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EDS ANALYSIS

DIVERGENCE TESTING LEADS TO AN INCREDIBLE EXPERT DESIGN STUDIO MODEL

By David Vomund

Divergence analysis is a key component of technical analysis. Any technician who is looking for reversal situations will incorporate some form of divergence analysis. Since AIQ's Expert System is a counter-trend system, there are

several rules based on positive and negative divergences. In this article, we'll put divergence analysis to the test using AIQ's new Expert Design

Studio and will then use the results to create an extremely effective short term trading model.

Almost any indicator can be used in divergence analysis. AIQ's Price Volume Divergence report uses Money Flow and On Balance Volume so we'll put to the test these two indicators (in upcoming articles we'll perform the same test with other indicators).

In quick review, a positive divergence using the Money Flow indicator occurs when Money Flow rises at the same time that the price of the security falls. Since the indicator leads price action, this is a bullish scenario. A negative diver-



DAVID VOMUND

"The results of testing a number of different indicators led to the best EDS model that I've created to date... We tested this model on the S&P 500 stocks and on the AIQ Pyramid industry groups. It outperformed in both cases."

gence occurs when the security increases in price at the same time that Money Flow decreases.

In the Expert Design Studio package, there is a prebuilt formula for a positive divergence in Money Flow and a prebuilt formula for a positive divergence in On Balance Volume. The formula uses a default value of 60 days but we have changed this value to 15, which is the number used in the Price Volume Divergence report.

Both On Balance Volume and Money Flow use volume in their analysis. These indicators lose their

EDS ANALYSIS *continued* . . .

effectiveness on thinly traded issues so we created a rule that only screened for stocks with a moving average of volume greater than 200,000 shares. This eliminates most of the "garbage stocks" that often give faulty indicator readings.

In our test of the effectiveness of Money Flow and On Balance Volume divergences, we looked at stocks that were uptrending and downtrending. An uptrending stock is one which is above its 200 day moving average and a downtrending stock is one that is below its 200 day moving average.

All of our tests reported in this article use a database of approximately 2200 stocks. The sell strategy is simply to protect 90% of principle and 90% of profit above 5%.

The results of our On Balance Volume divergence analysis test are found in **Table 1** and the results using Money Flow are found in **Table 2**. The statistics are based on two years of analysis and about 5000 trades, so we can feel confident that the sample size is sufficient. The most striking statistic is how the performance improves when using divergence analysis on downtrending stocks. The downtrending stocks have a higher return per trade with a shorter holding period than do uptrending

On Balance Volume Divergences

Table 1

	Uptrending Stocks	Downtrending Stocks
Average Profit Per Trade	1.62%	1.87%
Average Holding Period	20 days	14 days
Annualized Return (trading)	19.82%	31.89%
Annualized SPX (Buy & Hold)	30.68%	30.68%

Money Flow Divergences

Table 2

	Uptrending Stocks	Downtrending Stocks
Average Profit Per Trade	1.56%	1.96%
Average Holding Period	20 days	16 days
Annualized Return (trading)	19.54%	30.08%
Annualized SPX (Buy & Hold)	30.68%	30.68%

stocks. This is true whether you use On Balance Volume or Money Flow.

Screening for positive divergences on uptrending stocks underperforms the market. A strategy of buying downtrending

stocks that show a positive divergence gives a return about equal to the market. We should note that this assumes we buy all stocks with divergences, no matter how small. The weighting factor that is used on

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Table 3

	Winners	Losers	Neutral
Number of trades in test	2985	2138	840
Average periods per trade	18	17	14
Maximum Profit/Loss	78.47%	(51.57)%	
Average Drawdown	(5.26)%	(2.95)%	(12.29)%
Average Profit/Loss	2.22%	7.95%	(12.21)%
Average SPX Profit/Loss	2.20%	3.07%	0.06%
Probability	71.22%	28.05%	
Average Annual ROI	33.44%	112.64%	(211.33)%
Annual SPX (Buy & Hold)	30.68%		
Reward/Risk Ratio	1.85		

EDS ANALYSIS *continued* . . .

