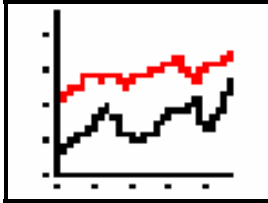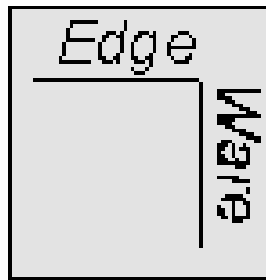# FastGraph

Version 3.x

Edge Ware, Inc.
www.edge-ware.com

Disclaimer and License Agreement

The information that FastGraph provides is only part of the information needed for a good investment program. Consult your mutual fund representative before buying or selling any fund. Read the prospectus to determine whether an investment meets your objectives.

Table of Contents

1.0 Introduction

First, a little background. FastGraph is a product of Edge Ware, Inc. which was founded by brothers, Ken and Nelson Huck. Ken is an engineer with 20 years of experience in technical analysis and computer simulation in the aerospace industry. Nelson is a programmer/MBA with 10 years experience in financial programming.

After developing an investment software tool called FastBreak*, Edge Ware found a need for graphical tools that were not readily available in other programs. It was with this need that FastGraph was developed. The initial version of FastGraph was oriented toward visual aids to determine stable/robust trading parameters using output from Fast-Break, and FastTrack. This latest version of contains some of the most advanced technical analysis features you will find in any investment software package.

Kenneth L. Huck
Nelson R. Huck

*Visit the Edge Ware Internet web site (www.edge-ware.com) for additional information on all these products. FastBreak is a Windows based strategy testing and trading program. FastBreak relies on the FastTrack database. For those not familiar with FastTrack, it is a mutual fund & stock database and software analysis package. The database is updated by modem each day the market is open with the closing prices of thousands of mutual funds, stocks and indexes. Users of FastBreak must be subscribers of FastTrack (call 800-749-1348 to subscribe) to access the required data. **Do not call FastTrack for information relating to FastBreak or FastGraph.**

2.0 Upgrade Notes

Below are a few changes to the manual that reflect the enhancements made with Version 3.0 of FastGraph.

FastGraph now loads all the FastTrack mutual fund and stock databases at the same time when "FastTrack Funds, Stocks & FNU files" is selected in the following menu:

```
FastBreak Summary File                ▼
FastBreak Summary File
FastTrack Funds, Stocks & FNU files
FastWays Fixed File
FastTools File
FastGraph Summary File
FastGraph Detail File
```
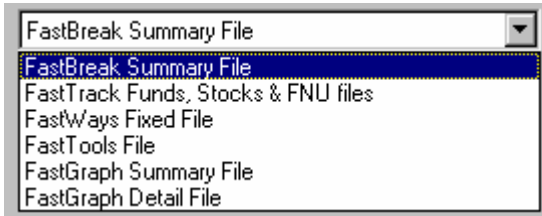
Starting with Standard FastBreak 4.0 and FastBreak Pro 4.0 three new data fields were added in the Summary output: Beta, Correlation, and Alpha. If you are using these versions of FastBreak you can graph these new parameters because they are now available in the Data Field pull down menu:

```
Data Field:      Avg Annual %                  ▼
                 % Winners                      ▲
                 % Avg Gain Per Buy
                 % Avg Gain Winners
                 % Avg Loss Losers
                 Avg STRF
                 Strategy Beta
                 Strategy Corr
                 Strategy Alpha                 ▼
```

Clarification Issues

FastGraph only reads the output files from the DOS version of FastWays.

We have a place holder in the Data Types menu for FastTools but don't currently read any FastTools file types.

3.0 Technical Support and Upgrades
Note: Do not call Investors FastTrack for technical support.

Do not use the 800 order line number for technical support. This is a commercial order line that <u>only</u> takes orders and they are not equipped to answer any questions. <u>Any messages left with the order line will not be returned.</u>

Please read this entire manual and **check the FAQ chapter before calling for support**. We have tried to make this software and documentation as user-friendly as possible. You should have a basic working knowledge of Windows, i.e., how to copy and move files, change directories, select drives, etc.

Technical support is provided by email. You will usually receive a response within 24 hours. We encourage you to post questions of general interest on the Fast-Break/FastGraph discussion area on the site www.ft-talk.com. This allows us to help several users at once. If you post a question on the web site, email us to let us know you posted the note.

We can be contacted at email2ew@edge-ware.com. This address will send your note to both Ken and Nelson and will help you receive a timely response. We recommend that you <u>always</u> use this address. If one of us is traveling or otherwise unavailable your note is likely to be answered sooner if it is sent to both of us.

If your support issue can't be handled by email, we will arrange for telephone support.

We charge $25 for replacement installation CDs.

There is no charge for **most** technical support. Problems with reinstalling FastGraph is our number one tech support problem. We receive a large number of support requests from users reinstalling FastGraph because of hard drive failures, purchase of new computers, etc. We reserve the right to charge $25 to assist in reinstallation of the product, starting six months after purchase. If you follow the following steps you shouldn't have any problem reinstalling.

Reinstalling FastBreak

You MUST use the installation CD to reinstall. We have had a number of users just try to copy files to the new computer or hard drive. This will not work. Here are the steps:

- Install FastTrack first
- Do at least one download and update of FastTrack data
- Verify that the FastTrack account number on this computer matches the account number on the FastGraph CD
- Install FastGraph using the installation CD

- Go to our web site and download the latest upgrade, if one exists

Upgrades

We provide minor upgrades to FastGraph on our web site, and if you encounter an error, we suggest you download the latest version of the software because this will often solve the problem. The Edge Ware Internet Web site (www.edge-ware.com) always has the latest version for download.

4.0 Installing FastGraph

Note: We have found that FastGraph installs with the least number of problems when the installation is made just after booting your computer. Also, before you start the installation make a backup copy of the installation disks.

To install FastGraph:

Minimum of 5 MB free on your hard drive
Windows operating system
Note: FastGraph will not run under Windows 3.1
16 MB RAM
Pentium class processor

1) Start Windows

2) Stop any application that may be running. *Note: We have had a number of users call with installation problems because Microsoft Office was running in the background.*

3) Insert the installation CD

4) From the Start menu, choose Run. Type A:\SETUP (or B:\SETUP depending on your drive.) The first screen you will see is:

This is a warning to close any applications you may have running. The various versions of Windows have different methods for determining applications that are running. Consult your Windows manual to determine how your version works. If you don't have applications running select OK otherwise, exit Setup and close the applications.

5) The second screen you will see is:
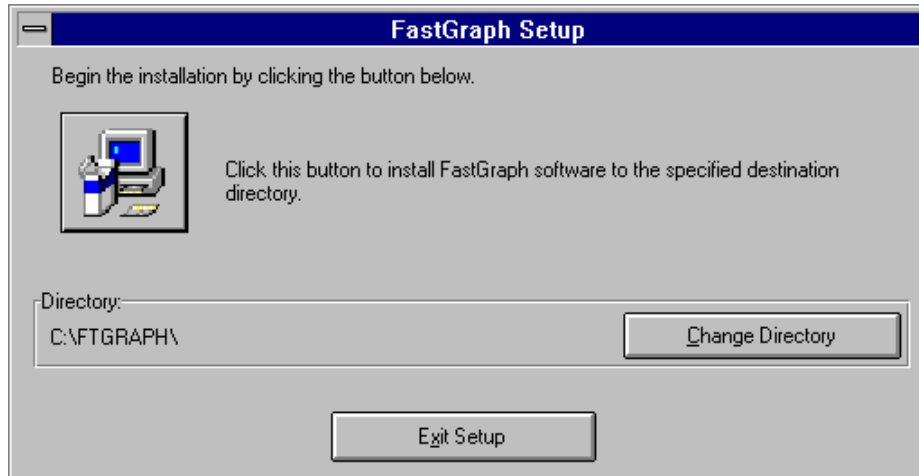
The setup program is asking the name of the drive and directory where FastGraph is to be installed. The default is C:\FTGRAPH, and we suggest that you use the default directory name. If the default is acceptable click on the button that resembles a computer and skip to step 8.

6) If you need to change the drive letter or directory path click the Change Directory button and the following screen will appear:
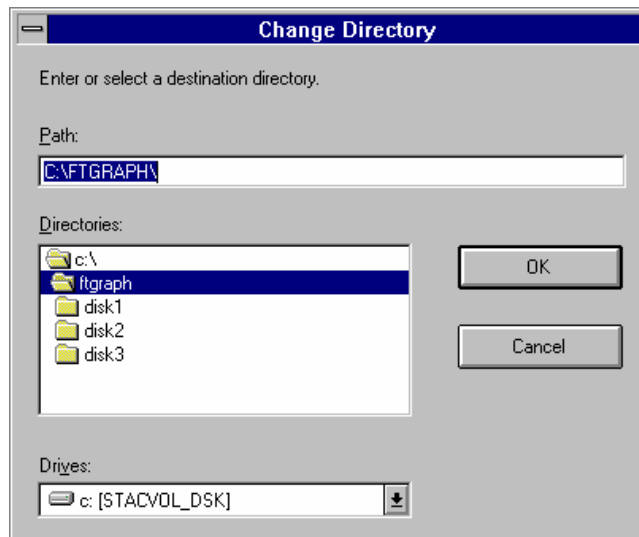
This screen allows you to change the drive and or the path and directory. If you need to change the drive, click on the Drives pull down arrow button to get a list of your drives to select from. Once you have selected a drive, click on the drive folder to see a list of existing directories for installation or type a directory name in the Path box then click the OK button.

A FastGraph run icon will be created in your Windows Programs environment. Click the FastGraph icon as you would to launch any application.

Reinstalling FastGraph

Reinstalling FastGraph is our number one tech support problem. Users crash hard drives, buy new computers, new laptops, etc. You MUST use the installation CD to reinstall. We have had a number of users just try to copy files to the new computer or hard drive. This will not work. Here are the steps:

- Install FastTrack first
- Do at least one download and update of FastTrack data
- Verify that the FastTrack account number on this computer matches the account number on the FastGraph CD
- Install FastGraph using the installation CD
- Go to our web site and download the latest upgrade, if one exists

5.0 FastGraph Quick Start

FastGraph is run from the Windows environment and your installation should have created an icon under Programs when you use the Start button. Click the icon as you would to launch any application.

When FastGraph is launched the main menu will appear:
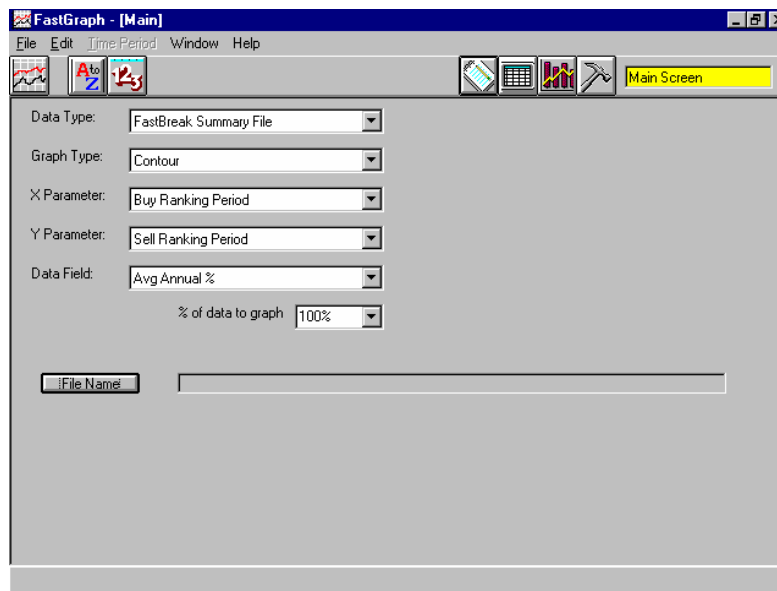
The menu may initially look very complicated but is quite logical and user friendly. We will step through each menu and describe each feature. FastGraph uses the very common Windows Tool Bar method of presenting functions and data.

Main Screen

When FastGraph launches the Main Screen is on top. See the above figure. This screen is used to select the type of file to import and the settings for the graph to be plotted.
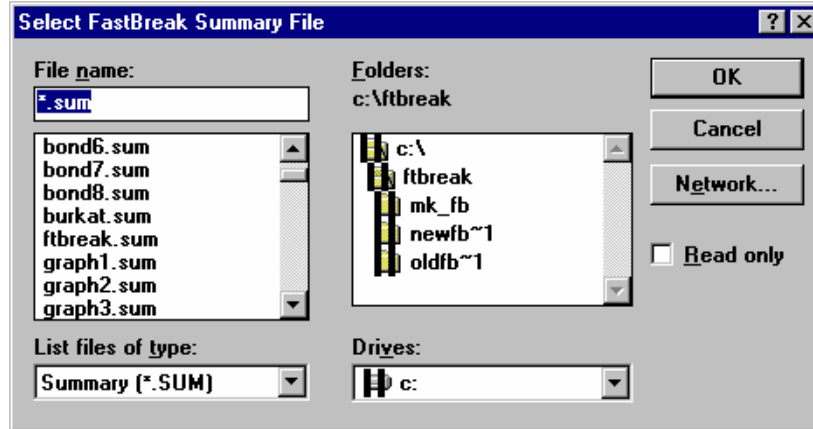
Data Type
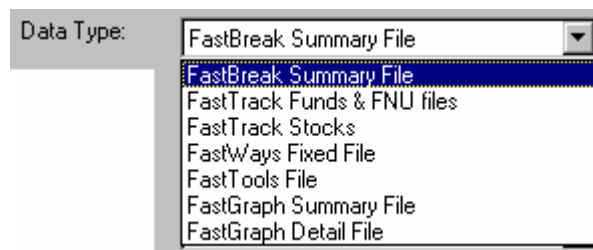
The type of data file must first be selected before loading data. The Data Type pull down menu allows selection of FastBreak, FastTrack, FastWays, and eventually FastTools data files.

File Name

When the File Name button is selected the following menu will appear:

This menu allows you to find and load the appropriate file. Use the Drive and Directories boxes to find the data files. Select the file from the left side of the screen and click the OK button.

Graph Parameter Settings

These pulldown menus allow you to change the graph parameter settings and are self explanatory.

% of data to graph

This menu item allows for graphing only part of the loaded data. For example, if a FastBreak Summary file has been loaded with 500 test cases, selecting 40% will graph only the first 200 test cases. This menu item will be demonstrated in a later chapter.


Shifting Screens

Use the above icons to shift between screens. The first icon will bring up the Main Screen, the next icon shifts to the Data Screen, the next icon brings up the Graph Screen,

and the far right icon brings up the Calculations Screen. These icons will be described later in the chapter.

Loading FastTrack Data

Note: When you select FastTrack as the data type a large number of new items appear on the main screen. Some of these will be explained now, others will be explained in Chapter 7.

