MARKET ANALYST

UNLEASH THE POWER OF SCRIPTING

FACTSHEET

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Summary

The ability to create your own custom formulas to scan or filter large sets of data can be a huge time-saver. The scripting language in Market Analyst can be used across the whole program, from the Scanning Manager to Watchlist Columns to Technical Alerts. Gaining an understanding of how to write your own scripts unleashes an enormous amount of flexibility and power.

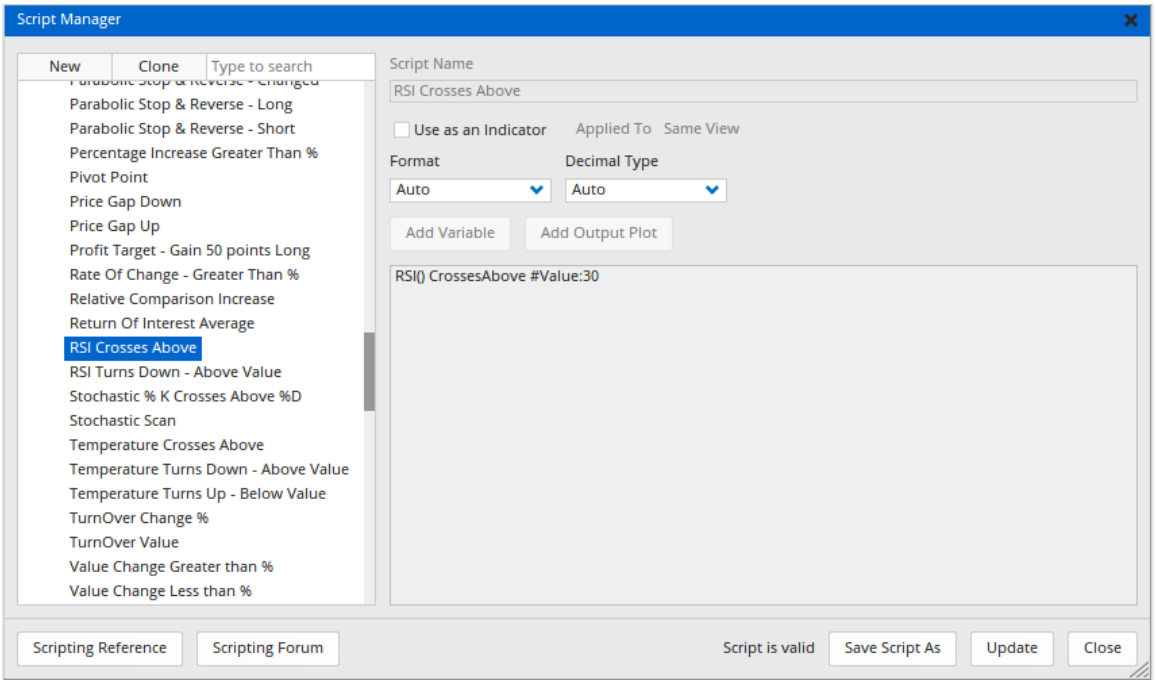
While scripting is an advanced topic - after all it can be daunting if you have never programmed anything before - this paper will serve as a foundation to give you the basic understanding of the theory and show how easy it is to create your own scripting formulas.

For a complete list of features utilising the scripting language, please refer to the appendix at the end.

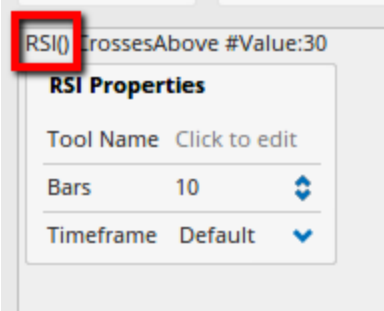
The Script Editor

No matter how you come to create or edit a script, you will be presented with the Script Manager. This editor has been designed to help you as you build your scripts. While you can create your own custom scripts, there are also nearly one hundred default formulas available based on popular indicators, such as Moving Averages, ADX, RSI, MACD (etc.). We've created a number of default scripts for you. In the Script Editor window click on **Saved Scripts** and select the script you want to work with. No matter what script is used, we understand every user requires different settings, and these can easily be edited as required.

