PRODUCT REVIEW

NeuroShell Trader

Version 4.2

WARD SYSTEMS GROUP, INC.

Executive Park West 5 Hillcrest Drive Frederick, MD 21703 Phone: 301 662 7950 Fax: 301 663-9920 Email: sales@wardsystems.com; support@wardsystems.com System requirements: 800 MHZ Pentium or equivalent, 128 MB RAM, Windows ME/2000/XP. (Much of this review was done using a 450 MHZ PC with Windows ME.) Price: Prices start at \$795 for NeuroShell Trader, and go to \$2,295 for NeuroShell DayTrader Professional. Numerous plug-ins available at \$299 each.

by Dennis D. Peterson



hen you start reviewing an excellent product you can generally tell immediately, and so it was with Ward Systems' NeuroShell Trader.

What makes this an outstanding product? As you get started, you find that the CD-ROM that contains the program code also has a number of video clips. Each one is short and to the point so you don't have to listen to a long lecture. You can listen to just what you need. That's a very nice touch I seldom see, and it was my first clue as to the quality of the product.

DATA SOURCES AND CHARTING

The first thing you want to do is access your data. NeuroShell Trader supports a variety of data formats and allows you to distinguish between data on your hard drive versus datafeeds you might have. You can mix and match sources on a single chart. The menuitem "Tools" lets you select "Data sources," which has three tabs (Figure 1) allowing the identification of servers and datafiles. For example, under the "Server" tab you can see that six different servers are recognized: eSignal, TradeStation, Omega Research Global, Prophet, Dy-



NeuroShell Trader enables the user to develop and test trading systems in a charting interface; choose from over 800 indicators, neural networks for predictions, and trading rules.

namic Data Exchange, and Quote.com.

In Figure 2, I used the eSignal data server for the top chart of daily QQQ data, and for the bottom chart of Nasdaq new highs and new lows I used MetaStock data from my hard drive. To put this data on the chart, you follow a pattern of user interface techniques of dropdowns and dialog selections used throughout the software. What you even-



FIGURE 1: DATA SOURCES INTERFACE. Establishing a link to data is easy, as the choices have been made for you through dialog screens and dropdown lists. All you have to do is make a choice. The most popular servers are supported, while the Directories/ Files Tab allows you to follow a folder/file tree of your hard drive to identify MetaStock, CSI Inc., and csv (comma separated variables) files.



FIGURE 2: DAILY QQQ AND VOLUME, WITH NASDAQ NEW HIGHS AND LOWS. Legends accurately describe the data shown. The top chart is daily QQQ data using an eSignal server, with three moving averages; note the legend at the top with volume in the middle chart, while the bottom chart is the 10-day simple moving average of Nasdaq new highs/ (new highs + new lows) using MetaStock files on the hard drive. The height of each chart can be sized using cursor drag and click between charts, while time covered is governed by zooming in or out over a scrolled area.

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Indicator Wizard

	Day & Date Flags Time Flags Boolean Relational Rules Trading Strategy: Exit Signals Crossover & Breakout Identification
11 11	Note: Only Boolean (True/False) indicators are available because the indicator or trading strategy that you are inserting into requires a Boolean input.
Help	Options < Back Next > Cancel

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FIGURE 3: INDICATOR INTERFACE FOR TRADING STRATEGIES. In keeping with a syntax-free interface, the user is given a list of categories to choose from for building the trading strategy rules. Choices include day and time flags to allow you to optimize on days of the week or hours of the day, and relational rules such as A>B, where you can choose from any of the 800-plus indicators to be either A or B.

FIGURE 4: INDICATOR RELATIONS AVAILABLE. Rather than have the user type in what A and B might be, along with <, >, or =, you select one of the relations and the software will allow you to select a line that reads "A=" and fill in the blank using the indicator wizard where the numerous indicators are available.

tually find out is that the user interface doesn't require you to become an expert in NeuroShell syntax, since the interfaces have all been set up for you.