If the user selects FastTrack Funds & FNU Files as the Data Type data on the Graph Settings Tab the following menu will appear (If FastTrack Stocks is selected as the Data Type, a very similar menu will appear):
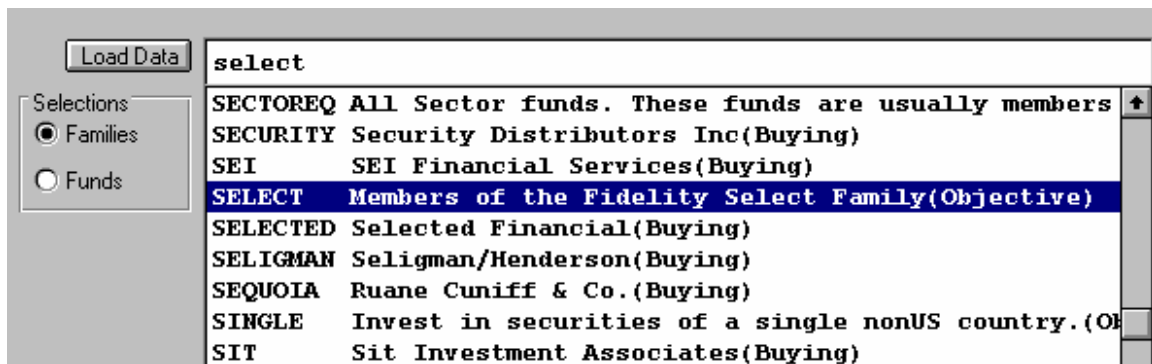

This menu contains FastTrack trading family names or Fund names. The default is to load the family names. Put the cursor in the empty line just above the first family name and start to type the name of the family to be evaluated. FastGraph will find the family as the name is typed. *Note: The indexing may have problems if you have family names starting with unusual characters such as ~,@ etc.* You can use the slider bar on the right of the family names to find the family of interest. Once the family is located, use the cursor and left mouse button to click the family. It will highlight as in the above screen. *Note: The highlighted family will NOT appear in the box where you started to type the name.*
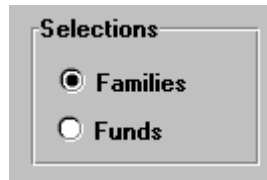
Family or Fund Selection

The box marked Selections allows loading data of individual funds. Selecting the Funds button will load all individual fund names into the scroll box:
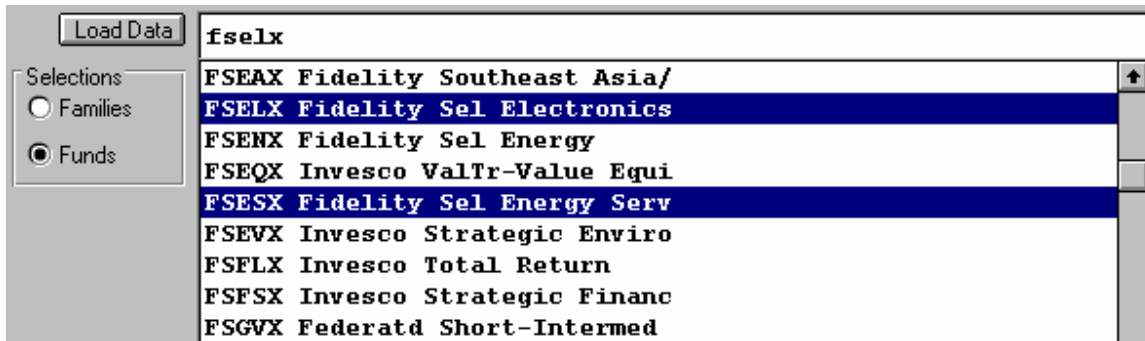
A fund can be found by typing the fund symbol as you did the family name. To select multiple fund names FastGraph uses the standard Windows selection method: hold the Control key on your keyboard and "click" the left mouse button to select additional funds. In the above example both FSELX and FSESX have been selected.

Note: FastGraph will read all your FNU files. When these files are made part of your trading family, FastGraph will include them in the graph. See the FastTrack manual for information on FNU files.

Load Data

After the appropriate FastTrack family or fund(s) have been selected click the Load Data button to load the data into the spread sheet.

Graphing FastTrack Data

When FastTrack is selected as the Data Type the following menu item appears on the Graph Setting Tab:
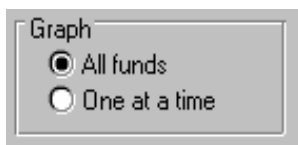
This menu item allows you to graph all the selected funds on a single screen or graphed one at a time. If the One at a time option is selected the following icons appear on the FastGraph tool bar:

These arrow icons will allow you to move forward or backward through all the selected funds one at a time.

Data Screen

After loading data from the select file, the data can be reviewed in a spread sheet by selecting the Data screen icon. Going to the Data screen icon the data will resemble the following:

Different parts of the data can be reviewed by using the slide bars or page up and page down keys. This screen will be covered in more detail later.

The data is loaded on a distribution included basis, i.e., the fund distributions have been included into the fund NAV, and therefore, the NAV values may not be the same as the actual fund NAV. This is equivalent to exporting the "red" line in FastTrack.

Note: A minus one (-1) is used to denote a fund was not yet available.

Before FastGraph can plot FastTrack data the specific data to be plotted needs to be selected. This is done by going to the Data Screen and highlighting the column of data to be plotted. This is done by clicking on the column heading, i.e., B, C, etc. The entire column of data will become highlighted or shaded. Different columns of data can be selected at the same time by using the standard Windows Shift and Ctrl keys in combination with the left mouse keys. In this manner many funds can be chosen from a loaded family. The next chart shows four columns of NAV data that are selected:

Graph

This tool bar icon allows the user to produce a graph. When the icon item is selected FastGraph will go into a graphing mode and bring up the Graph Screen.
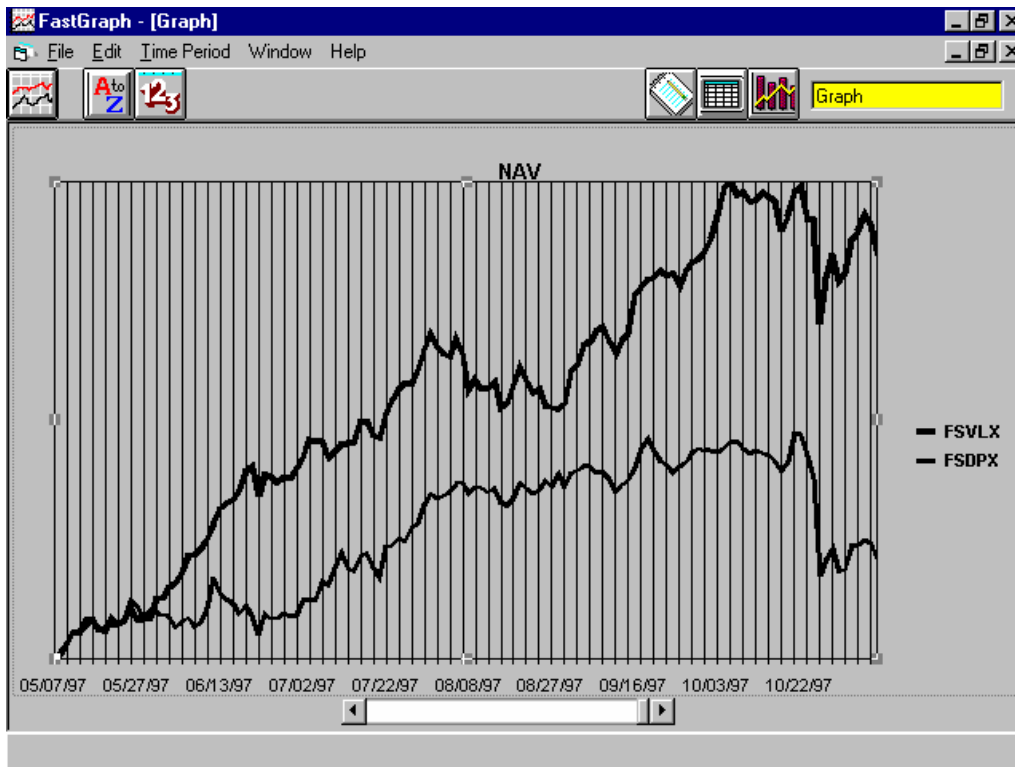
Changing the Time Period Displayed

The slide bar at the bottom of the graph can be used to view different graph start and stop times.

```
Time Period
√ One Month
  Two Months
  Three Months
  Six Months
  Nine Months
  One Year
  Two Years
  Three Years
  Five Years
  All
```

Changing the Graph Time Period

When FastTrack data has been selected the time period of the graph can be changed by using the Time Period pulldown menu. A variety of time periods can be selected.

```
Wizard...
Edit Chart Data...

General...
Plot...
Series          ▶
Axis            ▶
Legend...
Title...
Footnote...

Copy
Paste
Print...
Save As...
Load...
```
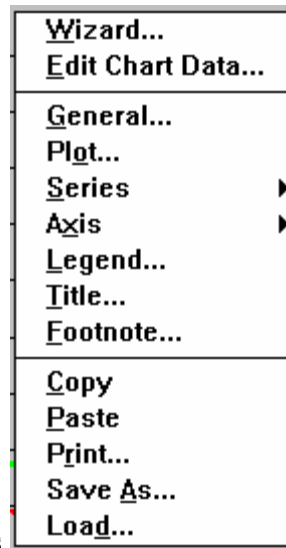
Printing the Graph and Other Options

Placed the cursor on the FastGraph Graph Tab screen and click the right mouse button. The above menu is displayed. These options allow the graph to be printed as well as customizing the graph. The graph can also be saved or a saved graph reloaded. The menu is mostly self explanatory. One item that may deserve special note is the Edit Chart Data option. This item will allow you to edit the data displayed on the chart.

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6.0 Analyzing FastBreak Output

FastBreak summary files can be analyzed using FastGraph, and this is where the real power of FastBreak can be realized. This example will compare the effect of changing a single parameter on return results of a trading strategy.

Start by making two FastBreak back testing runs using the following parameters:

Run #1 - Trade using the Select family, date start 1/1/89, end date 12/31/95, Buy and Sell using Rank, Set Buy rank = Sell rank, with a minimum ranking period of 5 days and a maximum of 50 days, Delta=1 day, Top%=50 , Min hold 30 days, Delay =1 day, Short loss=.75, and #funds set to 1.

Run #2 - Same settings as Run #1 except hold three funds rather than one. Be sure you change the summary file name when making the two runs.

Go to the FastGraph main screen and select FastBreak Summary file as the import file type and import the Summary file data into FastGraph using the File Name button. *Note: You can load several files at a time. When the file selection menu is open select all the files you want to load by using the standard Windows left mouse button clicking method (including Shift and Ctrl key methods to select several files)*

Select Scatter as the Graph Type, Test Case as the X Parameter, and Avg Annual % as the Y Parameter. Now use the graph icon to create the following graph:

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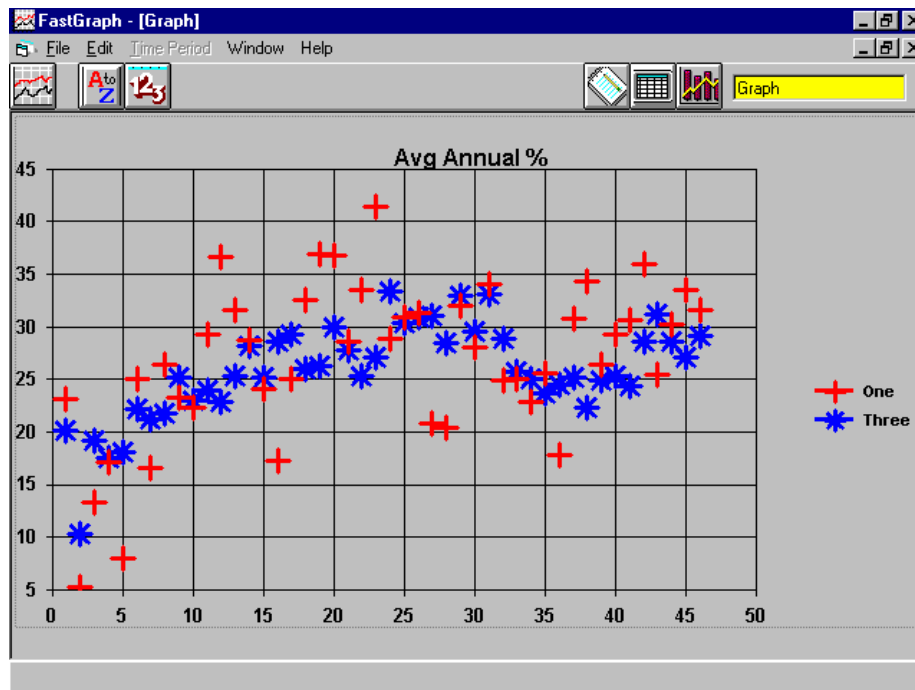
In this example, the + symbols represent test cases holding one fund, and the * symbols represent three funds. The first thing to notice is the large variation in annual performance when holding one fund.

It is rather difficult to determine the average effect on return by holding one fund vs. three funds. However, there is a solution.

Sort

When the Sort icon is selected the following menu appears:
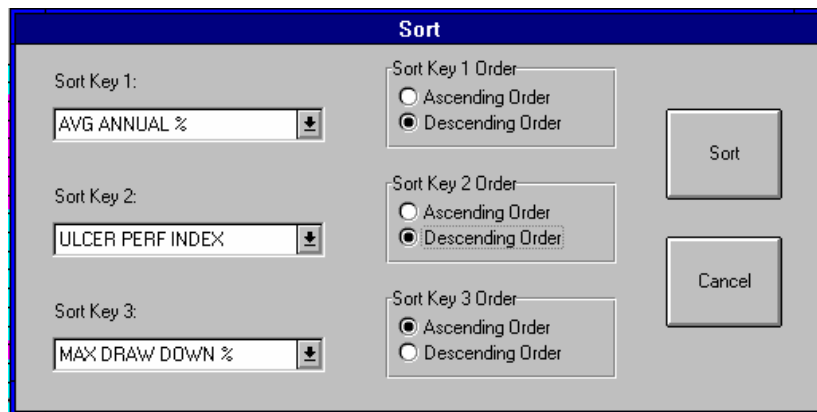
This menu allows you to sort the data in the spread sheet by a variety of criteria. Each of the sort keys is a pulldown menu. The Sort Keys allow a hierarchy for sorting. In the above example, the data will be sorted by Avg Annual% first. If two records (test cases) have the same Avg Annual% then Sort Key 2, Ulcer Perf Index, is used to discriminate the test cases. Finally, Max Drawdown% is the final sort criteria. You can also sort the date in Ascending or Descending Order.