AIQ's Price Volume Divergence report is not part of our EDS screening.

Our final divergence analysis test looks for stocks that have a positive divergence on both On Balance Volume and Money Flow. The result of testing for stocks in a downtrend but showing a positive divergence on both Money Flow and On Balance Volume are found in **Table 3**. Here we see that the screening technique still has a lot of trades (2995) and slightly outperforms the market.

Creating an EDS Model

Users of EDS know that the majority of screenings underperform the S&P 500 (partially because the S&P 500 has been very strong, led by about 50 high flying stocks). The fact that the model in Table 3 kept pace with the market and had 2995 trades was encouraging. With that many trades, we can add additional screening techniques which can improve trading performance and still give us enough trades to make the system worthwhile. The results of testing a number of different indicators led to the best EDS model that I've created to date.

Table 4

	Winners:	Losses:	Neutral
Start test date:	01/02/96		
End test date:	03/02/98		
Number of trades in test:	1351	1004	334
Average periods per trade:	18	18	18
Maximum Profit/Loss:	73.64%	(45.37)%	
Average Drawdown:	(4.75)%	(2.90)%	(11.70)%
Average Profit/Loss:	2.62%	7.62%	(11.50)%
Average SPX Profit/Loss:	2.34%	3.13%	0.06%
Probability:	74.32%	24.72%	
Average Annual ROI:	39.17%	105.22%	(158.90)%
Annual SPX (Buy & Hold):	30.68%		
Reward/Risk Ratio:	1.99		

When a model looks for downtrending stocks with a positive divergence, it is looking for bottoming situations. Unfortunately, picking the low point on downtrending stocks is difficult and there are many false signals. Very often, it pays to wait until the stock actually begins to advance before purchasing. Therefore, we added to

our divergence model a price-based indicator that will only turn bullish when the stock actually advances. That indicator is Wilder's RSI.

The RSI is typically used as an overbought/oversold indicator. You can also use it to judge bullish or bearish stocks by simply seeing if the stock is above or below 50. When the RSI is above 50, the stock is moving higher and is bullish. To make the indicator more responsive to price movement, we lowered its setting in TradingExpert's Charts from 14 to 7 days.

The result of adding the RSI greater than 50 screening is found in **Table 4**. Comparing this result to Table 3, we see that adding the RSI screening helped increase the average gain per trade to 2.82%, up from 2.22%. The average annualized return increased from 33.44% to 39.17%. (Note: we also tested the 14 day RSI and tested for an RSI below 30. The best results were achieved with a 7 day RSI greater than 50).

With the improved results, we applied an additional screening technique to this model. Once again,

Table 5

	Winners:	Losses:	Neutral
Start test date:	01/02/96		
End test date:	03/02/98		
Number of trades in test:	1222	513	298
Average periods per trade:	17	17	17
Maximum Profit/Loss:	73.64%	(45.37)%	
Average Drawdown:	(4.75)%	(2.90)%	(11.81)%
Average Profit/Loss:	2.94%	7.73%	(11.81)%
Average SPX Profit/Loss:	2.26%	3.07%	(0.04)%
Probability:	74.71%	24.36%	
Average Annual ROI:	42.51%	110.57%	(168.99)%
Annual SPX (Buy & Hold):	30.68%		
Reward/Risk Ratio:	2.04		

EDS Analysis continued on page 4

EDS ANALYSIS *continued . . .*

we looked at an indicator that was based strictly on price movement. That indicator is the MACD.

The MACD is a momentum indicator. That is, in order for this indicator to increase, the rate of change in the stock price must be improving. We kept the default settings of 12 and 25 days for the MACD indicator. In our test, we created a rule that requires the MACD line (often called Phase Line) to be above its Signal Line. In other words, the fast line needs to be above the slow line.