For example, the default **RSI Crosses Above** formula will return a true/false result when the RSI(10) value crosses above 30:



To see and change the default properties, there's no need to learn any complicated syntax. Click in the brackets of the function, in this case **RSI()**, to change the required value and press **Enter**. In this example the default setting for RSI() is 10:



Result Types

It's important at this point to digress so that we understand the difference between a script that returns a boolean result (True/False) and one that returns a numerical value, and when we would use each.

True/False result only:
Scanning Manager, BackTester, Signal Tester, Analysis Tile and Show Bar.

Value only:
Script Tool, Show Bar, Show Plot and Show View.

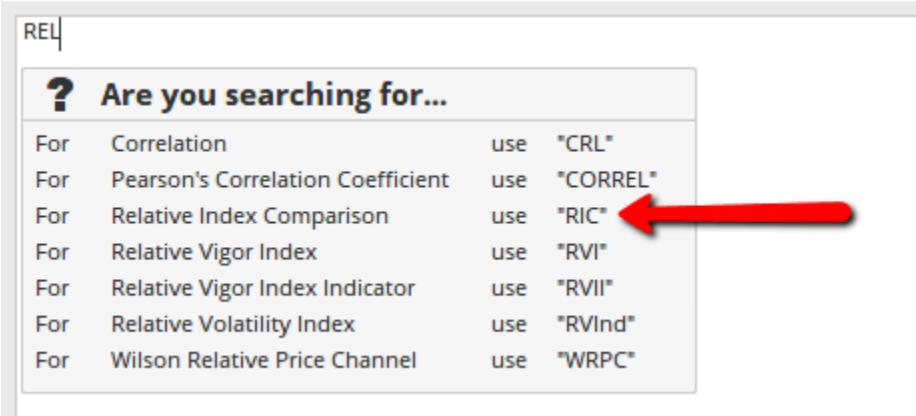
True/False or Value:
A column in a Watchlist.

The appendix at the end of this paper shows examples for each of the features within Market Analyst that use scripting.

Custom Scripting Formulas

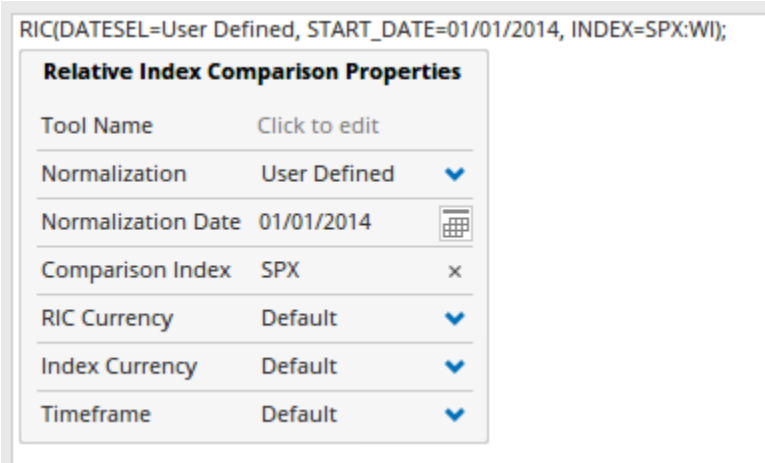
Editing the default formulas is a great way of learning the process and familiarising yourself with the Scripting Editor interface. What if you want to create your own formula based on an indicator that hasn't been used in a default example? This is where the power of the scripting formulas really shine and allow you to come up with almost any script you can imagine.