Sort All

This icon allows all the spread sheet pages (if multiple files are loaded) to be sorted at the same time. For example, you may have five different FastBreak Summary files loaded and want to sort all the sheets of the spread sheet at the same time. This icon will bring up the same sort menu as shown above.

Select the Sort All icon and sort on Avg Annual % in Descending order. Go to the Main screen and select XY Line as the Graph Type. Now, graph the sorted data using the graph icon. You will see the following:
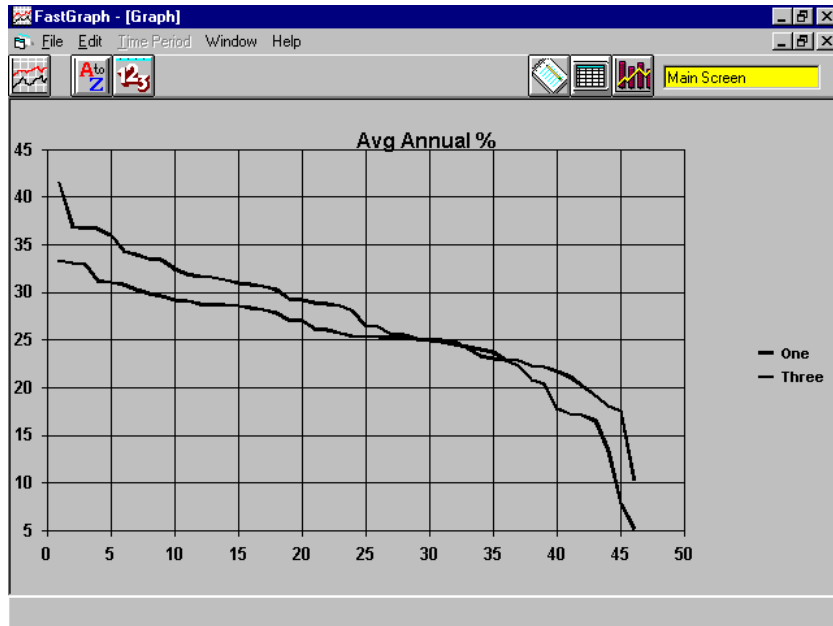
Now it becomes clear that holding one fund can have a return of more than 5% per year when compared to holding three funds. However, it is also clear that holding three funds can give more consistent performance regardless of ranking period.

If you want to look closer at the best test cases go to the Graph main screen and select 50% in the "% data to graph" menu. Now, re-graph the data:
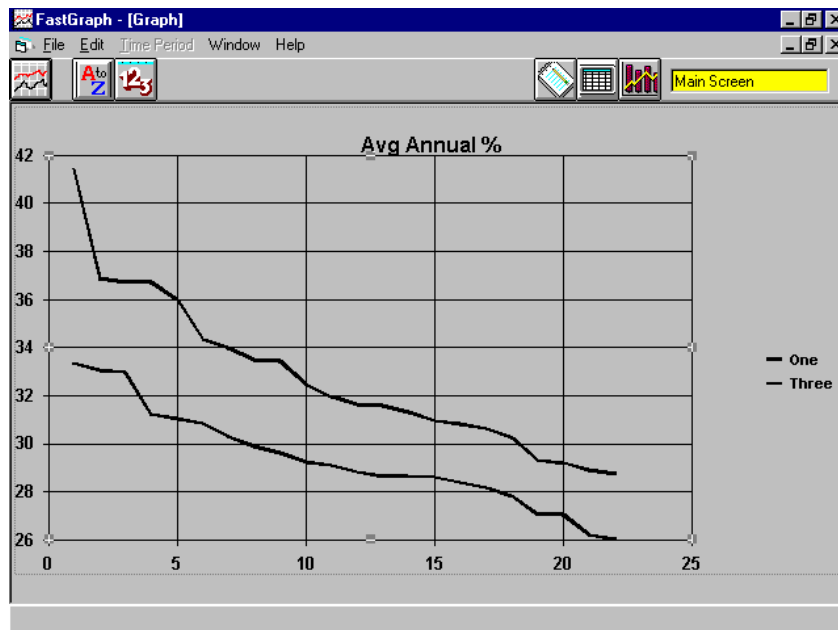
Now only the best half of the test cases are shown but in greater detail. Other parameters in the FastBreak Summary file can be charted in a similar manner.

Finally, what are the best parameters to use for buy and sell ranking? The values that gave the best annual return may not be the best choice because that combination may have undesirable characteristics, i.e., high drawn down, too many switches per year, etc. The most significant problem - the parameters may not be a good "robust solution" and only a "statistical fluke." Stability is a requirement in your parameter choice. In other words, if the parameters are changed slightly, there shouldn't be a large change in annual trading performance. You do not want to "curve fit" the past. In the above example holding three funds may have resulted in a slightly lower return, but the return was quite consistent and peaked in the 25-30 day ranking period. Holding a single fund shows considerable variation in performance, For example, ranking over 24 days has over a 35% annual return but ranking over 16 days results in less than 20% annual return.

Using FastBreak with different ranking periods for buying and selling the problem becomes a little more difficult because there are now two independent parameters and many more combinations. Contour plots can be used to help select "optimum" parameters. For example, make a FastBreak run the same as Run #1 earlier with the following exceptions: Buy min and Sell min set to 10, and Buy max and Sell max set to 50.

Import the file in FastGraph, select contour as the graph type, and Avg Annual % as the Date Field. You get the following graph:
Note: The graph will be in color on the computer monitor.
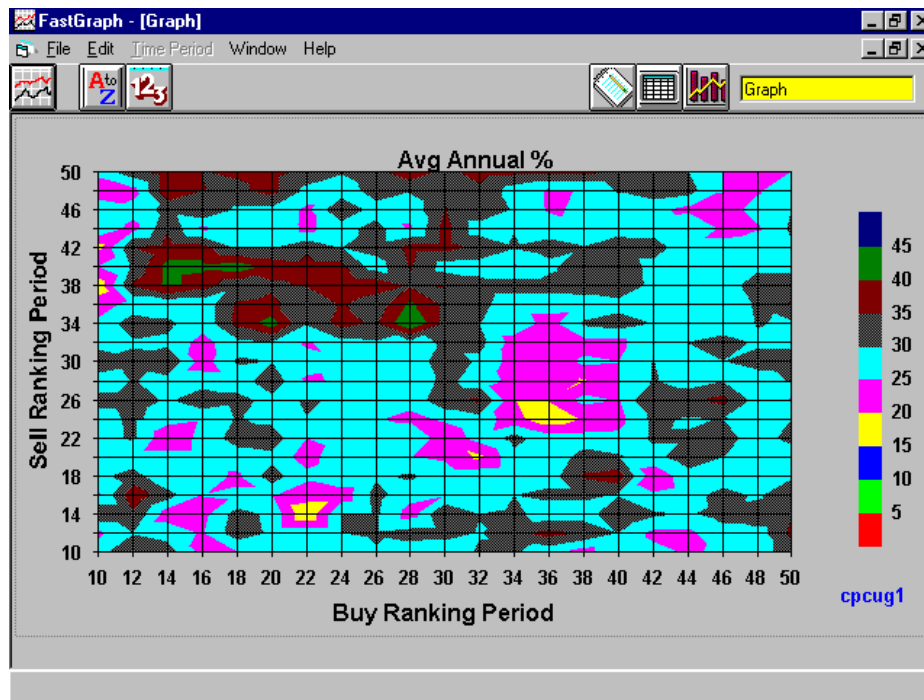
The annual return is shown as a different color and is a function of buy and sell ranking periods. It appears there are large regions of stable/robust parameters. Parameters are considered robust when by changing them by a moderate amount the results stay consistent.

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The areas can be further evaluated by looking at UPI, UI, S/Y etc. The following graph was made by selecting UPI as the Data Field:
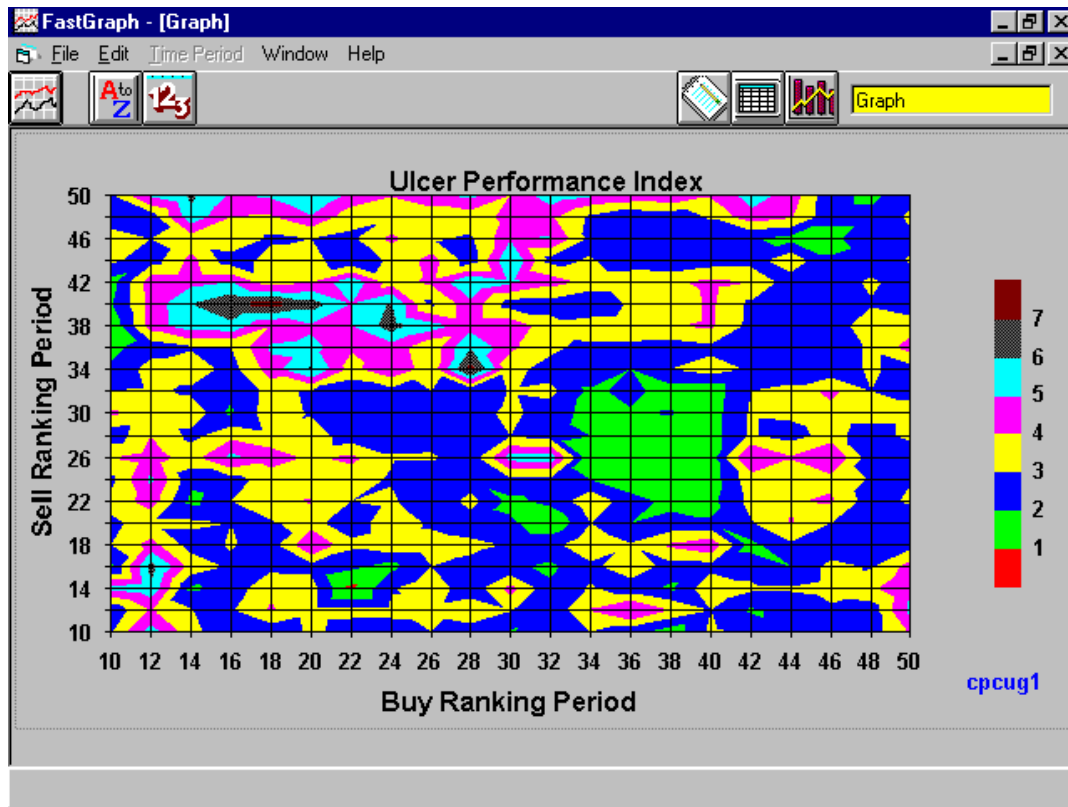
All regions still look reasonable, but the buy 16/sell 45 does a little better.

There are no guarantees the ranking period that tested well in the past will work well in the future. However, looking at the past performance may give an indication of what will work in the future, and you certainly don't want to choose a parameter set that performed poorly in the past.

7.0 Analyzing FastWays Output

FastWays is a FastTrack add-on product (see Resources Chapter for more information) that can evaluate a variety of FastTrack functions: AccuTrack, Stochastic, Moving Average, and MACD. FastWays output can be analyzed in a graphical manner to help select optimum/robust parameters. ***Note: When running FastWays select the "Fixed length" type for file output.***

FastWays Example #1 - AccuTrack

One popular FastTrack trading strategy is to switch between energy funds and transportation funds using AccuTrack. These two sectors of the market often move opposite to each other and it is often better to be in one or the other. One question the investor may have is it better to switch between Fidelity Select Energy and Select Transportation, or switch between Select Energy Service and Select Transportation? With this in mind make two FastWays runs: Run #1 will use AccuTrack switching between Select Energy and Transportation, and Run #2 will switch between Select Energy Service and Transportation. Make both FastWays runs with a range from 5 to 50 on AccuTrack parameter one and parameter two. The time period for this example is 12/30/88 - 12/21/96.

Once the two FastWays runs have been made load the data into FastGraph. Next, select the "Sort All" icon and sort based on Ra in decreasing order. Now use the "Graph" icon to get the following graph:
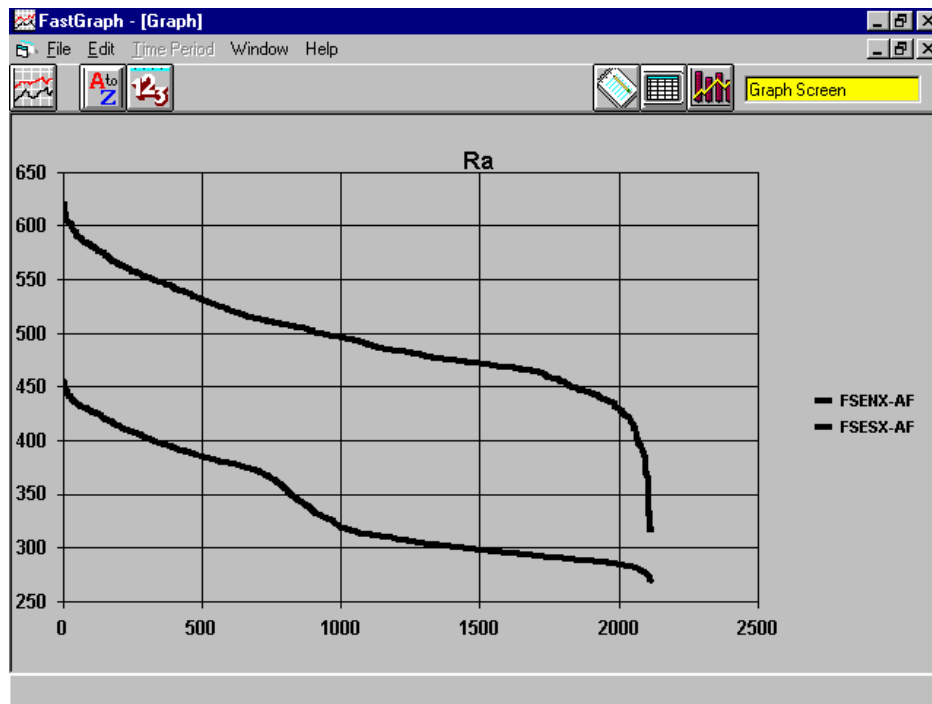
Note: If you have any doubt about the effectiveness of this AccuTrack strategy here are the buy and hold values for each fund and the S&P 500 index over the same time period:

FSENX   156%
FSESX   227%
FSRFX   225%
S&P 500   197%

The AccuTrack system easily beats these values using ANY set of parameters. It is also clear that trading Transportation with Energy Service is the preferred pair. The next step is to determine the AccuTrack parameters that give a good robust strategy. Go to the FastGraph Data Tab and bring the FSESX/FSRFX data to the top. Go to the main screen and select Contour as the graph type and Ra as the Data field. Here is the graph:
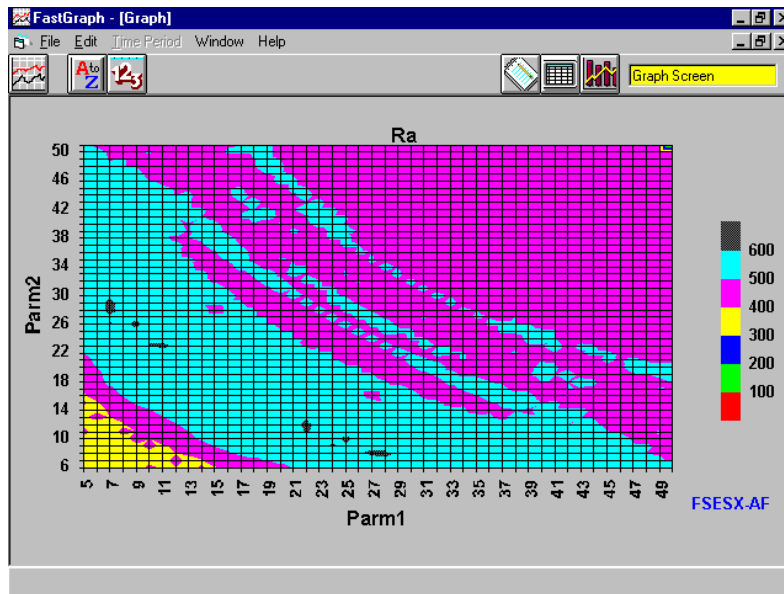
The set of parameters that result in the best Ra (600% or greater) form a wide band centered in the area of 15/22. Other FastWays output parameters such as switches per year could be used to further refine the parameter choices.