The charting capability provides crisp clean pictures (Figure 2) and allows you to add charts of indicators and other data. How much you see of what you have created is controlled by interfaces that allow you to hide selected pieces of data, zoom in or out on what is shown, or simply change the frequency by using a dropdown list at the top right of the top chart. There are more than 800 indicators to choose from and you can select multiple periods for an indicator by simply typing in the periods separated by commas. Charts can be saved either as a chart with your specific quote data or as templates to retain indicators or trading strategies you have built.

vides neural network solutions as well, but the optimization of trading statements or indicator parameters is incredibly quick, brought about by the use of a genetic algorithm.

GENETIC ALGORITHM

Unless you go out of your way to find a description, you won't see how seamlessly this approach has been integrated into the software. What the algorithm does is find the optimal solution to either the parameters in custom indicators or the true/false statements in a trading strategy.

The algorithm is only available in the professional versions of NeuroShell Trader. The performance is amazing in that what would easily take hours with other processing models, going through every combination of parameters or state-

> ments, gets you there in a matter of minutes using the genetic algorithm. Now, of course, you might worry about curve-fitting, but NeuroShell Trader is one step ahead of you on that account as well.

Let's take a problem that usually consumes

many traders' hours of either set-up or computational time to see if there is a winning trading strategy. There's a problem, though: Are there favorable times to trade a stock during the day, and what

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indicator might work best? In bull markets, it seems at times the rule is to sell before lunch and buy in the last five minutes of the trading day. Even in bull markets, with a substantial gain the day before, profit taking seems likely at the beginning. Mind you, this exercise doesn't even touch using neural networks, but we'll get to that.

From the main menu line, select "Insert," then "Trading Strategy." You are presented with tabs that require trading rules for long and short entry/exit. When you select "Add Conditions," you get the Indicator Wizard (Figure 3). The lists of indicators are strategy-specific, so if you try to insert an indicator not connected with trading rules, it won't work.

Now, select one of the categories. If you choose relational, then you get a set of choices (Figure 4). Then select the relation that makes sense, such as A>B, and when the relation is shown in the tab for, say, long entry, you will be given the chance to state what is going to be A and B by first clicking on A then B. When you do, the indicator wizard appears again.

As you create the statements for each of the tabs, you'll notice a small "+" beside the rule, and clicking on it causes an expansion that shows the range of variables that are going to be tested (Figure 5), which you can change. At the top of dialog space, a dropdown lets you select from market, stop, limit, stop

optimization of indicator parameters is incredibly quick, brought about by the use of a genetic algorithm.

You'll note the absence of drawing tools such as trendlines, pitchforks, or Fibonacci retracement lines, but the real power of this software is in the genetic algorithm. Obviously, the software pro-

The software provides neural network solutions as well, but the Stocks & Commodities V. 21:12 (87-91): Product Review: Neuroshell Trader Version 4.2 by Dennis D. Peterson

Use the tabs below to specify rules for when to buy or sell
Cong Entry Long Trailing Stop Long Exit Short Entry Short Trailing Stop Short Exit ✓ Generate a buy long market ▼ order if all ▼ of the following are true • Time=×(Date Variable ×) Date Marking Stop Date = Date
X Search Space = 2:300 PM to 3:30:00 PM + A>8(MACD Signal[Time Series,ExpAvg1 Periods,ExpAvg2 Periods,ExpAvg3 Periods),B) = A>8(IRSI(Closing Price,Periods)B) = Closing Price Search Space = Close = Periods Search Space = 1 to 10 = B Search Space = 0 to 100
Add Condition(s) Modify Condition Remove Condition(s)

FIGURE 5: TRADING STRATEGY INTERFACE. Separate tabs allow separate entry of rules/ conditions for long and short entry/exit, and clicking on the "+" to the left of the condition statement expands the statement to show the parameter range chosen by the system. Each line can be individually selected to allow the parameter range to be changed. Note that in the middle condition, the relation is easily seen as A>B, where A is the MACD signal and B is a parameter with a separate range. There's no syntax; just click and fill in the blank.

limit, and market close for order types, and looking farther to the right, you see a box that says "If all of the following are true." The "all" can be changed to one, two, three, or whatever number of statements you want to be true to place the order of your choice.

