



FORMULAS.... *MADE EASY*

One of the benefits of using Aspen Graphics is the ease with which you can customize the program to fit your individual needs. Once you master the basics, an unlimited number of personalized formulas will be at your fingertips, ready to display in charts and quote windows, to export to an Excel® spreadsheet or to set alerts on your formula.

A *QUICK AND EASY WAY* to chart a formula:

Any formula can be typed directly into a chart, just like a symbol. This is helpful for short formulas or for a formula that you want to quickly test to see if it is calculating as you would expect.

1. Display a chart on the screen, by either typing **.dc** for a default chart, or retrieve any other chart that you have saved in the program.
2. Type in the formula. Some examples of commonly charted formulas:

c#-c#1	spread the front month to first out of corn
(ng#+ng#1+ng#2)/3	3-month strip of Nat. Gas
(intc/oex)*100	comparing intel to the S&P 100 index
msft+ibm+intc+hwp	custom basket of stocks

What if I want to use the formula in another window?

When you want to use your formula in more than one Aspen application, it's quicker to enter the formula in Aspen's Formula Listing so that it can be quickly recalled in other windows, alarms, DDE, etc. Because this feature will also evaluate your formula for errors in syntax, it's a good idea to enter a more complex formula directly into the Formula Listing so that you will be alerted immediately to any syntax problems.

1. Display the Main Menu and select Formulas.
2. Single-left click on Enter Formula.
3. A formula written in the Formula Listing must have 3 components:

Formula_ Name	Equal sign	Expression (where numbers get crunched)
↓	↓	↓
21DayHigh	=	RMAX(\$1.high,21)

Formula Names can be as descriptive as you like; they are not case sensitive. Using both upper and lower case letters in the formula name can make it easier to read the name from a menu. Use the underscore (_) instead of the space bar to add a space to your formula name.

Expressions are made up of:

- * constants (CLZ5, 42, etc.)
- * operators (+, -, *, /, =, etc.)
- * variables (\$1, \$1.low, cl#, etc.)
- * functions (RMAX(), DEV(), LOG(),

Some examples of formulas as they would be entered in the Formula Listing:

6month=(*sum*(ng#,ng#1,ng#2,ng#3,ng#4,ng#5))/6
crush=(2.2**sm#*)+11**bo#-s#*
20DayAvg(input)=*savg*(\$1,20)
Gas_Crack=(42**hu#*)-*cl#*
pchg=(*\$1-\$1.prev*)/*\$1.prev**100
Net_=*\$1.last-\$1.prev*
MACD_(series)=*eavg*(\$1,.2)-*eavg*(\$1,.1)

Notice that each of these formulas has a name (in **bold** for example purposes), an equal sign and an expression (in *italics* for example purposes). You'll see why 20DayAvg and MACD_ have the parameters (input) and (series) following the formula name later on.

Why do some formulas have a \$1?

Using \$1 in a formula makes the formula *generic*, so that you can calculate this formula for any instrument. Take a look at the following formula:

3month=(*sum*(ng#,ng#1,ng#2))/3

This formula will ALWAYS add the front 3 Natural Gas contracts and divide that value by 3. Entering the formula this way limits its use. If, instead, the formula were entered in the Formula Listing like this....

3month=(*sum*(\$1,\$2,\$3))/3

the formula could be used for any three symbols. The \$1, \$2 and \$3 in the formula are *variables*. Think of them as placeholders for symbols that you will provide later. This immediately prompts the question, "Once I write a generic formula (like the one above), how do I tell Aspen what symbols I want the software to use?" In the chart (or quote page, alarm or color rule) where you want to use the formula, type in the formula using the following syntax:

3month(ngv8,ngx8,ngz8)

This is called passing arguments to the formula. Other examples of passing an argument to a formula:

Formulas as written in the Formula Listing:

Crack_Nov=(42*\$1)-cl#
F_RANGE=\$1.high-\$1.low
Spread=\$1-\$2

Formulas as entered in the chart (or other application):

CRACK_NOV(ho#)
F_RANGE(ngf9)
spread(w#,w#1)



Notice that there **MUST** be the same number of arguments passed to the formula when implemented as there are variables in the formula as written in the Formula Listing. For example, if the formula uses \$1, \$2 and \$3, there should be three symbols typed in parentheses after the name of the formula when implementing it.

Embedding Formulas

What if I want to chart the formula along with a bar chart?

Using Aspen Graphics, it is simple to chart more than one item on the same bar chart. For instance, if you want to compare the price of two (or more) instruments, you would type the symbols separated by commas. For example, to chart Microsoft & IBM together, you would type in:

msft,ibm

The same method can be used to add a formula to the chart. Let's suppose you had already entered this formula in the Formula Listing to calculate an instrument's 20-day high:

20DayHigh=rmax(\$1.high,20)

To display Intel AND a its 20-day high on the same daily bar chart, you *could* enter:

intc,20Dayhigh(intc)

Using this method, if you wanted to then change the chart to display Microsoft and its 20-day high, you would have to type in **msft,20dayhigh(msft)**. A more efficient way of setting up this page would be to make one slight modification to the original 20-day high formula in the Formula Listing. Adding the (input) parameter after the formula name allows you to OVERLAY the formula on whatever instrument is displayed on the chart (just like a Moving Average, Bollinger Band or any of the Overlays listed on the Select Study menu). For example:

20DayHigh(input)=rmax(\$1.high,20)

Once the (input) parameter is added to the formula, it will be available to overlay on any bar chart. To display the 20DayHigh custom overlay study on a chart, follow these steps:

1. Display a daily bar chart and type **intc** .
2. Display the Graph Menu.
3. Single left click on **Study**. This will display the Select Study menu.
4. Single left click on **Formulas...** in the lower right hand corner of the Select Study menu. This will display the Select Formula Study menu.
5. In the *Overlays* section of the Select Formula Study menu, you should see **20DayHigh**. Single left click on **20DayHigh**. You should now have a chart on your screen similar to the bar chart below.