Here are other studies to consider:

Rather than using Select Transportation, perhaps Select Air Transportation would have been a better choice. Run FastWays switching between Air Transportation and the two energy funds. Import these two FastWays files into FastGraph, sort the data and compare all four line graphs.

Some AccuTrack users trade between a mutual fund and a common index, i.e., DJ-30, S&P 500, OTC, etc. A good question is which index should be used because different equity funds respond differently to the different market indexes. Make different Fast-

Ways runs using your fund of choice and switch between different indexes. Next, load these FastWays files into FastGraph, sort, and compare the different line graphs. It should make the selection of an index more obvious.

FastWays Example #2 - Moving Average

FastWays/FastGraph can be used to find robust parameters for a moving average. Make a FastWays run using the OTC-C index as the fund and Vanguard Money Market fund (VMMXX) as the index. Run with a moving average range of 10 days to 250 days. The time period evaluated was 12/30/88 - 12/31/96.

Import the resulting FastWays file into FastGraph. Select XY Line as the graph type and you will get the following graph:
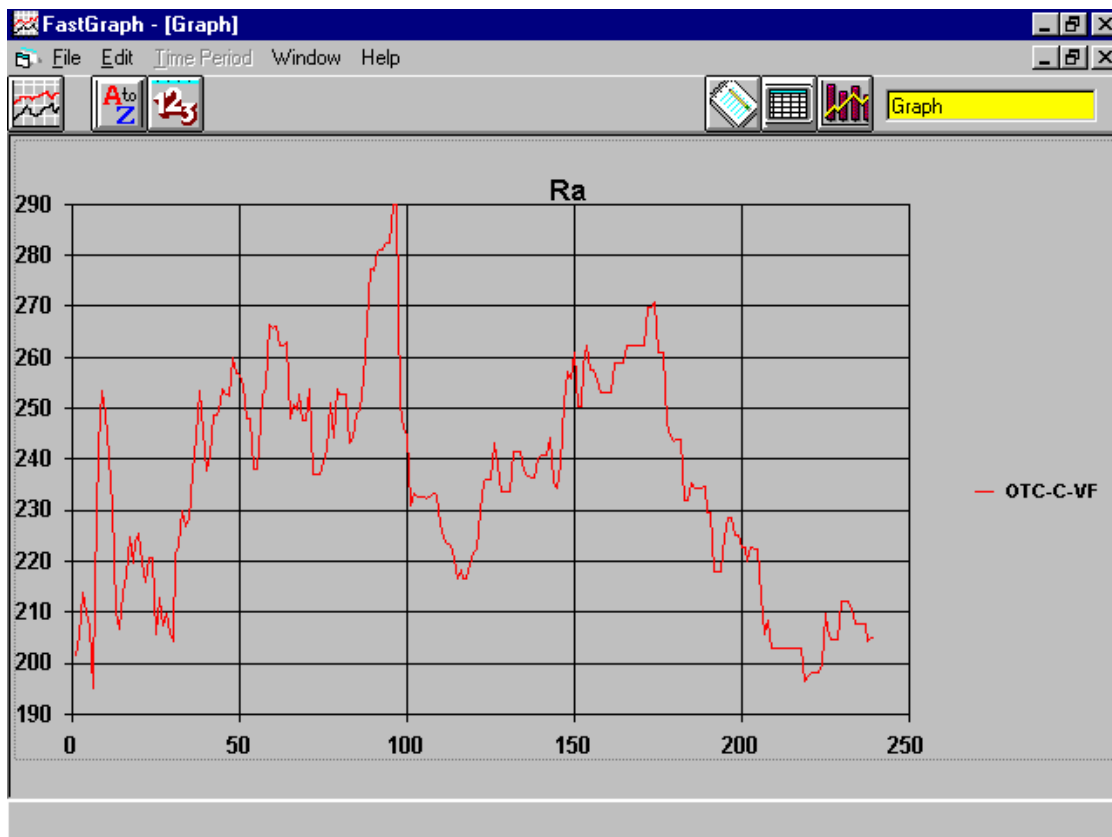
Note that the X axis is case number and not the moving average value (case#1 = 10 days, case #2 = 11 days, etc.).

Buy and hold had a return or 238% over this test period. It can be seen that a moving average between 50 and 100 days is optimum for Mr.

Selecting Switches per Year give the following graph:
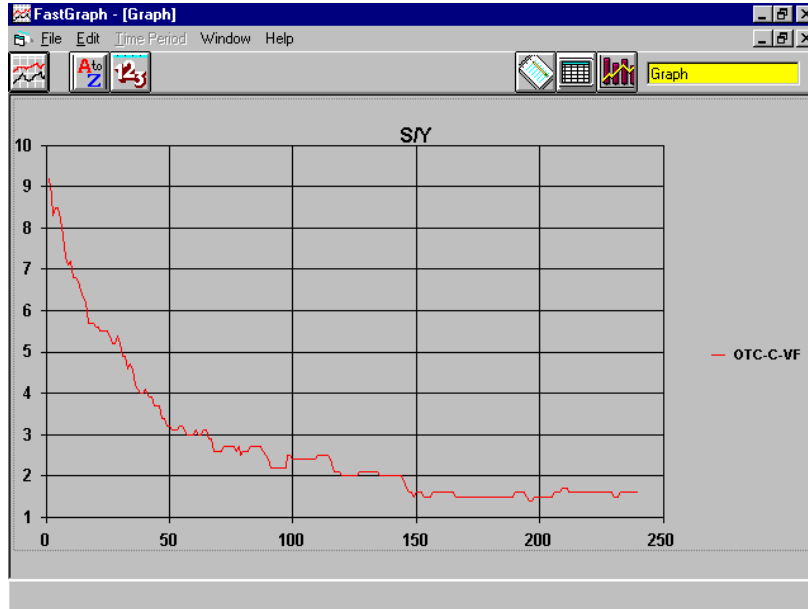
The number of switches is a reasonable 2-4 per year for the most favorable Ma.

Finally, charting risk:
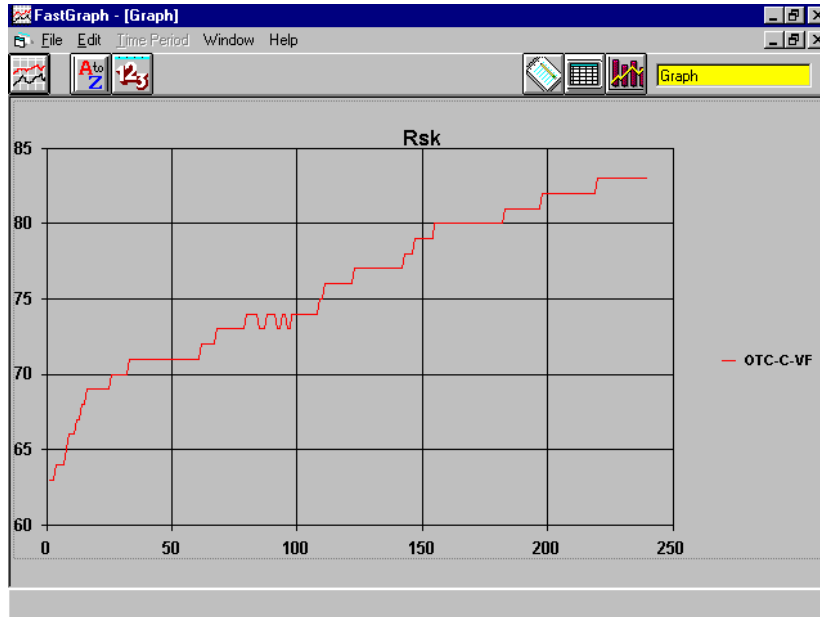
The risk (percent time invested in the OTC index) for the most favorable moving average values is in the range of 70-75%

Maximum Draw Down (MDD) could be examined to determine the benefit of using the moving average vs. buy and hold.

FastWays Example #3 - MACD

Since the functions that FastWays evaluates have different number of parameters Fast-Graph changes the graph selection parameters depending on the type of file imported. For example, AccuTrack has two parameters but MACD has three. There is also the issue of how to determine parameters if the function has more than two independent variables. MACD is an example since it has three parameters. Here is a method to help determine good parameter ranges.

First, make a FastWays run on a fund over a wide range of MACD parameters. Import this file into FastGraph. What we want to see are those parameters that give the best Mr return. Sort the FastWays file by Mr in descending order. Next, set 10% as the % of data to graph. Now graph the data:
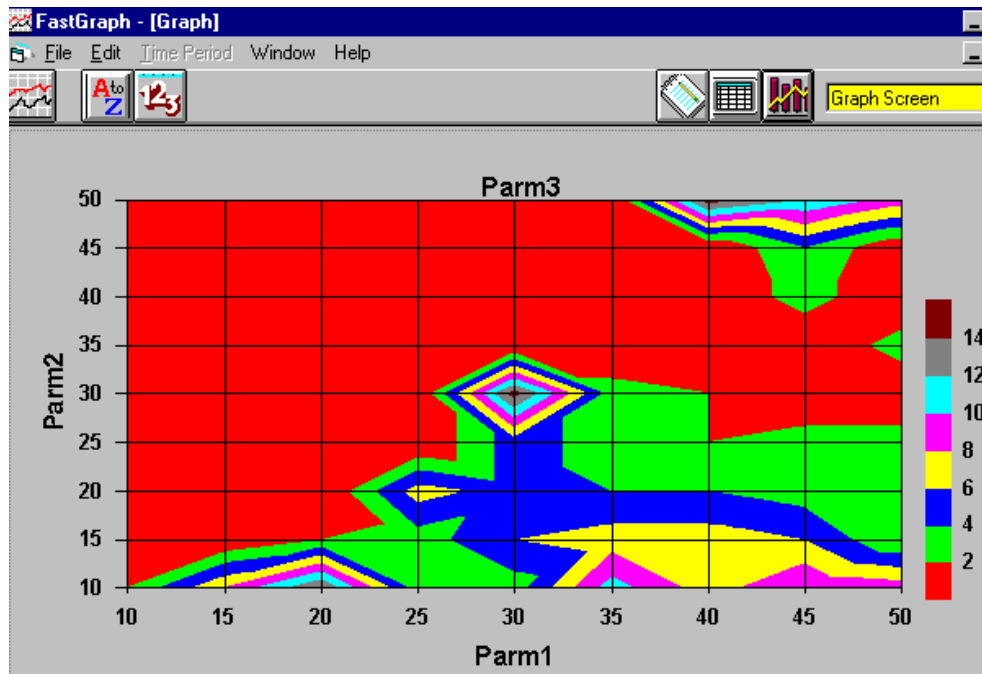
In this case the MACD parameter 1 and 2 were varied from 10 to 50. Parameter 3 was varied from 2 through 15. This graph only shows the results of the "best" 10% of the test cases. The results indicate that good Parm1 values are in the 25-50 range, Parm 2 is in the 10-30 range, and finally, the best Parm 3 values are in the 2-4 range.

Again, the values can be further refined by looking at switches per year, Mr, Risk etc.

8.0 Analyzing FastTrack Data

The FastGraph Main screen changes dramatically when FastTrack Funds & FNU Files is selected as the Data Type:
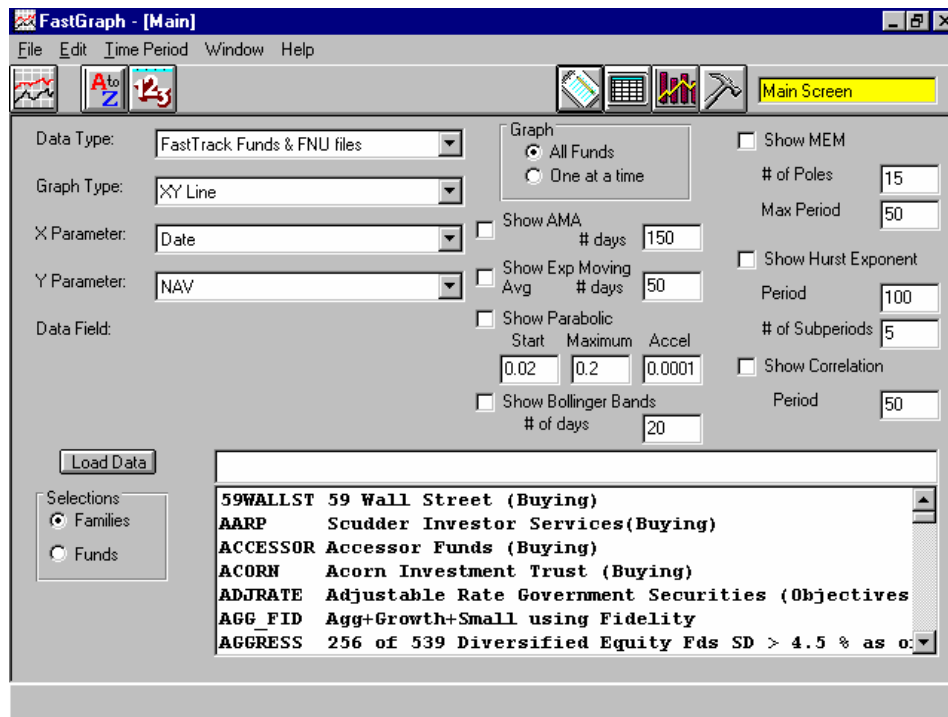
Several options become available and we will step through each with an example.