You could set all this up in 10 minutes. Now, recall that NeuroShell Trader was one step ahead of us in curvefitting. You can select one period of time to optimize and then, using the parameters or statements found in that optimization period, use them to paper trade. An interface is provided (Figure 5) that allows you to select the first dates for the optimization period and the paper-trading period. The other tabs allow you to set commissions, margins, buy a fixed number of shares or buy against a fixed number of dollars, or use the whole account, optimize against profit or minimum drawdown, and so forth.

TRADING STRATEGY OPTIMIZATION

Now, you let the software work on the problem. I used the genetic algorithm on five-minute interval data of SPY (AMEX: Standard & Poor's 500) starting on July 21, 2003, and optimized through September 20, 2003, on a range of both entry and exit times (see Figure 6). I also used two indicators, the moving average convergence/divergence (MACD) and relative strength index (RSI) for long and short entry, each having a

range of values. It took a computer with a 2.6 GHz processor with Windows XP approximately five minutes to arrive at the answer.

The answer is presented in a variety of forms, one of which is the trading rules (Figure 7). In case you are curious about trading SPY, the answer is: Buy long at 2:30 and sell at 4:00, given that the MACD signal is greater than -6.5, using a

MACD of seven, eight, and 12 periods and a two-period RSI > 28; and buy short at the first interval after the market open if the MACD of two, six, and 19 periods is less than 88 and a nine-period RSI is less than 57. This gives you 14 wins and 10 losses in paper trading from September 20 to October 14, 2003.

The visual picture of equity and trades (Figure 8) shows that while the optimization was done on periods of principally sideways motion, there are

Trading Strategy Parameters					
Rules Trading Dates Costs Optimization					
Data used to evaluate trading strategy					
[Specify Date]					
Optimization Paper Trading					
07/21/2003 🗧 09/20/2003 🗲 Last Chart Date					
 Optimize across data before paper trading End paper trading before last chart date 					
<u>QK</u> <u>Cancel</u> <u>H</u> elp <u>Qptions</u>					

FIGURE 6: TRADING DATES OPTIMIZATION. NeuroShell Trader Professional allows you to pick a span of dates to optimize on, and then paper trade another period using the optimized results. The other five tabs allow you to select all of the usual parameters for trading such as commission size, trading size, as well as choose from 18 different optimization techniques, such as maximize on net profit, minimize drawdown, and the maximum number of winners.



FIGURE 7: OPTIMIZED TRADING RULES. The results of your trading strategy are presented with the usual statistics, trade-by-trade rules as well as the rules that finally were chosen.



FIGURE 8: TRADING STRATEGY PAPER TRADING RESULTS. Top chart is five-minute SPY price bars, and the bottom the equity curve. Long entry is shown with a blue up arrow, and short by a down red arrow. Exits are shown with down blue triangles and red up triangles. This is the paper-trading phase that uses the parameters set by the optimization period. Equity performance is one of a few charts available to examine performance.

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FIGURE 9: NEURAL NETWORK INPUT INTERFACE. Shown are the six indicators that will be used to create a neural network solution for trading the underlying security, which in this case will be SPY at five-minute intervals. Any of the 800-plus indicators can be used, or other price or market data. One of the indicators, %R, has been expanded to show the parameters used in building the indicator, which in this case uses a range of periods from 1 to 10.



