neural networks and chaos theory possible.

Macintosh History On-Demand in Beta Testing

Until now, the ability to order historical data and download it in the same phone call was a luxury for PC users that left our Macintosh customers out in the cold. No more!

Several Trade Data Manager users are now testing our upcoming release, (version 1.5.2) which will include the History On-Demand feature. With this new software, Macintosh users will benefit from both convenient history processing and lower prices.

We expect to release Trade Data Manager version 1.5.2 during the month of June. Pre-release orders are being accepted on a first-come, first-serve basis. To order, please see the CSI Software Product Summary on page 5. Credit cards will not be charged nor checks cashed until the software is shipped. ✦

We've Added New Data Lines and a Second Fax to Serve You Better

Everyone hates busy signals - and for good reason. They are frustrating time wasters for busy investors like our customers. Unfortunately, since we added History On-Demand and greatly increased the volume of data calls, our customers have been having to deal with more frequent busy signals. You can kiss those busy signals goodbye, because in the past month we have installed one new phone line for high-speed transmissions and switched a largely inactive 1200 baud line over to a more popular 2400-14.4 baud modem. We expect to have a third high-speed line installed by June 1st, at which time busy signals should really be a thing of the past. We apologize for the inconvenience you have experienced and thank you for your patience in awaiting these expanded services.

We have also added a second fax line, primarily for use by our Marketing and Bookkeeping departments. These department are on the ground floor of our two-level operation, so a separate fax machine should allow them to respond more quickly to your faxed correspondence.

For marketing inquiries and billing questions or credit card payments, please send your faxes to (407) 392-7761. This line should also be used as a backup for our primary fax line (407) 392-1379 whenever needed, especially during the peek activity hours of 4:30 to 6 p.m. eastern time. ✦

CSI FAX #s

Bookkeeping & Billing (407) 392-7761
Customer Service & Data Department (407) 392-1379 (most hours) (407) 392-7761 (4:30 - 6 p.m.)
Marketing & Sales (407) 392-7761

History On-Demand: A Progress Report

We appreciate your patience as we work out the remaining bugs in our History On-Demand service. Since we introduced immediate processing of historical data in April, we have made the following enhancements:

Completed Work:

- Included both commodities and stocks
- Expanded time period to include the full history of the data base
- Improved reliability

Still To Come:

- Changes to portfolio processed with history order (planned for 6/94)
- Cash, nearest-future and Perpetual Contract® data (availability planned for 7/94)
- Further improvements in reliability (ongoing) ✦

Ask Customer Service

A couple of times a year, our customer service staff steps aside to let our bookkeeping department address issues concerning CSI's billing procedures. Here are a few common questions and answers about our monthly statements from Kathy and Debbie.

Q. *My first CSI invoice shows a balance due of -$39. Although I prepaid for my first month of service, I haven't actually started retrieving data. How can I have generated more charges?*

A. Whenever your amount due is a negative number (indicated by a - sign), the invoice becomes a credit memo and no payment is due. The amount shown is the positive credit in your account which we will apply to your future charges. Credit balances are common on a first invoice from CSI because of our prepayment requirement. They may also occur if you overpaid a prior bill or received a credit for a CSI purchase.

Q. *My invoice shows a prior balance, but I know I paid my last bill. Why doesn't it show up on my invoice?*

A. The due date of your CSI invoice is the 15th of the month. All payments received by the 25th are noted on your invoice, while those received after the 25th won't appear until your next statement. To assure proper credit, please be sure your payment arrives on time. Also write your User I.D. on the check and include the payment stub. Please do not staple your check to the stub. If your invoice does not reflect a payment that may have crossed in the mail, simply deduct your prior payment from the balance due.

Q. *I would like to pay my invoices by credit card instead of by check. Is this possible?*

A. Certainly. Many customers find credit card payment simple and efficient. If you would like automated monthly billings on your credit card, please request an authorization form from us and return it to the bookkeeping department. Starting the following month, you'll receive a receipt with your invoice. If you prefer to preview your charges each month, you may call or fax authorization at your discretion. We'll need your name, User ID, credit card number with expiration date and the dollar amount of the charge. CSI accepts MasterCard, VISA, Discover and American Express.

Q. *What should I do if there is an error on my bill?*

A. Call the Bookkeeping Department. We can be reached from 9 a.m. to 5 p.m. eastern time Monday through Friday (holidays excluded). Please have your invoice number on hand and be prepared to say why you feel the bill is in error. Your billing questions will be handled promptly and courteously.

Q. *How many calls for daily updates may I make in a month without incurring extra charges?*

A. Our price schedule allows for 26 updates during a billing cycle, even though there are normally just 21 trading days. Accessing more than 26 updates will result in proportionately higher costs. When more than 26 updates are requested for a custom portfolio, the next month's bill shows a PA (Prior Adjustment) of 4% per additional access. For a fixed portfolio, you would not have been pre-billed for your service. Therefore, your next bill would show the normal monthly rate for the fixed portfolio plus an extra-call surcharge of 4% per access exceeding 26 updates. ✦

Sprintnet Promises Lower Rates for Int'l Callers

Despite significantly higher rates, we find a large number of overseas users of the CSI Data Retrieval Service are still dialing through Tymnet instead of Telenet's Sprintnet service. Both services offer toll-free international access of the CSI data base, but Sprintnet charges much less.

Those users who have converted to Sprintnet are, for the most part, reporting good service. They are also pleased with the lower prices we can pass along when not paying Tymnet's high per-minute and kilocharacter charges.