FastTrack Example #1 - Multiple Funds

The FastTrack DOS has a limitation of comparing only two funds or indexes at once. FastGraph can put many sets of data on a single graph. Here is an example comparing the DJ-30, OTC-C, Fidelity Select Electronics, and Select Air Transportation. ***Note: Once the FastTrack data has been imported you must select the funds to be graphed by "selecting" the data columns in the Data screen spreadsheet.***
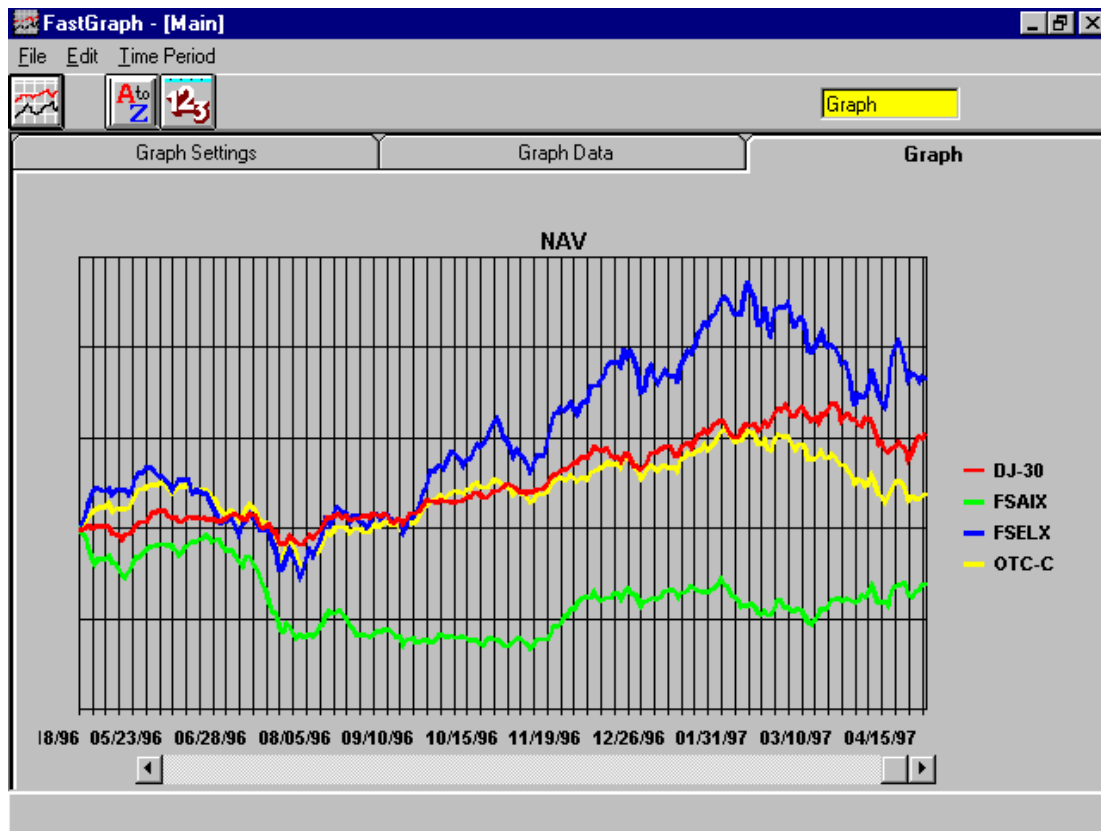
This graph makes it much easier to compare multiple funds and indexes.

FastTrack Example #2 - Exponential Moving Average/Adaptive Moving Average

Exponential moving average (EMA) analysis is one of the most common techniques in technical analysis. See your FastTrack manual for a description how exponential moving averages are calculated.

To display a fund with it's EMA, first load a FastTrack family or individual funds. Next, go to the Data screen and highlight the fund(s) you want to display, go to the FastGraph main screen and select Show Exp Moving Avg and enter a period over which to calculate the EMA. Determine if you want to show all the selected funds at once or one at a time. Finally, click the graph icon.

The following graph was made with a 50 day EMA and is displayed for a period of two years:

The Adaptive Moving Average (AMA) can be displayed in the same way. See the Appendix for a description of AMA calculation.

FastTrack Example #3 - Parabolic

The Wilder parabolic is a very common technique to set a stop in trading. See Appendix A for a description of how a parabolic is calculated.

To display a fund with its parabolic, first load a FastTrack family or individual funds. Next, go to the Data screen spreadsheet and highlight the funds you want to display, go to the main FastGraph screen and select Show Parabolic and enter the parameters to use in the calculation. Determine if you want to show all the selected funds at once or one at a time. Finally, click the graph icon.

The following graph was made with a starting acceleration value of 0.02, maximum value of 0.2, and delta acceleration value of 0.0003 for a period of two years:

FastTrack Example #4 - Bollinger Bands

Bollinger Bands are used by many technical analysts. See Appendix A for an explanation of how Bollinger Bands are calculated.

To display a fund with its Bollinger Bands, first load a FastTrack family or individual funds. Next, go to the Data screen and highlight the funds you want to display, go to the main FastGraph screen and select Show Bollinger Bands and enter the number of trading days to use in the calculation - the typical value is 20 days. Determine if you want to show all the selected funds at once or one at a time. Finally, click the graph icon.

FastGraph shows the NAV of the fund, the upper and lower Bollinger Band, and the moving average for the period used in the Bollinger Band calculation. The Bands are +/- 2 standard deviations from the average.
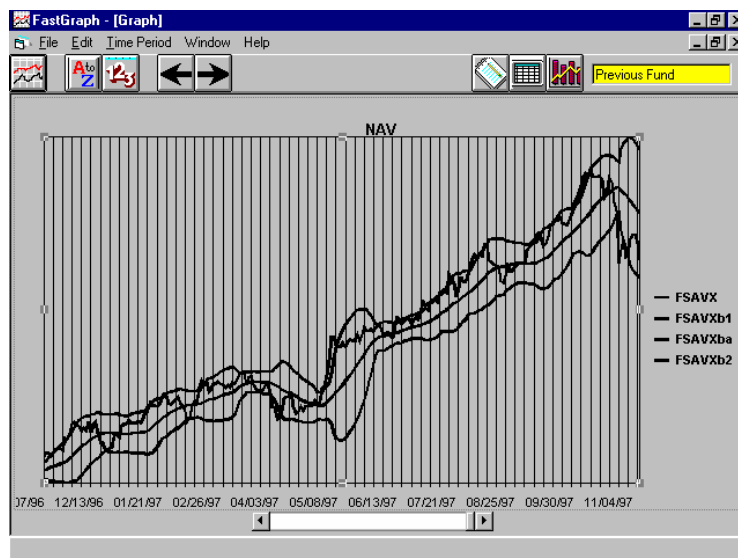
FastTrack Example #5 - Candlestick Charts

Many traders use Candlestick charts to make trades. Candlestick charts are built using daily open, high, low and close values. With mutual funds the only data available is the daily closing. Some users have found that a "synthetic" Candlestick chart can be useful using weekly data to determine the "open, high, low and closing" values. This is the approach FastGraph uses. After importing FastTrack data, and selecting the columns of data to graph, select Candlestick Bar as the chart type. The following chart was built using Fidelity Select Electronics:

The interpretation of Candlestick charts is well beyond the scope of this manual. Please check your local bookstore for books on this subject.

FastGraph has the capability to graph Candlestick Line chart that will show weekly open, range and closing values for your funds:
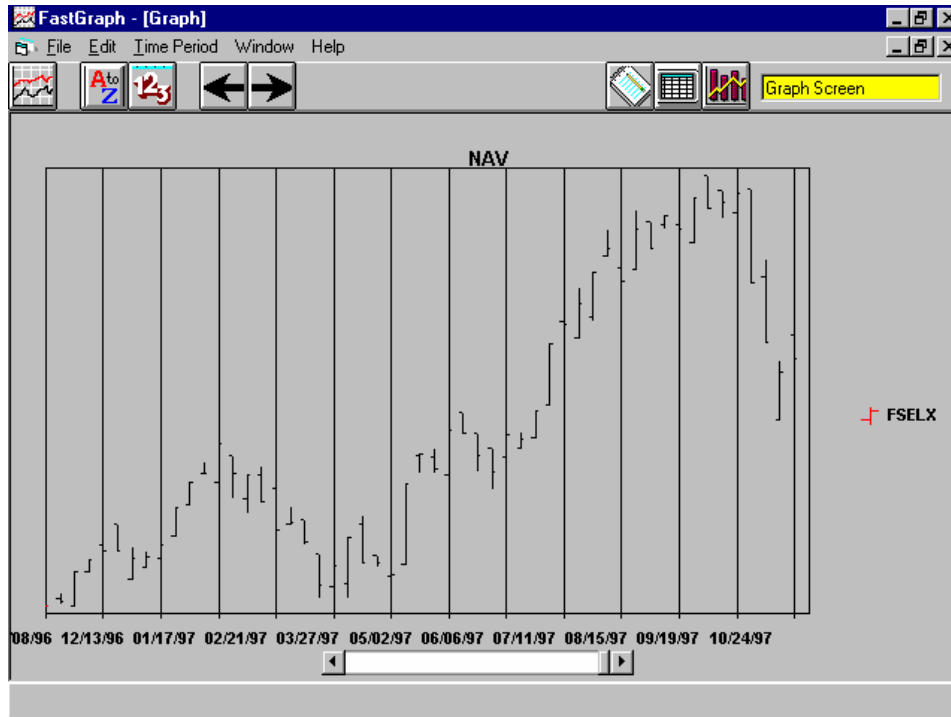
FastTrack Example #6 - Point & Figure Charts

Point & Figure (P&F) charting is a technique that has been around for a century. Recently this method of analysis has been making a strong resurgence. Interpretation of P&F charts is beyond the scope of this manual, but see the Resources chapter for a list of books on the subject.

To make a P&F chart in FastGraph you first need to import FastTrack data. Next, select Point & Figure as the Graph Type. You will see the following button appear on the screen:

Clicking this button will bring up the following screen:

This menu will allow you to change the box size values (the defaults are from the Dorsy book which is listed in the Resource chapter) and the Box Reversal values.

The next step is to select a time period range. The final step is to use the Graph icon to see the chart:

To move through a family of funds, first load the family into FastGraph. Next, go to the Data screen and "select" the columns for those funds you want to view. You can select the entire family by quickly by clicking in the blank cell in the upper left corner (cell A:1).

Select the Graph icon to chart the first P&F chart. Now you can review each of the funds by using the:

 icons to move forward and back through the funds you selected.

If you get the following message:
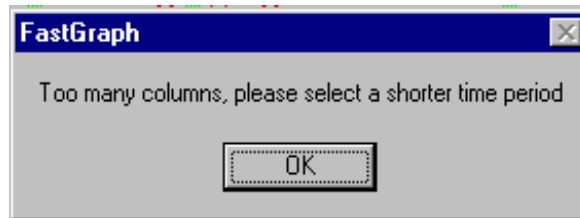
The time period selected contains too many columns of X&O's. Select a shorter time period using the Time Period menu.

FastTrack Example #7 - Correlation Analysis

Correlation Analysis allows the comparison of funds and indexes to determine how closely related they may be. FastGraph uses the common Pearson's correlation to do this analysis. Maximum correlation has a value of 1.0 and negative correlation has a value of -1.0

If an investor is trying to be diversified by holding more than one fund it may be a good idea to hold two funds that have a low correlation. Correlation can also be used for inter-market analysis.

To display the correlation between two funds, first load a FastTrack family or individual funds. Next, go to the Data screen and highlight the two funds you want to analyze (only two funds at a time), go to the main FastGraph screen and select Show Correlation and enter the number of trading days to use in the calculation, a minimum value of 50 trading days is recommended. Finally, click the graph icon.

FastGraph shows the NAV of the funds (or indexes) in the upper part of the screen, the lower part of the screen shows the correlation value.