FIGURE 10: FIVE MINUTE SPY PRICE (TOP) AND EQUITY (BOTTOM). The gray price bars are the ones used for neural network training, while the green bars are the ones used to do the evaluation or paper trading. Entry and exit for longs and shorts are shown the same way as for trading strategies, with blue up arrows for long entry, blue down triangles for long exit, red down arrows for short entry and red up triangles for short exit. Red and blue Xs show the actual entry/exit fill price for longs and shorts. The equity curve is the result of optimizing using the criteria of maximum percentage gain. The inputs are in Figure 9, while the percentage choice the genetic algorithm made in optimizing is shown in Figure 11.

few serious drawdowns, in part due to limiting the number of shares traded. Examining the long and short entries/exits shows that the technique was successful.

NEURAL NET PREDICTIONS

As the name infers, NeuroShell Trader provides neural net solutions. The user interface is similar to that of inserting a trading strategy. You start by inserting a prediction into a chart. Instead of filling in the six tabs associated with a trading strategy, you have only one (Figure 9), and going through "Add Inputs" gets you to the same indicator wizard you have used elsewhere. You can also input "Other Instrument Data," meaning you can input other price or market data. The plus signs to the left of each of the inputs is the same as for trading rules: associated with each indicator is a range of parameters that will be optimized. Again, you can change the range of the parameters.

When you are finished with your inputs, your price chart (Figure 10) is annotated with the buy and sell entries and exits, but the price bars are also color-coded to indicate which were used for training and which for evaluation (paper trading).

The results of the neural network train-

ing include optimization. Associated with each of the indicators is a range of parameters, and as part of the neural network solution, the genetic algorithm (professional version only) will be used to find the optimal neural network inputs and thresholds. Neural network solutions are calculated as the genetic algorithm searches for the optimal inputs and thresholds. After using this product, it becomes apparent that the genetic algorithm is a powerful feature since it is always looking for an optimal solution. Again, you get to define what is meant by optimal for example, maximum percentage gain or minimum drawdown — but in the case of neural network solutions, you get to choose from an additional five that are neural network–unique, giving you a choice of 23 different target solutions.

An interesting twist that NeuroShell Trader provides is that rather than show the Sharpe ratio[†], one of your optimal solution choices is maximum Sharpe ratio.

With six inputs, you probably want to know what was finally found by the genetic algorithm as the optimal solution. Because the genetic algorithm is optimizing using the input parameter ranges as choices, some indicators end up being used more than others. In this case, the optimized solution to five-minute SPY bars shows (Figure 11) that stochastic %D, volume price trend, and money flow index (MFI) are noncontributors to the optimal solution.

Does it get better? Yes. You can select different walkforward periods, how many you want to use, and how many you want to optimize. NeuroShell Trader defines walkforwards as containing both the training period and evaluation period. The dates you input to the neural network allow you to stagger training and evalua-



FIGURE 11: NEURAL NETWORK PREDICTION RESULTS. Six indicators, each with a range of parameters such as the number of periods used in Williams' %R, were used to find the optimal solution, which in this case was maximum percentage gain.

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tion. It would be as if you ran a training many months ago and then decided you wanted to train again but with more recent data. You can also access other neural network models using the plug-ins.

SUMMARY

What becomes apparent as a strong feature with NeuroShell Trader is that it allows the recursive use of inputs. A neural network can be the input to a trading strategy or another neural net. An indicator can be the input to another indicator. Trading strategy signals can be input to neural nets, other trading strategies, or indicators. Coupled with the genetic algorithm optimization of the professional version, this is a powerful piece of software. And fast!

The interface to TradeStation allows the import of both data and indicators. I used MetaStock end-of-day data and eSignal. Every screen can be moved and sized. I turned on all of the options. For new users this might be a bit daunting. I exhausted the video clips, but they were a great start. I liked the brevity.

Finally, I liked the syntax-free way of constructing indicators and strategies. This is one of the most user-friendly interfaces I have used. I installed plugins with ease. I use a combination of visual clues and indicators in my own trading, and I would recommend some drawing tools be added.

I tried to keep my identity as a reviewer a secret during the review process to get an idea of how helpful the support people are, but it didn't work in this case, because NeuroShell calls you after the first week to see if you need any help. It is easy to understand why this software is the readers' first choice.

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