Sprintnet uses a different brand of modem than Tymnet, so the qualify of service could vary. A Hong Kong customer reported problems with the Sprintnet service there. Unfortunately, there is a wide range of quality in modems. Some work well and some do not. We note that problems often boil down to inferior or incompatible products on either end of the communication link.

If you are still using Tymnet for international calls and would like to change, please contact Customer Service for local access numbers and information on making the simple change in User Constants. For the difference in price, Sprintnet is certainly worth a try. You may be glad you did! ✦

Holiday
Schedule

CSI will be closed for voice communication on Monday, July 4th for the Independence Day holiday. The CSI host computer will be accessible as usual throughout the holiday weekend.

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CSI Software Product Summary

Please check all that apply and complete the information box at right.
Mail or fax to CSI, 200 West Palmetto Park Road, Boca Raton, Florida 33432; Fax: (407) 392-7761

❏ **QuickTrieve®/QuickManager®** for PC - To retrieve, manage & edit data (includes 1994 Alerts Calendar); Unrestricted use $99. New daily user $59. QuickTrieve/QuickManager version 4.05 upgrade (for current QuickTrieve users only): $39

❏ **QuickPlot®/QuickStudy®** for PC - Charting & analysis software (requires QT/QM) $89

❏ **Trade Data Manager™** - Macintosh downloader & accounting program $59; upgrade $49 or *FREE* with $100 history order
  ❏ Ship version 1.5.2 when available

❏ **Trading System Performance Evaluator™ (TSPE)** for PC - Computes your system's capital requirements $149

❏ **Trader's Money Manager™** for PC - $399 (includes TSPE); Demo disk: $15

❏ **TraDe$k™** for PC - Traders' complete accounting system-(price varies with number of accounts) CSI daily user $149; Unrestricted use $299; 30-day trial version $22

❏ **Seasonal Index Value Pack** for PC - Ten years of history for 33 popular commodities $315

❏ **Daily Updates** for PC - Starting at $10.80 per month

❏ **CSI Technical Journal** - Aug. 1990 to present $35/Yr. or $5/ Reprint

❏ **CSI Mailing List** - $200/1,000 names (CSI users omitted)

❏ **CSI Product Catalog** - *FREE*

NAME _____

DAY PHONE (____) _____

ADDRESS _____

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USER ID# _____

DISK PREFERENCE
- [ ] 5.25"/360K [ ] 5.25"/1.2 MB (HIGH DENSITY)
- [ ] 3.5"/720K [ ] 3.5"/1.44 MB (HIGH DENSITY)

METHOD OF PAYMENT (PREPAYMENT REQUIRED)
- [ ] CHECK [ ] MASTERCARD/VISA [ ] AMEX

AMOUNT ENCLOSED $ _____

CARD # _____

EXP. DATE _____

SIGNATURE _____

6/94

All prices subject to change without notice.

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Neural Network
Resources:

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

NEURAL NETWORKS ALGO-
RITHMS, 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, Inc.
(Vantage Point Software) 25941
Apple Blossom, Wesley Chapel,
FL 33544. (813) 973-0496 or
(800) 732-5407

Art Turman (Neurotrader
Software) 299 Indian Creek Rd.
Oakhill, FL 32759. (904) 345-
0502

The speed of the computer is critical to the network processing algorithm because of the vast quantity of input and the many combinations of weights of input that must be examined to produce reliable patterns of cause and effect. All inputs may be grouped in subsets where the elements of each set are weighted over a finite range. This allows the network to establish and verify a repeatable and predictive dependent variable response.

Neural Network Input Layers

Typically, a neural network design will hold what has been loosely defined as visual input layers and visual output responses. Various further consolidated subsets not necessarily identified by the user will lie in so-called hidden layers where further weighting and combining of inputs are processed. Plenty of programs exist on the software market for processing the interactive layers of combinations of inputs, which the literature typically refers to as input neurons. It may not be expedient to reinvent the proven tools of a neural processor. It is probably more practical to spend one's efforts on the pre-conditioning of the data and in setting up networks. Leave any compulsion to reinvent this wheel to someone else until you can conceptualize and fully grasp the overall process.

Input Preprocessing

The key to the design of a network is in preprocessing the input. My earlier statement that 90% of the total neural network design effort concerns input data is not an exaggeration. A key requirement one must satisfy during the data preconditioning exercise is the introduction of leading or lagging input effects. The market often must digest subtle day-to-day news and developments

before a measurable reaction takes place. What happened with a given input weeks ago may be more germane today to the expected direction of the dependent variable than the immediate effects one is conditioned to anticipate when a significant event occurs. These considerations must be taken into account when the input preprocessing work is done.

For example, Treasury Bill prices which reflect short term interest rates may have an impact on a stock market index like the S&P 500. A closer look shows that the effect of a drop in T. Bills on the S&P will later be absorbed and discounted as the public gets accustomed to the change in interest rates. In other words, the short term effect of lower rates is significant to the stock market only in the short term. The longer term effects of stock market directional movement depend upon other factors beyond simple interest rates. A neural network for forecasting stock prices might therefore take a dual role (focusing on today's rates and the rates of weeks earlier) where short term interest rates are involved.

It is the sophisticated use of neural networks and chaos theory that allow new insights into market movement. Today's traders have access to analysis methods investors of previous decades only dreamed of. With more and more powerful personal computers available to individual investors, the power of technology is no longer limited to those few engineers and analysts with access to mainframe computers. While no analysis method or system can guarantee trading success, the use of these tools can greatly enhance your chances of prospering. ✦

Bob Pelletier