The following chart shows the correlation is very high between Fidelity Select Regional Banks and Select Home Finance, as would be expected. However, notice that there are periods when the correlation does change dramatically. The chart is for a total of five years.
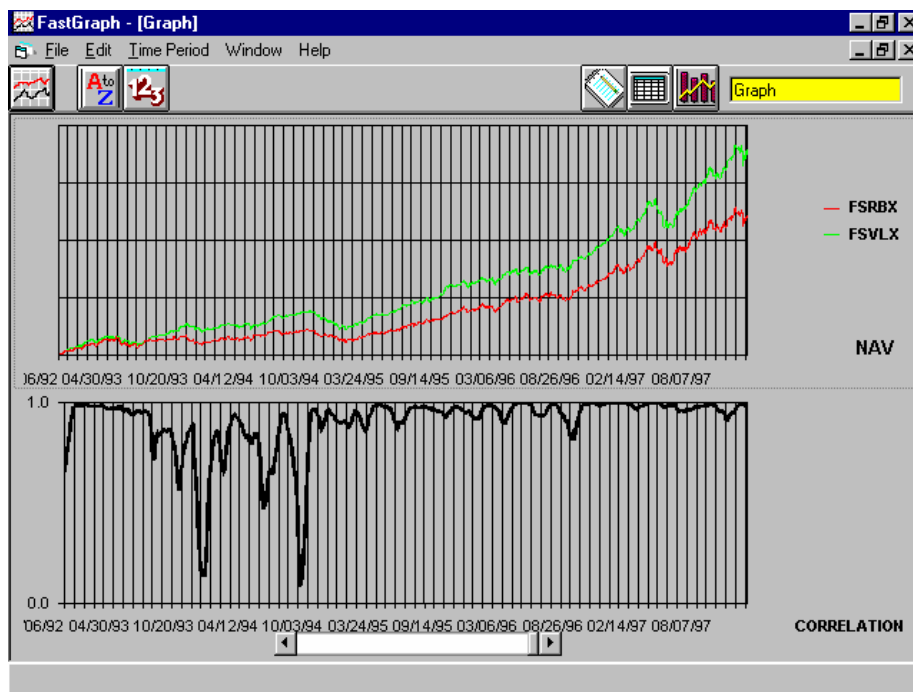
The following chart shows the low, even negative correlation between Fidelity Select Air Transportation and Select Energy Service. The type of correlation shows why the pairing of these two funds using AccuTrack has been a very successful trading strategy.
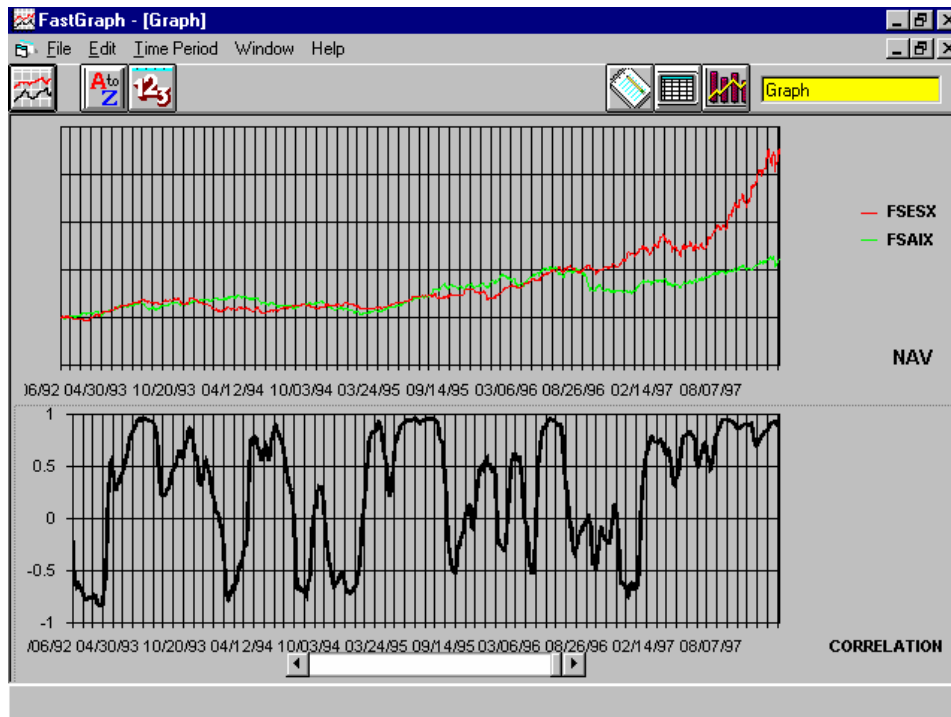
Correlation analysis can be used to show inter-market relationships. The following graph shows the relationship between the Dollar Index and the price of gold:
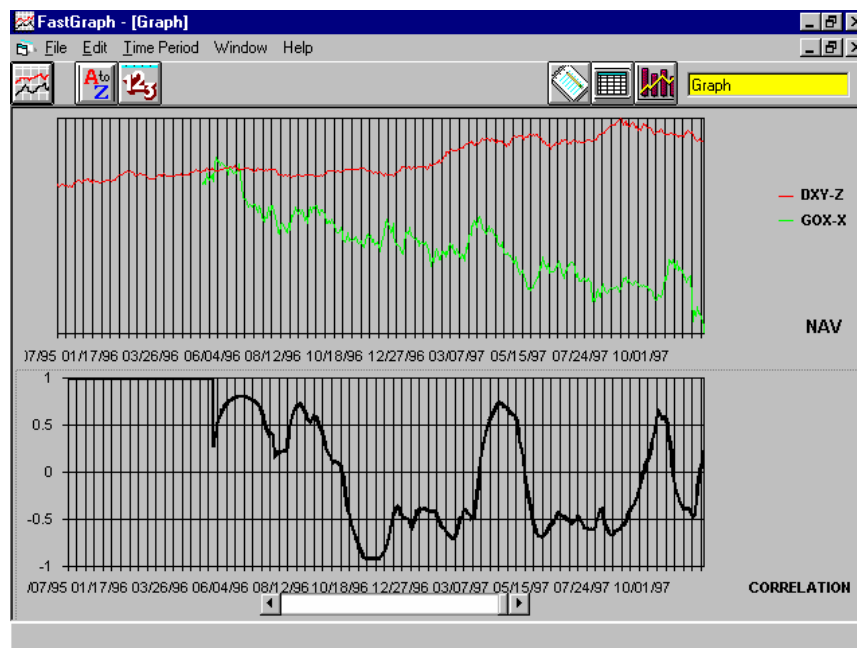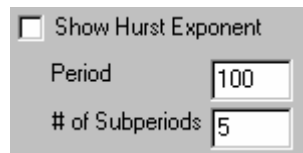
This chart shows the low to very negative correlation between the value of the dollar and the price of gold. This would tend to support the common notion that when the dollar is strong, the price of gold (denominated in dollars) declines.

FastTrack Example #8 - Hurst Exponent Analysis

Hurst Exponent (HE) calculations are quite involved. See Appendix A for a description of the calculation.

The HE is of interest because it can be used to determine if an index or fund has strong trending properties. The HE can have a value between 0 and 1. Values less than 0.5 indicate a fund is antipersistent, i.e., trading range, values greater than 0.5 indicate trending.

Show Hurst Exponent

```
□ Show Hurst Exponent
   Period          100
   # of Subperiods  5
```

The option to display the HE appears when FastTrack data is selected as the data file type. Two values are required when the option is selected. See Appendix A for a description.

The HE can be used to compare the trending characteristics of different funds. The following chart shows that Fidelity Select Home Finance historically has a higher HE than Select Electronics. The chart was made with a HE period of 500 days and 10 periods:

FastGraph - [Graph]

File   Edit   Time Period   Window   Help

Graph

— FSELX
— FSVLX

NAV

1/92 12/01/92 05/24/93 11/11/93 05/05/94 10/25/94 04/18/95 10/06/95 03/28/96 09/18/96 03/11/97

0.9

— FSELX
— FSVLX

0.4

'11/92 12/01/92 05/24/93 11/11/93 05/05/94 10/25/94 04/18/95 10/06/95 03/28/96 09/18/96 03/11/97

HURST EXPONENT
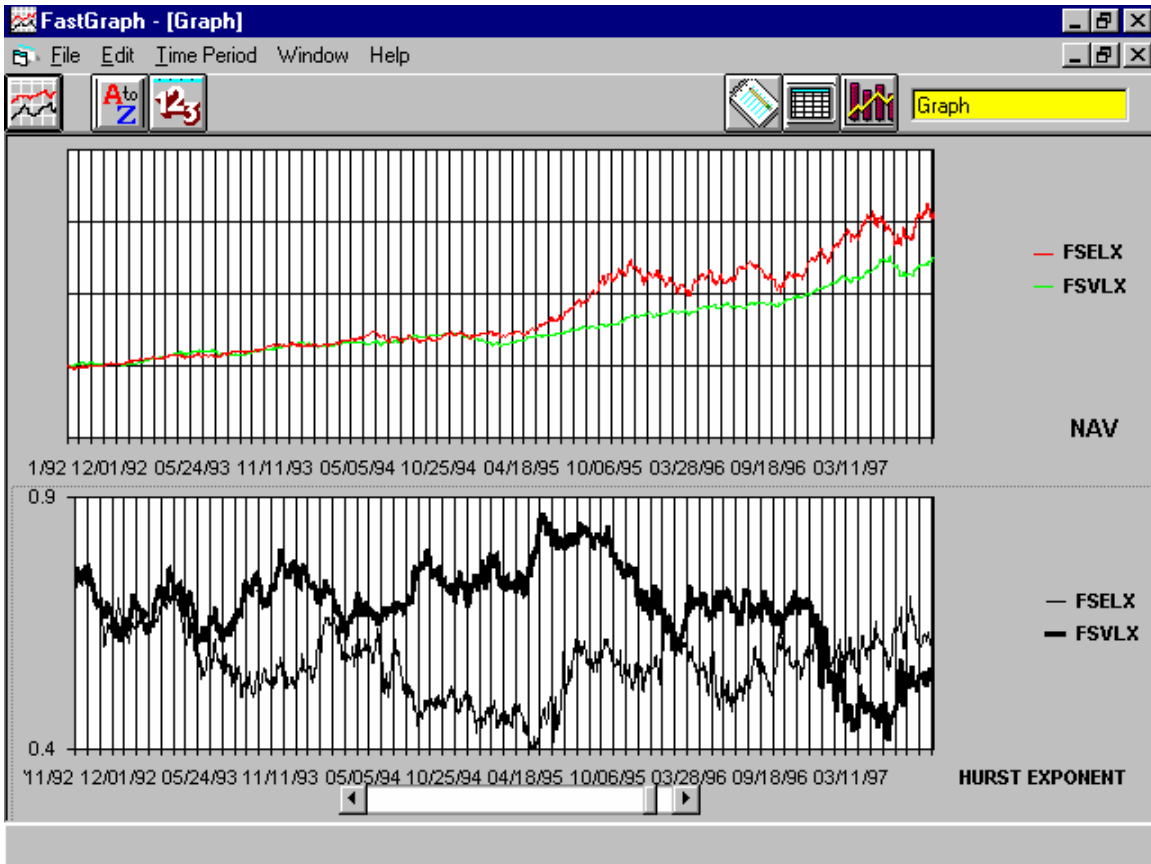
9.0 MEM for Cycle Analysis

A larger number of market technicians use cycle analysis in their trading. Proponents of cycle analysis will claim that the market moves in somewhat repeatable cycles and if the period(s) of these cycles can be determined then it may be possible to make predictions of short term price movements. Just knowing if the market is in a cycle mode or trending mode can be very important to an investor. If the market is in a trending mode then the investor should use trend following methods such as moving averages, and if the market is in a cyclic mode then trading methods such as stochastic are better tools to use.

The method FastGraph uses to determine cycle information is called the Maximum Entropy Method (MEM) that has been popularized by John F. Ehlers. For an excellent book on the subject see Mr. Ehlers's *MESA and Trading Market Cycles*. The mathematics of the MEM are quite involved and beyond the scope of this manual. We will concentrate on how to interpret the charts in FastGraph.
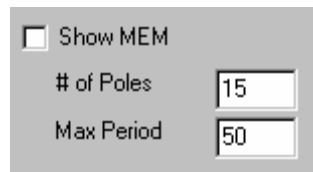
Note: The color charts do not reproduce well in black & white. It may be a good idea to bring the following examples up on your color monitor as you walk through this section.

To activate the MEM control options you must have selected and loaded the FastTrack families or funds. Once this is done the following options can be found on the main FastGraph screen:

The two MEM control parameters will be explained later in the chapter. For now, load the FastTrack funds, find and load the NASDAQ composite index (OTC-C), select the Show MEM option, go to the FastGraph Data screen and select this column of data that has been loaded., and click on the graph icon. You will see a chart similar to the following which was made for a period of six months with an ending date of October 1996:
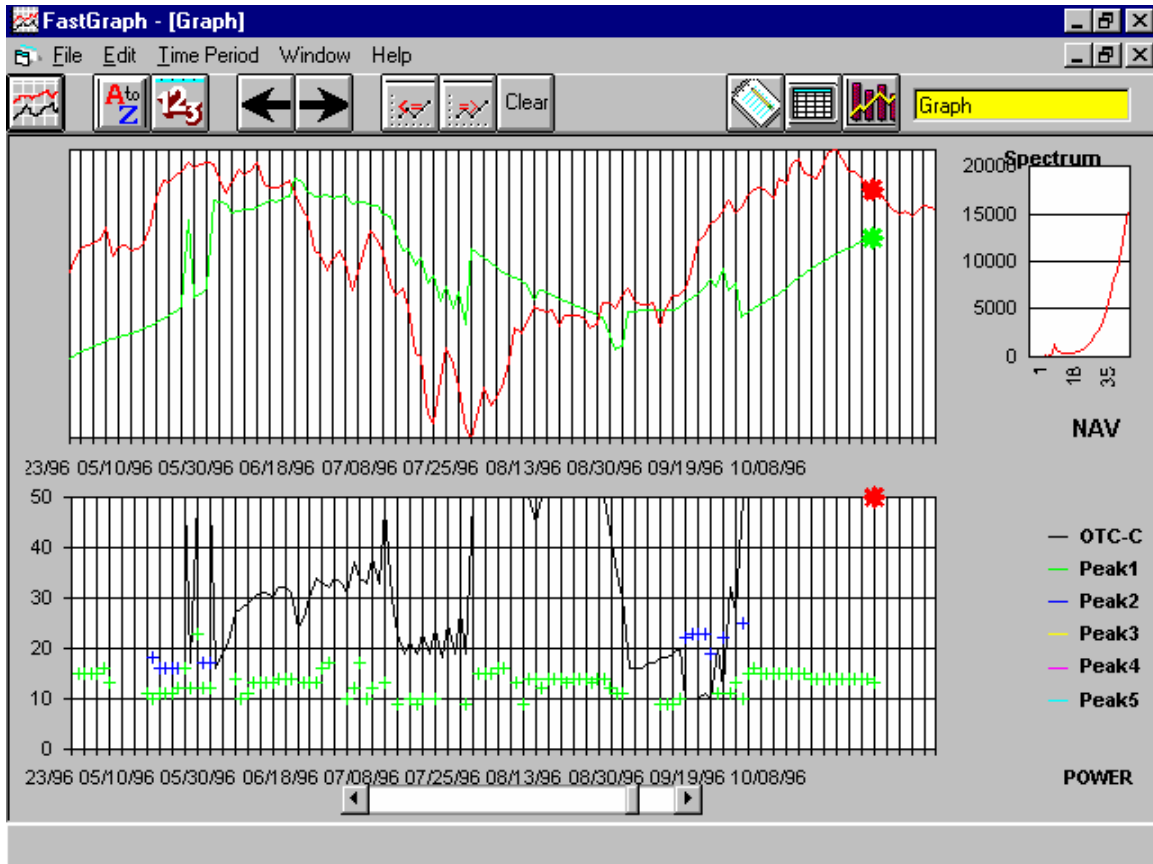
This is a very busy screen. The top half of the screen has the NAV of the index and a moving average line. The bottom half of the screen contains information about the dominant cycles, and finally, the upper right part of the screen has the spectrum of a specific day.

Starting with the lower half of the screen there is a solid line (red) that starts at 50 on the left of the screen and cycles between 8 and 50 as it moves from left to right. This line is the period of the dominant cycle period. When the line is at or near 50 the NAV (the OTC-C in this case) is considered to be in a trend mode. The value of this period is used to calculate the trend line (green) in the upper half of the chart. The trend line is a simple moving average using this dominant period. Notice that as we move toward the right in time, the dominate period drops toward 20 days and you can see the moving average in the upper part of the chart respond by moving much closer to the NAV line (red). When the NAV line crosses below the trend line this is considered a sell. The NAV continues below the trend line into the center of the chart with the dominant period falling between 20 and 40 days. Near the center of the chart, in time, the dominant period again goes to 50 days. The MEM is now saying that the index is in trending mode, but it is a **downward trend**. The dominant period starts to move toward 50 days and the NAV jumps above the trend line. ***Note: Using the criteria outlined in Ehlers's book, a fund would not be purchased until it had traded above the trendline for one-half the dominant period. We have found this to introduce too long a delay. For mutual funds a better buy***

point may be when the NAV trades above the trendline and the dominant period goes to 50 days.
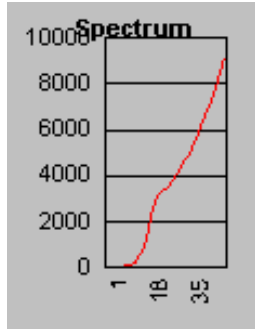
Spectrum

The spectrum in the upper right portion of the screen shows the "power" of each period in the cycle. In the above example the maximum power is in the 50 day period and indicates a high quality trend mode. The following spectrum is characteristic of a cycle mode:
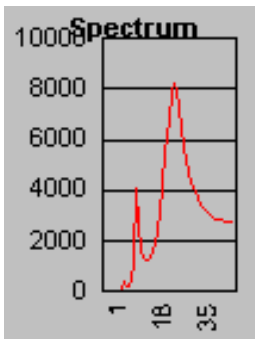
  This spectrum shows that the dominant cycle is 28 days long and a second, less powerful cycle, at 12 days. The minimum period that FastGraph will allow is 8 days.