The result of this test is found in **Table 5**. We are now clearly outperforming and still have a lot of trades. The average gain per trade is 2.94%. The annualized return is 42.51%. With the high number of trades, we can now apply an additional screening technique. (Note: we also tested for the MACD line (Phase Line) to be increasing in value rather than above the Signal Line but results were not as good).

The final indicator that we added to our model is the Money Flow RSI (MF RSI). This indicator takes Money Flow and puts it into the RSI formula. Combining these two

Table 6

	Winners	Losses	Neutral
Number of trades in test:	97	29	2
Average periods per trade:	15	12	2
Maximum Profit/Loss:	44.30%	(17.29)%	
Average Drawdown:	(4.34)%	(2.19)%	(11.85)%
Average Profit/Loss:	4.21%	9.06%	(11.72)%
Average SPX Profit/Loss:	1.91%	2.42%	0.34%
Probability:	75.76%	22.66%	
Average Annual ROI:	72.68%	147.55%	(298.04)%
Annual SPX (Buy & Hold):	30.68%		
Reward/Risk Ratio:	2.59		

indicators into one formula is unique to AIQ so you won't find this in any technical analysis book. In effect, the MF RSI measures overbought/oversold levels of Money Flow. Rather than looking for an oversold level as bullish, we looked for situations where the MF RSI was overbought (indicator above 70).

Looking for overbought levels sounds backwards but remember, the indicator is based on the activity of Money Flow, not the price of the stock. For Money Flow to be overbought, Money Flow must be strong. In our testing, we used the default values for the MF RSI.

The result of adding an MF RSI greater than 70 rule to our model led to an amazing improvement in performance. The test of our final model is found in **Table 6**. These results can only be described as remarkable. For the average holding period of 14 days, the model's average profit per trade of 4.21% exceeded an equivalent trade in the S&P 500 by 2.3%. The annualized return jumped to 72.68%. (Note: we also tested for an MF RSI below 30 and MF RSI greater than 50 but the results were not as good).

Using our final model, there were 128 trades over a two year time period. To verify the validity of our final model, we tested it over an entirely different time period (1994 through 1995) and it continued to outperform. We tested it on the S&P 500 stocks and on the AIQ Pyramid industry groups. It outperformed in

Table 7

```

MA if [close]<[LT MA].
volume if [volume ESA]>2000.
! OBVPct slope is dn while price slope is up
OBVPctDnUp if Slope([OBV Pct],15)>0 and Slope([close],15)<0.
! Moneyflow slope is up while price slope is down
MFupPRICEdn if Slope([Mnyflow],15)>0 and Slope([close],15)<0.
RSI if [RSI Wilder]>60.
MACD if [MACD] > [MACD Sig Line].
MFRSI if [MF RSI] > 70.

allworks if volume and MA and OBVPctDnUp and MFupPRICEdn
and RSI and MACD and MFRSI.
    
```

EDS ANALYSIS *continued* . . .

both cases. We have not over-optimized.

You may want a system to trigger more signals than 128 over two years. You can get more trades by removing the criteria that specifies that the stocks must be below their 200 day moving averages. This system works best on downtrending stocks but it also has very impressive results when run on uptrending stocks. You can get even more trades by loosening the criteria for the MF RSI. Changing MF RSI to require a reading greater than 60 instead of 70 will result in more trades.

Conclusion

The Expert Design Studio package was released only three months ago. With much testing still to be completed, we believe that we'll continue to find more effective models. We may uncover better

models, but we expect that this model will stand the test of time.

In review of our final model, we looked for stocks that have an average volume greater than 200,000 shares, price below the 200 day moving averages, positive 15 day divergence on both Money Flow and On Balance Volume, a 7 day Wilder RSI greater than 50, a MACD indicator above its Signal Line, and finally, an MF RSI indicator greater than 70.