With the addition of the (input) parameter to our formula, you can now simply type in **msft** in the chart and both the price data and the formula will update automatically.

What if the scale for my formula is very different from the price data?

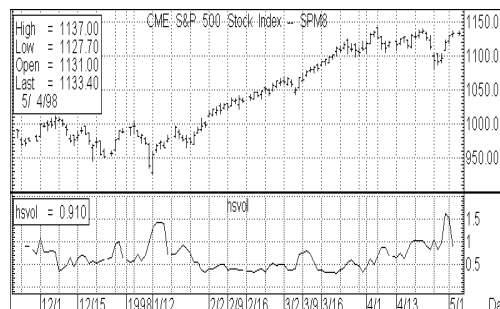
In the example above, we created a formula whose scale was very close to the price itself. What if we wrote a formula using data that was significantly different than the instrument's price (for example a formula using the instrument's volume as one of the variables)? If this type of formula was overlaid on the price, the display of both the price and the formula would be "flat-lined" because the chart's scale would have to encompass a large range to include both values. In situations like this, where the formula's scale will be significantly different than the price scale, you will want to use the (series) parameter in the formula. This will allow you to display your formula in a split window below the chart, similar to the preprogrammed studies such as volume, RSI or stochastics.

An example of this type of formula study would be the "Historical Volatility meets Tony Crabel"¹ strategy discussed in the book *Street Smarts*, written by Linda Bradford Raschke and Laurence Connors. Part of the setup includes a comparison of the 6-period historical volatility to the 100-period historical volatility. The scale of this study will range from zero to 3 or 4. It would not make sense to chart this study on a bar chart for any instrument trading in a price range above \$10. To write a formula to chart the study in its own window, you would enter the following formula in the Formula Listing:

$$\mathbf{hsvol(series)=hvol(\$1,6)/hvol(\$1,100)}$$

To display this study in a split chart, follow these steps:

1. Display a daily chart and type in a symbol.
2. Bring up a Graph Menu and single left click on **Split**. This will split the chart into 2 distinct sections.
3. With the mouse arrow in the bottom (empty) portion of the chart, bring up a Graph Menu.
4. Single left click on **Study**. This will display the Select Study Menu.
5. Single left click on **Formulas....** This will display the Select Formula Study menu.
6. Single left click on **hsvol** (should be found under the *Studies* heading on the Select Formula Study menu). Your chart should look similar to the chart below.



¹ Raschke, Linda Bradford and Laurence A. Connors, *Street Smarts: High Probability Short Term Trading Strategies*, Malibu, CA: M. Gordon Publishing Group, 1995, p. 162



REMEMBER: using the **(input)** parameter after the formula name will create a study which will display on top of the bar chart (overlay) and using the **(series)** parameter will create a study to be displayed in its own window. Any formula that uses (input) or (series) will be found on the Select Formula Study menu under the appropriate heading. This type of formula must be selected from the Select Formula Study menu to be displayed on the chart. Simply typing in the name of the formula and its instruments (i.e. spread(w#,w#1)) in the chart will return a blank chart.

To display more than one Study (a formula using the (series) parameter) in the same chart:

- a. Select your first Formula Study.
- b. Select [] Add a Study.
- c. When this line is highlighted and an X appears in the brackets, select your next Formula Study.
- d. *If the second study is to be calculated on the **first study*** instead of on the original bar chart (Ex. an RSI of a Slow Stochastic), make sure the Price parameter for the second study is set to First Study.

Other types of formulas:

Embedded formulas are formulas that use another formula as part of the calculation. For example, the following formula uses another formula called **Div1** for the divisor:

$$\text{Apr_Oct_Strip}=(\text{sum}(\text{ngj8,ngk8,ngm8,ngn8,ngq8,ngu8,ngv8}))/\text{Div1}$$

Self-Referencing Formulas use a past value of the formula to create an "accumulator" formula. This type of formula keeps adding to itself.

$$\text{ADVANCES}=\text{ADVANCES}[1]+(\$1-\$2)$$

Formulas which **Reference Past Bars** by surrounding the number of bars back in square brackets ([]). For example:

$$\text{RECENT_AVG}=(\$1+\$1[1]+\$1[2])/3$$

This formula calculates the average price in the last 3 bars by adding the current price (\$1) to the price one bar back (\$1[1]) and to that adding the price 2 bars back (\$1[2]) and dividing the total by 3.

If you like what you see, and you want to learn more....

Chapter 8 of the *Aspen Graphics User's Guide* (titled Formulas, Color Rules and Alarms) is a great reference. In there you will find a complete list of functions included with Aspen Graphics, how to use special functions like the `chart()` and `scale()` functions in formulas, how to display formulas in quote pages and how to write Color Rules and Alarms based on formulas. If you do not have the latest version of the User's Guide, call your Aspen Graphics Sales Representative to order.