To see the spectrum of different days use the following icons:

These icons will move you left and right to show the spectrum of different days. The day you are showing is indicated on the charts by the large red and green asterisks:
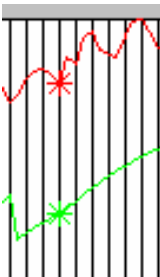
These move along the graph lines as you click the icons.

In the lower right corner of the MEM screen you will see:
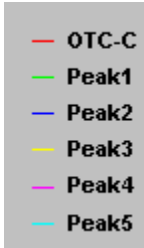
This is the legend for various peaks in the spectrum. In a trending mode only the red dominate period will be displayed on the bottom Power chart. As other peaks appear in the spectrum these will be indicated on the Power chart. For example:
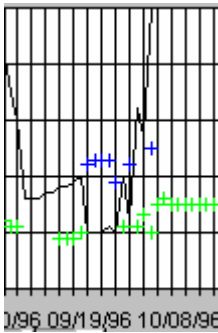
This portion of the Power chart shows the red line indicating what the dominant period is doing. There are also a few green and red + symbols to indicate that other peaks are present in the spectrum but are of lesser power, and hence lesser importance, than the dominate period. When additional peaks start to show on the Power chart it is an indication of a stronger cycling vs. trending mode. As the spectrum moves toward a trending mode the extra peaks will start to disappear and finally only the dominant period red line will remain.

Price Prediction

The MEM has the ability to make a short term price prediction. FastGraph always shows a ten day price prediction at the far right of the NAV chart:
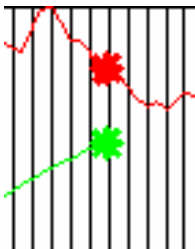
The red NAV line to the right of the * is a 10 day price prediction based on the current spectrum analysis. You can look at past price predictions by moving the mouse cursor to any point along the red NAV line and clicking the left mouse button. The ten day price prediction will appear as a blue line. Here are some examples (in black/white):
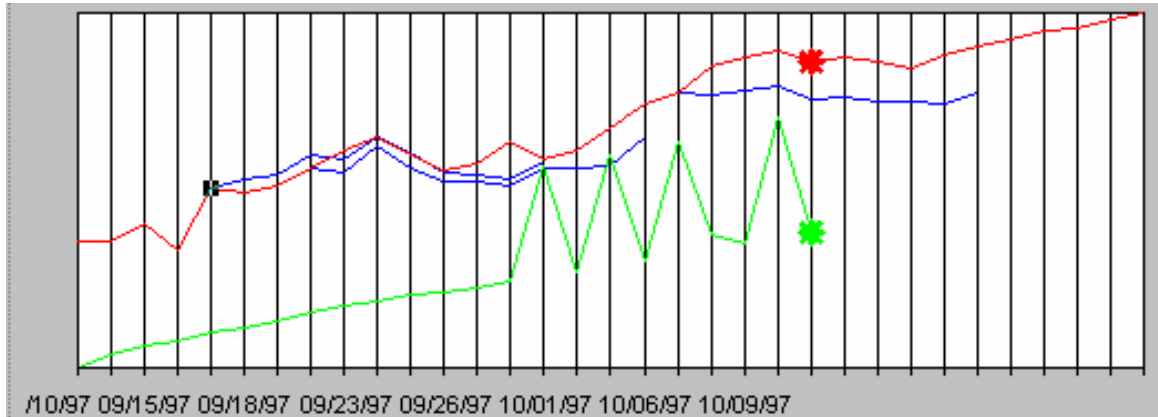
Note: When trying to make price predictions the placement of the cursor is very sensitive. Often when you click you may bring up the option to change the NAV line characteristics. We suggest that you only show short time periods, a month is good, when checking price prediction accuracy. With a little practice you can determine the best area on the NAV to place the cursor.

You will find that the predictions are poor when the mode is a transition, switching from cyclic to trending, and from trending to cyclic. Such short term predictions are of limited use in mutual fund trading.

Using MEM - Summary

Should the NAV moving above or below the trend line be used as specific trading signal? The answer is an emphatic NO! What the MEM charts can help tell you is if a fund or index in a trend mode is starting to break down into a cycle mode and may be an indication to start watching closer if you are in the fund or index. On the other hand, if a fund or index has been in a trading mode and now the spectrum and Power charts start to move toward longer dominant periods then you may want to start to consider an entry into a long position.

The Power and spectrum chart can help determine the quality of a trend. If the dominant period is at fifty days but you start to see other peaks appear then a change MAY be starting.

Here is another example using Fidelity Select Electronics for nine months ending in October 1997:
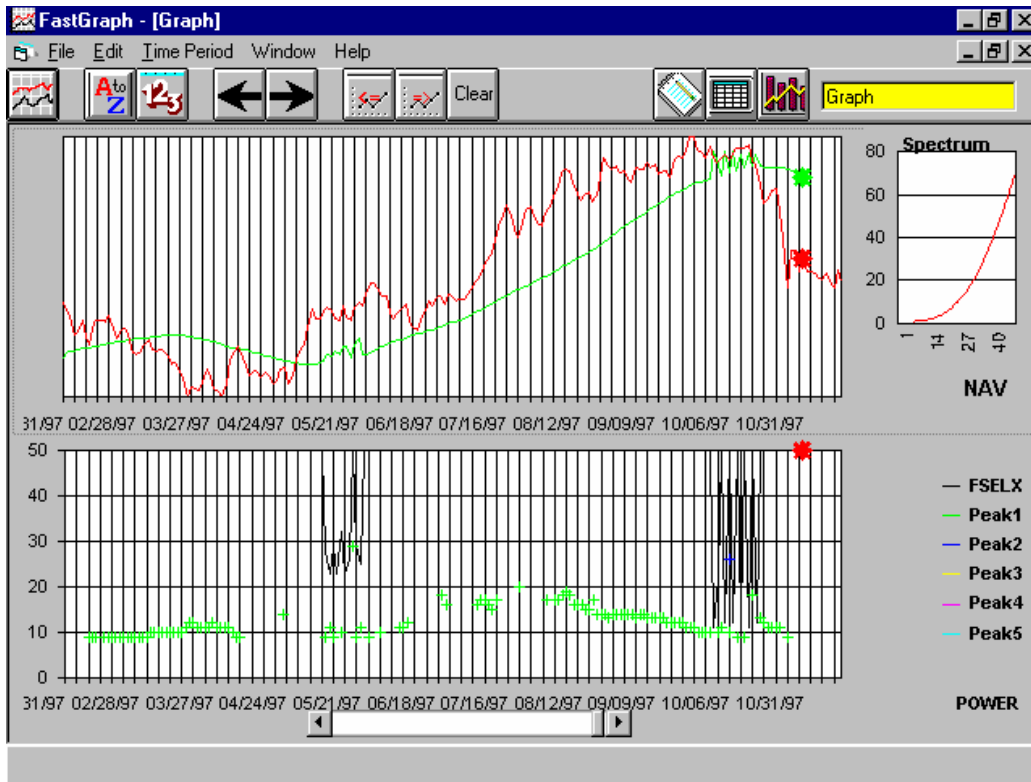
When the chart starts on the left the dominant period is fifty days, and therefore a trend mode. In this case it is a down trend and the NAV drops below the trend line shortly after the chart begins. Approximately three months into the chart the dominant period drops to a cyclic mode with a period of about 18 days, however, the length of the dominant period turns up almost instantly and the NAV goes above the trend line. An aggressive trader may want to buy the fund at this point. A more conservative trader would wait until the trend is more obvious. This happens when the dominate period goes to 50 days. The upward trend continues with little indication of changing until the dominate period drops to about 12 days and the trend line moves toward the NAV quite dramatically. This is an indication that the upward trend may be ending and the fund is entering a cyclic mode. Other indicators should be looked at to help make a trading decision.

In this particular case the upward trend was ending and the fund dropped significantly. Will this happen in every case? NO! There are no perfect indicators or guarantees. This is another tool to put in your tool box.

A Note on Picking MEM Parameters

We recommend that the Max Period parameter be left to the default of 50 days. This is the value recommended by Ehlers. The selection of the # of Poles parameter is a little more difficult. The higher this number the more "spikes" that will appear in the spectrum. A recommend value is 40% of the Max Period parameter. Therefore, if using 50 days then 20 poles is a good starting point. We have very little experience with using the MEM and are in an experimental mode ourselves.

10.0 Making Simulated Index Funds

Index fund investing has become very popular and some of the new index fund products actually leverage the index. For example, the Rydex Nova fund actually attempts to beat the S&P 500 Index by 50%. Other funds actually take an inverse approach to the index, for example, the Rydex Ursa fund rises when the S&P 500 Index drops and declines in price when the S&P 500 Index increases.

The problem for investors is that there is a limited amount of data because these funds are relatively new. This lack of historical data prevents developing strategies in FastBreak (and other products) that can be tested back to 9/1/88.

FastGraph allows you to create a simulated index fund that has the same length of history as the index you are using in the simulation. ***Note: This will be an approximation that may be very good or very bad depending on a number of issues. You need to be very careful in how you use this feature. Trading systems that spend a short time in the simulated index fund will be affected much less than strategies that hold the simulated index for very long periods of time because errors tend to compound over time.***

FastGraph calculates the daily percentage change in the index to be matched, then multiplies this change a "beta" and applies the result to the simulated fund. For example, if the S&P 500 increases by 1% on a given day and a beta of 1.5 is used the simulated fund will increase by 1.5% on that same day.

To use the new feature first load the fund or index you want to "clone" into FastGraph. For example, if you want to create a simulated Rydex Nova fund load the S&P500 (SP-CP) from the FastTrack data base. Go to the Data Screen and select (highlight) the SP-CP data column.

Calculations Screen
 When you click this icon a new screen appears:

There is a small button on this screen that when clicked a menu appears that asks for the name of the FNU file. Once you enter the file name and click OK, screens appear to input a title description and symbol. You need to input a Beta factor that will be applied to the imported index. For example, to make a Nova "like" fund use 1.5 as the beta multi-

plier. The last issue is to input a starting NAV value for you simulated index. This value isn't very critical because FastTrack and FastBreak work off changes in NAV not the actual value. However, if you build a simulated index fund that declines dramatically over time then this value needs to be made large enough to prevent round off errors as the NAV gets smaller. A good starting value is 100.

The last step is to click the Calculate button. The FNU file will be created and the data will be loaded into the Data Screen.
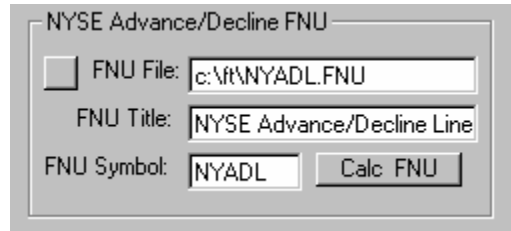
The file produced by FastGraph will be perfectly correlated (correlation coefficient of 1.0) with the imported index. This usually isn't the case for the real index funds even though this may be their stated goal. Also, the simulated fund will not be updated automatically each day.

Again, be careful how you apply the results and let us know how we can make this a better feature.

11.0 Calculate Advance/Decline Lines

FastGraph can calculate the Advance/Decline (A/D) line for both the New York Stock Exchange (NYSE) and a user specified family. These data are put in a FNU format that can be loaded into FastTrack or FastGraph for viewing.

Go to the Calculation screen and you will see the following area:
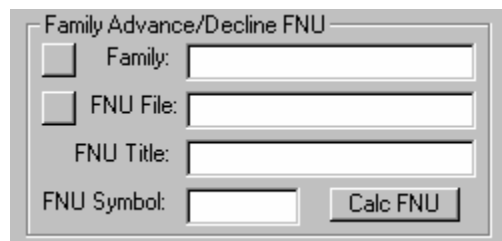
This option will calculate the A/D line for the NYSE. If all the inputs fields are loaded with acceptable values click the "Calc FNU" button. If you want to change the fields click the button next to "FNU File" and a series of screens will ask for the name of the FNU file, title, and symbol. After you input these values click the Calc FNU button. You can load and view the A/D line in FastTrack or FastGraph.

To calculate the A/D for a user specified family use the following screen area:

This option is very similar to the NYSE option. The only difference is you need to input the family that you want to analyze first. This is accomplished by clicking the Family button to select the FastTrack family.

12.0 Composite Timing Signal Analysis

There are no perfect market timing signals. Some users have found that better results are obtained by using combinations or composites of several signals. For example, a strategy could use five separate signals, and the investor would buy into the market when any three or more signals are on a buy, and sell out of the market when two of fewer signals are on buy. The question is should the investor use two of five signals, four of five …? Also, what results can be expected; Annual return, MDD, Switches per year, etc. Fast-Graph allows you to build and test composite signals.

Calculations Screen

Clicking on this icon will bring up the following screen:

Note: This screen takes some time in loading because FastTrack data is being loaded.

There are several steps in analyzing a composite of signals. The first step is to select the signals from your FastTrack signals directory that you want to combine. This is simply done by clicking on a signal file name from the list on the left part of the screen. Clicking the Add button will add this signal to the box on the right half of the screen. If you make a mistake you can use the Remove button.

Once you have built your list of signals you can save it by clicking on this button:
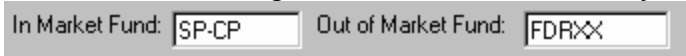
We suggest you use the default suffix. Then click on the save button.

Next, enter the starting and ending dates for the period to be analyzed. In addition, add the delay, in days, for the signal. If the signal is to executed the same day it occurs, the delay is zero, and if the signal is executed the next day (most typical for FastTrack users) enter a one day delay.

Start Date 09/01/1988   End Date 09/25/1998   Delay 1

The next step is to select the fund or index to be invested in when you are "in" the market and the fund or index when "out" of the market. This example will be invested in the S&P index when long and into the FDRXX money market when out of the market.

In Market Fund: SP-CP   Out of Market Fund: FDRXX

We now need to create a place to save our results. Click on the Make Sig Sum File box:

☐ Make Sig Sum File:

A menu will pop up to enter a file name. ***Note: Do not confuse this file with the Signal Family File which was created a few steps back.***
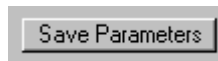
For the next step we will skip toward the bottom of the screen to this line:

Buy and Sell Range
☐ 2D Test Range   1   to 5
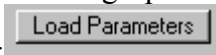
FastGraph has a choice of two types of analysis. The simple strategy is what we call a One Dimensional test. This method uses the same number of separate signal buys and sell for the composite signal. For example, a strategy that goes long on three signal buys will exit the market if there are only two signals in the market. The Buy and Sell Range will test all combinations of the separate signals. In our five signal example we will look at the results when one or more signals are on a buy, two or more, three or more …. Up to five or more. Any time that fewer signals are in the market then the composite will sell out of the market.