This EDS model is found in **Table 7**. Users can download this model from the internet at www.aiq.com. Choose *Technical Support* from the menu on the left, and then select *TradingExpert 4.1 and Expert Design Studio*. In order to achieve similar results, you must change the setting of the RSI indicator in Charts to 7 days and the long term moving average to 200 days. ■

MARKET REVIEW

There were no market timing buy or sell signals during the month of March. There was, however, reason to be nervous at the start of the month as Intel gave an earnings warning. This led to a one-day market sell-off but the market remained on a buy.

During March, the Dow rose about 3% but this was not just a large-cap rally. The Russell 2000, a measure of small-cap activity, gained 4%.

There were some big movers in the first quarter of 1998. The Steel group quietly gained an amazing 40%. Home Construction stocks were up about 30% as was the Computer Networking group. About the only group that has lost money this year is Tobacco. ■

STOCK DATA MAINTENANCE

The following table shows past and future stock splits and large dividends:

Stock	Ticker	Split/Div.	Approx. Date	Stock	Ticker	Split/Div.	Approx. Date
Comerica Inc.	CMA	3:2	04/02/98	Cellular Comm.	CCIL	3:2	04/15/98
El Paso Nat. Gas	EPG	2:1	04/02/98	Theragenics Corp.	THR	2:1	04/16/98
Lucent Tech.	LU	2:1	04/02/98	Monaco Coach	MMCO	3:2	04/17/98
Safeskin Corp.	SFSK	2:1	04/02/98	FBL Financial Group	FFG	2:1	04/20/98
General Dynamics	GD	2:1	04/03/98	Legato Systems Inc.	LGTO	2:1	04/20/98
Raymond James Fin'l	RJF	3:2	04/03/98	Tootsie Roll Ind.	TR	3%	04/23/98
Symbol Tech.	SBL	3:2	04/06/98	Syntel Inc.	SYNT	3:2	04/23/98
RCN Corp.	RCNC	2:1	04/06/98	Best Foods	BFO	2:1	04/27/98
Sterling Software	SSW	2:1	04/06/98	Quiksilver Inc.	QUIK	2:1	04/27/98
OHSL Fin'l Corp.	OHSL	2:1	04/07/98	Amoco Corp	AN	2:1	04/29/98
Siebert Fin'l Corp.	SIEB	4:1	04/08/98	Steiner Leisure Ltd	STNRF	3:2	04/29/98
Fossil Inc.	FOSL	3:2	04/09/98	Venturian Corp	VENT	3:2	05/01/98
Mastech Corp.	MAST	2:1	04/13/98	Dayton Hudson	DH	2:1	05/01/98
Kennedy-Wilson	KWIC	3:1	04/13/98	Amsouth Bancorp	ASO	3:2	05/01/98
Jefferson Pilot	JP	3:2	04/14/98	Family Dollar Stores	FDO	2:1	05/01/98
Buckle Inc.	BKE	3:2	04/15/98				

Trading Suspended:

ITT Corp (ITT), MacDermid Inc. (MACD), National Auto Credit Inc. (NAK), Oregon Metallurgical (OREM), Quality Food Centers (XQ), Western National Corp (WNH), Xpedite Systems (XPED)

Name/Ticker Changes:

Aaron Rents (ARON) to Aaron Rents Inc. (RNT), Cambrex Corp (CBM) to Cambrex Corp (CBM), Corestaff Inc. (CSTF) to Metamor Worldwide Inc. (MMWW), Egghead Inc. (EGGS) to Egghead.com Inc. (EGGS), McClatchy Newspapers Inc. (MNI) to McClatchy Co 'A' (MNI), Wausau-Mosinee Paper Corp (WSAU) to Wausau-Mosinee Corp (WMO)

TIMING THE OEX INDEX BY CREATING AN OEX MARKET

By David Vomund

One of the most popular short term investment vehicles is options on the S&P 100, otherwise known as the OEX. In this article, we will discuss how AIQ's market timing model can be applied to the OEX index. To begin with, we will use TradingExpert's Market Breadth Builder to calculate breadth and volume figures on the OEX, which will enable us to obtain buy and sell signals on that index. Next month, we'll look at the stocks that make up the OEX to see which type of stocks, growth or value, are the better performers.