The next step is to save the setting we have just made using: Save Parameters

Clicking this button will bring up a menu to save a parameters file that you can reload later using this button: Load Parameters

Finally, we can start the analysis with this button: Calc Sig Sum

When the execution is complete go to the FastGraph Main screen and select XY Line as the Graph Type since this is 1 dimensional analysis. The Summary data is loaded to the Data screen during execution so the Summary File (SSM) does not need loaded before graphing. The file can be reloaded at a later time by selecting FastGraph Summary File as the Data Type. When we click the Graph icon we get the following graph:
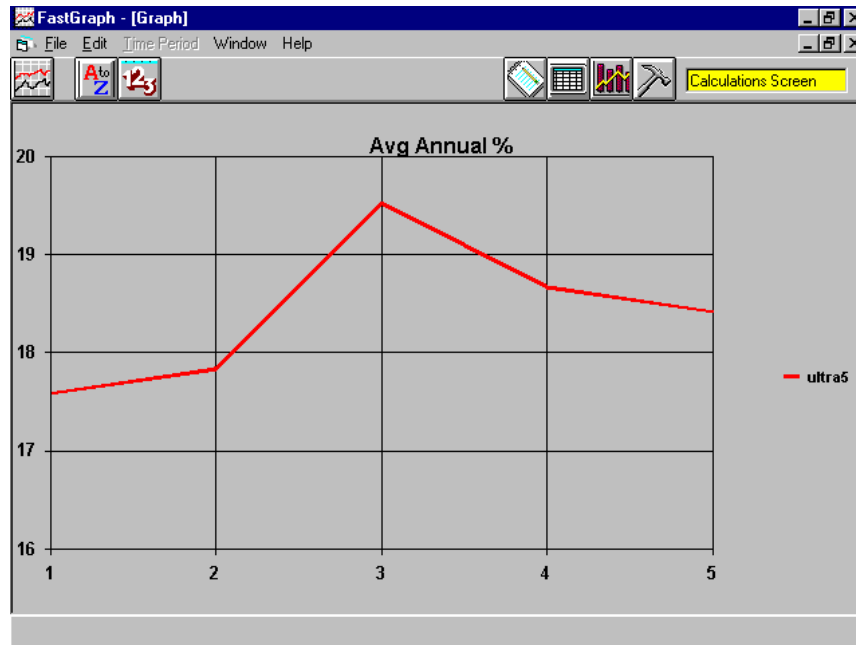
From this graph we see that we get the best annual return when we "Buy" with any three of the four signals in the market. We would sell if there are less than three separate signals on a buy.

You can also examine MDD, UI, UPI and switches per year in the same manner if you select a different Y Parameter.

To make a Two Dimensional analysis (2D) go back to the Calculations Screen. Now, select:

Notice that we now have separate fields for Buy Range and Sell Range. FastGraph can now use or have a different number of "buy" signals to go long the market than the number of "buy" signals to leave the market. For example, a strategy may enter the market when four of five separate signals are on a buy but not sell until there are only two signals still on a buy. *Note: FastGraph always looks at the direction of the last change in signals. This will be explained in the following example.*

Create a Sig Summary File by clicking the Calc Sig Sum button. When the calculation is complete go the Main Screen and load the file. Since we have made a 2D run we can use Contour as the Graph Type. Here are the results:
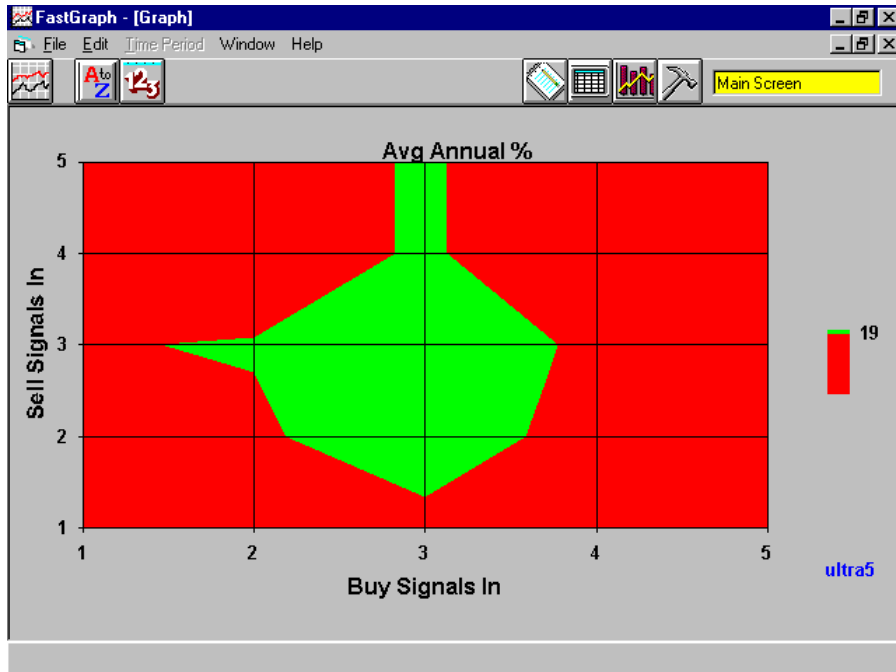
This graph needs some explanation. This graph indicates the best results are obtained when a Buy is made when any 3 OR MORE signals are on a buy. A sell is made when only 2, 3, 4, 5 OR FEWER signals remain on a buy. At first this may not make sense, but remember FastGraph looks at the direction of the most recent change in the number of signals in the market. The above graph has the best results centered about the point 3/3. This means that the best results were obtained when 3 or more signals were a Buy (Buy when going from 2 to 3 signals on a Buy), and the market was Sold when 3 or fewer signals were on a Buy (Sell when 3 or fewer signals were on a buy with the last change in direction is a sell signal). Here is an example of how a series of trades would look as different signals go in and out of the market:

Date	Number of Signals on a Buy	Position
2/10/90	2	on sell
2/11/90	3	**Buy**
2/17/90	4	on buy
2/18/90	5	on buy
4/11/90	3	**Sell**

Notice that the same number of signals (3) on a buy is used for both Buying and Selling. The difference is the direction of the last change (go from 2 to 3 to buy and go from 5 to 3 to sell).

Now that we have determined a specific strategy we can create an FNU file that Fast-Track can use to display the equity curve for this strategy. Enter the optimum parameters in the Buy and Sell Ranges:

Now click on the Make Signal FNU box which will bring up menus that allows you to fill in the file name, title and symbol name:

We can also make a Detail file by selecting the following menu:

The Detail file contains the information on each trade and can be loaded into the Fast-Break Data Screen.

We can also create a Composite signal file that FastTrack can use. This file will be a standard FastTrack signal file that can be placed in the FastTrack Sig directory. This file is created and named by using the following menu item:

At this point the composite strategy can be executed by using the Calc Sig Sum button.

Here are some of the details that can be viewed in the Data Screen:

	A	B	C	D	E	F	G	H	I
1	BUY	SELL	BUY	TRADE	TRADE				
2	SIGS IN	SIGS IN	DATE	DATE	GAIN				
3	3	3	9/2/88	9/30/88	0				
4	3	3	9/30/88	1/3/89	2				
5	3	3	1/3/89	10/12/89	29				
6	3	3	10/12/89	11/1/89	0.7				
7	3	3	11/1/89	6/5/90	7.5				
8	3	3	6/5/90	9/24/90	1.9				
9	3	3	9/24/90	6/17/91	24.8				
10	3	3	6/17/91	6/24/91	0				
11	3	3	6/24/91	2/26/92	12				
12	3	3	2/26/92	4/14/92	0.7				
13	3	3	4/14/92	4/30/92	0.6				
14	3	3	4/30/92	5/27/92	0				
15	3	3	5/27/92	10/28/93	13.5				
16	3	3	10/28/93	11/22/93	0.2				
17	3	3	11/22/93	1/17/94	3.1				
18	3	3	1/17/94	5/16/94	1				
19	3	3	5/16/94	9/15/94	6.8				

13.0 Frequently Asked Questions

Q) Just because a particular strategy works well in back testing, what guarantee is there that that is will work well in the future?

A) *We are all looking for the perfect trading strategy or tool. There are no guarantees any strategy or indicator will work well in the future. An investor needs to look at his strategy(s) over a variety of market conditions and try to determine if it is a good general solution.*

Q) What trading parameters have you found that work best?

A) *There is more than one answer here. Depending on the account there are different strategies. Each investor has different objectives. FastTrack is operated under the rules that the individual investor take active involvement in investment decisions and the authors of FastGraph have the same rule.*

Note: Even with this answer we still receive many calls asking us to help, and we have spent countless hours on the phone. Therefore, we have a new policy. We will help develop and modify strategies, but our fee is $100 per hour for this support.

Q) File not found error?

A) *One of the file names you used is not valid. File names need to start with a letter of the alphabet, have up to eight characters before the period, and up to three characters after the period.*

Q) Can I use the spread sheet capability in FastGraph?

A) *You may have noticed the Data screen can become an active spreadsheet if you double click on the page. We have not fully evaluated this capability of the spreadsheet and do not support spreadsheet functions at this time.*

Q) Can I suggest enhancements to future versions of FastGraph?

A) *We always welcome user suggestions. Some of our best enhancements to FastBreak came from users. However, we receive numerous suggestions and try to incorporate the most frequently requested items.*

14.0 Resources

The Edge Ware Internet web site (www.edge-ware.com) is a good place to visit. Other items of interest will be posted as they become available.

FastWays is a product of Software Support Products, LLC. Edge Ware has no financial interest in this product, but we believe it to be a very powerful add-on to FastTrack and have used it for years. See FastTrack commentary number 8100 for additional information.

Traders Press is a good source of books on technical analysis. Call them at 800-927-8222 and ask for a copy of their catalog.

These are the books that Edge Ware used in researching Point & Figure Charting:
Point & Figure Charting: The Complete Guide by Carroll Aby
Study Helps in Pint & Figure Technique by Alexander Wheelan
Point & Figure Charting by Tom Dorsey

The reference used for research in cycle analysis :
MESA and Trading Market Cycles by John F. Ehlers

The reference used for the Hurst Exponent:
Fractal Market Analysis by Edgar Peters

Appendix A - Technical Discussion

Parabolic Stop

The parabolic stop system was developed by Welles Wilder and is documented in many books on technical analysis.

The parabolic formula can be summarized as follows:

$Par_2 = Par_1 + Acc\_fac \times \{high\_of\_trade - Par_1\}$

Where:

Par_2 = Tomorrow's parabolic value
Par_1 = Today's parabolic value
Acc_fac = Acceleration factor
high_of_trade = Highest price since the trade was established

The fund is held until the mutual fund NAV becomes equal to, or drops below the Par value. The initial value of the parabolic for a long trade is set to the lowest price reached while the fund was trading below the parabolic.

Wilder suggested setting the initial value of the acceleration factor to 0.02 and increased by 0.02 each time the trading vehicle (stock, commodity, etc.) hit a new high during the trade. He also suggested a maximum value of 0.2 Traders using this function for mutual funds have found the 0.02 increase for each new high to be too large a value. A more reasonable value is in the 0.001-0.0001 range. FastGraph allows the user to set the starting, maximum, delta increase.

Bollinger Bands

Bollinger Bands were developed by technical analyst John Bollinger. See a good book on market technical analysis for an explanation on how to best use this indicator.

Bollinger Bands are plotted two standard deviation above and below a simple moving average. The data used to calculate the standard deviation are the same data as those used for the simple moving average.

Upper band = $X + 2*\sigma$

Lower band = $X - 2*\sigma$

Where:

X = A simple moving average = $\sum X_i / N$

X_i = The daily NAV for days = 1, N

N = Total number of days for the calculation. The recommended value is 20 days.

σ = Standard Deviation = $\left[\sum(X_i - X) / N \right]^{0.5}$

Adaptive Moving Average (AMA)

There are a number of different methods to calculate adaptive moving averages. Fast-Graph uses the following equation:

AMA(day) = EMA (N x EMA(day) - (N-1) x EMA(day$_{-1}$))

Where:

day = current point in time series
day$_{-1}$=current point in time series minus one
EMA = Exponential Moving Average
N = number of periods in the time series to use for smoothing

Hurst Exponent

A good book on the subject of the Hurst Exponent (HE) is *Fractal Market Analysis* by Edgar E. Peters.

Interestingly, the HE development grew out of work by Einstein who found that the distance a random particle covers increases with the square root of time:

$R = T^{0.5}$

Where R = the distance covered
T = a time index

A process that changes with an exponent greater than 0.5 is said to be persistent or in market terms, trending. A process that changes with an exponent less than 0.5 is antipersistent or in market terms, trading range.

H.E. Hurst (1900-1978) studied river flows in his work as a dam builder. He noticed that flood years tended to be followed by other flood years, i.e., not a random occurrence. He developed a method to measure how persistent a process may be. The method is very

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data intensive and this chapter will give a brief overview. Anyone with a deeper interest is directed toward the Edgars book.

The HE works with "time series data" which for our purpose will be the daily NAV of a fund or index. The first step is to take the logarithm of the ratio of each daily NAV divided by the previous day's NAV.

The result of the first step is divided into a number of time series. If working with 100 days of daily data, for example, you may divide it into four periods of 25 days each. The average value is calculated for each of these four periods.

The next step is to find the "accumulated departures" from the average for each of the four periods. Accumulated departures are calculated by taking the sum of each value in the period minus the mean value of the period.

Next, a range is calculated for each period which is simply the maximum value minus the minimum value for each period.

A standard deviation is calculated for each of the four periods, and the range for each of the four periods is divided by the standard deviation of each period. This result is called R/S. An average R/S value is calculated by summing the R/S for each of the four periods and dividing the sum by four.

We are almost finished. The above result gives one value of R/S for a single period of time, i.e., number of days, in this case 25 days. To calculate the HE we need to find an R/S value for several different number of days, i.e., 20, 30 40 etc. The R/S values can be plotted vs. the different number of days on log/log paper and the HE will be the slope of the line. FastGraph calculates the HE by a mathematical curve fitting routine.

FastGraph requires two values when it calculates the HE. The Period is the maximum number of market days used to calculate the HE. The number of sub periods is the number of different values of time to curve fit. If you see values of HE less than zero or greater than 1, increase the number of sub periods to get a better curve-fit. The suggested number of sub-periods is five. The number of days to use should be one hundred or more.