In order to see AIQ's market timing signals, you must plot the Dow Jones Industrial Average using ticker DJIA. This leads to a misconception that AIQ's market timing buy and sell signals only apply to the Dow Jones Industrial Average. Although the DJIA is plotted, the Expert Rating signals are truly a "market" signal instead of a Dow signal. That is because the model compares the narrowly based Dow average to the activity of all the stocks on the New York Stock Exchange. All NYSE stocks are used in the calculation of the market breadth indicators and the New High/New Low indicator.

With that said, the best model to time an index such as the OEX or any other diversified market index is the standard AIQ market timing model, the DJIA with NYSE volume and breadth. We can, however, perform a complete analysis on the OEX to help identify which market timing signals should be acted upon.

With AIQ's Market Breadth Builder, we can create a market using

the OEX stocks. By creating a market, TradingExpert will compute volume statistics on the OEX, which will enable us to look at indicators such as Money Flow or an OEX Advance/Decline Line (these indicators are not available on the OEX index since volume and breadth information is not provided with the index).

Before creating a market for the OEX, we need to build a group comprised of the 100 OEX stocks. The first step is to create a list. In *Data Manager*, select *List* and then *New*. Name the new list with any

By creating a market, TradingExpert will compute volume statistics on the OEX, which will enable us to look at indicators such as Money Flow and an Advance/Decline Line.

symbol other than one that is already being used in your database (we called ours OEXLIS). Click *OK* and the new list name will appear in the left window.

At this point, we could simply add the 100 OEX stocks to our list. Instead, we will perform the additional step of creating an industry group that represents the OEX. The advantage of creating a group is that we'll be able to plot an index of the OEX stocks where each stock has an equal weighting.

To create a group in *Data Manager*, select *Ticker* and then *New*. In the first dialog box, enter a ticker symbol for the OEX group (we used OEXGRP) and then enter its *Type* (group). Click *OK* and in the next dialog box that appears, enter a *Description*. Choose *OK* to add the new group to your Master Ticker List. Then move the group under the list name in the left window of *Data*

Manager by either dragging and dropping or by clicking the *Insert to List* toolbar icon.

We can now add the 100 OEX stocks to the OEX industry group. In the left window of the *Data Manager* screen, highlight the group's ticker symbol and then select *List* and *Insert Tickers*. Type in the 100 OEX stocks with a semicolon separating tickers. To get a list of the OEX stocks, go the Standard & Poor's web site at www.stockinfo.standardpoor.com/index.html and then go to the S&P 100 components page. Before building your list, be sure all 100 stocks are entered in your Master Ticker List.

Our last step is to create a market based on the list of OEX stocks. In *Data Manager*, select *Ticker* then *New*. In the dialog box, enter a ticker symbol that will represent the OEX Market (we called it OEXMKT). Click the *Market* option button and select *OK*. Enter a *Description* in the next dialog box (we used OEX Market), and under *Market Breadth Data Source*, select the OEX industry group. Finally, under *Price Ticker* in this dialog box, type in OEX (see **Figure 1**).

With the creation of the OEX market complete, we can now chart our market ticker (in this example OEXMKT) and we will see that the price data is the actual OEX index but breadth and volume indicators are based on the stocks in the OEX. **Figure 2** displays a chart of our OEX Market along with an Advance/Decline Line which is calculated on the 100 OEX stocks. Another indicator shown is Money Flow, which utilizes the price activity of the OEX and factors in volume, where volume is based only on the 100 OEX stocks.

The OEX is a capitalization weighted index so there can be cases where only the largest capitalized stocks drive the index higher. By again looking at **Figure 2**, we see there is strong participation in the

ADVANCED OEX ANALYSIS - 1 *continued* . . .

OEX stocks since the OEX Advance/Decline Line is as strong as the index. Money Flow is strong as well.

An additional advantage in creating a market for the OEX is that the same market timing model that is used for the Dow is now at work for the OEX market. The buy and sell signals are specifically based on OEX data. In Figure 2, we see a 100 buy signal on January 27, one day before a buy was registered using AIQ's regular market timing model.

As we said earlier, the regular buy and sell signals on the Dow are AIQ's most accurate buy and sell signals. Those signals are the most accurate whether you trade the OEX, S&P 500, or even the Nasdaq Composite. The advantage of using our newly created OEX market is that the OEX buy and sell signals can be used as a confirmation of the regular market timing model. The Expert Ratings on the Dow are more accurate but the Expert Ratings on the OEX market are specific to that index.

To test the results of combining the Dow and OEX ratings, we started our testing in January 1995 and looked for cases where a 95 or

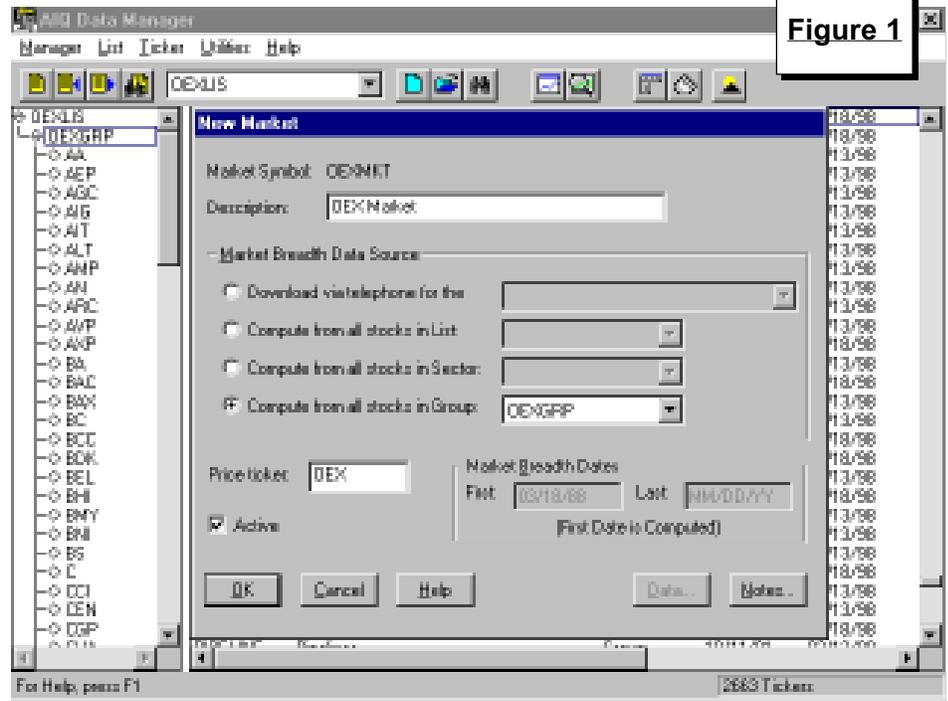


Figure 1

greater signal was registered on both the Dow and the OEX within three days of each other. If the signals did not occur on the same date, the entry point on our test was on the date of the second buy/sell signal. Since OEX traders are typically short term option traders, we looked at all Expert Rating signals rather than just

the first in a series. Our holding period was a fixed 10 trading days or until reversal signals were registered.

The results are found in **Table 8** (next page). The left section displays the buy signals while the right side of the table displays the sell signals. Our testing period reveals that more buy signals were registered than sell signals, and that the OEX made stronger advances after the buy signals compared to the sell signals.

When Expert Rating buy signals were registered on both the Dow and the OEX within three days, the OEX rose an average of 2.4% in the 10 days following the second signal. This doesn't sound like an impressive percentage, but OEX traders would be very happy to hold call options when the OEX advances 2.4% in 10 days.

Also, this test ignores a sell discipline. Someone who bought call options on January 27 certainly would not have sold them 10 days later (see Figure 2).

When Expert Rating sell signals were registered on both the Dow and the OEX within three days, the OEX



Figure 2

fell an average of 0.17% in the 10 days following the second signal. Not bad considering the OEX rose 140% over our three year testing period!

Analyzing the OEX Timing Model

With our OEX timing model complete, we'll now turn to the activity within the OEX. Within every diversified market index, some stocks can be labeled growth stocks and others value stocks. Similar to industry group rotation, there is a constant rotation of growth stocks and value stocks moving in and out of favor. We'll now create an industry group structure to help identify the rotation of OEX growth and value stocks.

Growth stocks are typically classified as those with a high earnings growth and high relative strength. Value stocks, on the other hand, are those that are down and out-of-favor.

In order to create an industry group structure which measures growth versus value investing, we need a list of growth stocks and a list of value stocks. To get a list of growth stocks, we ran the Relative Strength-Strong report on our list of OEX stocks on December 31 of each year, beginning with the year 1994. The top 20 stocks that appeared in the long-term section were used as growth stocks.

For a list of value stocks, we looked at the yield on the OEX stocks on December 31 of each year and took the 20 highest yielding stocks. (We found the 20 stocks with the highest yields in the December 31 issue of *The Wall Street Journal*.) The list of growth and value stocks was modified every year.

To create our industry groups, we go again to *Data Manager* to create a new list. In *Data Manager*, select *List* then *New*. Type in a symbol (we used GROVAL) and the new list name will appear in the left window. Next, we will create the

OEX Trading Results

Table 8

Buy Signals		Sell Signals	
Buy Signal Date	OEX % Chg.	Sell Signal Date	OEX % Chg.
04/24/95	2.43	10/02/95	0.54
10/13/95	-0.55	11/08/95	1.02
01/19/96	4.25	11/13/95	0.56
03/18/96	-0.14	11/15/95	1.57
05/08/96	5.32	12/18/95	1.85
09/09/96	3.69	04/04/96	-1.77
12/17/96	2.01	04/08/96	0.52
01/07/97	3.97	04/09/96	1.33
04/07/97	0.11	05/02/96	0.35
04/15/97	5.84	06/07/96	-0.59
10/21/97	-3.85	07/05/96	-2.63
10/28/97	-0.28	08/29/96	1.02
11/14/97	5.39	08/08/97	-1.37
11/17/97	2.90	12/10/97	-4.85
12/29/97	-0.45	Average=	-0.17
01/14/98	3.83		
01/16/98	5.02		
01/28/98	4.50		
Average=	2.44		

growth and value industry groups. Select *Ticker* then *New*. Type in a ticker symbol to represent a growth industry group (we used the symbol GROWTH). Select group as the *Type*, click *OK* and in the next dialog box type in a *Description*. Repeat the same process for the value group (we named this group VALUE). These new industry groups will now appear in your Master Ticker List.

We can now move the growth and value industry groups under the newly created list. The growth and value group names in your Master Ticker List can either be dragged and dropped under the List name in the left window, or you can highlight the List name, select *List* and then *Insert Tickers*. In the dialog box, type in the names of the growth and value industry groups, separated by a semicolon.

We can now add the growth and value stocks that we assembled from the Relative Strength-Strong report

(see above) to the two industry groups. In the left window of the *Data Manager* screen, highlight the growth symbol, then select *List* and *Insert Tickers*. Type in the growth stock symbols separated by semicolons. Repeat the same process for the value stocks.

In our creation of the growth and value groups, we started with the year 1994. We entered the top 20 high relative strength stocks or the top 20 high yielding stocks as of December 31, 1994. The groups were then calculated. On December 31, 1995, we changed the components of each group based on a new set of stocks and then recalculated the groups from December 31, 1995 on. This process of yearly rotating the stocks is continued on December 31 of every year. ■

Next month: Analyzing our newly created Growth and Value industry groups.