In the **Script Manager** window, start typing the name of the indicator you wish to use. As you type, a list of matching functions, and functions that may be a close match, will appear in a hint. For example, to create a scan using the **Relative Index Comparison** indicator, type **REL** to see the list of functions containing those letters. The hint tells us to use **RIC** for that particular function:



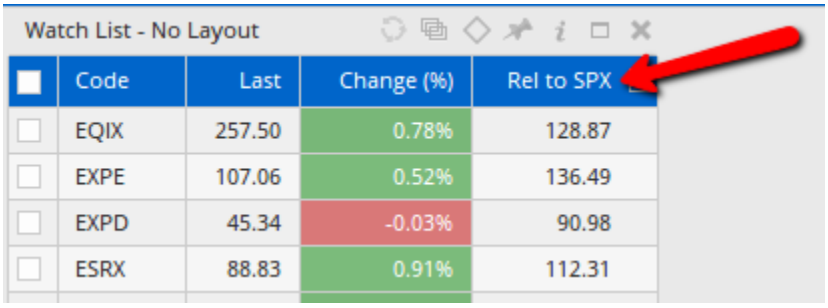
Type **RIC** and hit **Enter** to add the function using the default values. You can then edit as required.

As in the RSI example above, click in the brackets of the **RIC()** text and a window will open showing a list of properties that can be adjusted for that particular function. The following example will calculate the Relative Index Comparison between the chart symbol and the S&P500 index (SPX) normalised to January 1st, 2014:



The normalisation date and comparison index has been manually selected from the pop-up window, which has automatically added the text to the formula - without having to remember any syntax!

Note: if the above script formula was used in a Watchlist column, the result shown would just be a value as there is no condition:



In order to be used in a scan or backtest, a condition needs to be added. Because the RIC tool base value is 100, the complete formula to get a list of stocks that have out-performed the SPX since January 2014 would be:

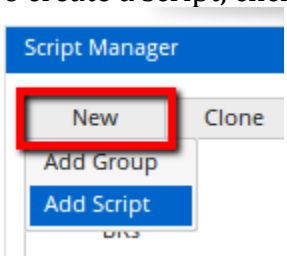
RIC(DATESEL=User Defined, START_DATE=01/01/2014, INDEX=SPX:WI) > 100

Similarly, to find those that have underperformed, the condition would be < 100.

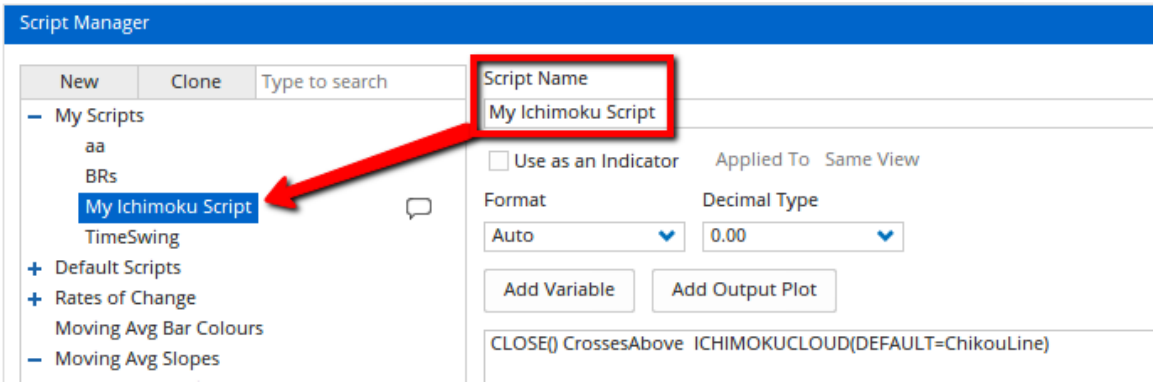
Saving Script Formulas

When a script formula is created you have the option to save it for future use in other tools or features.

To create a script, click on the **New > Add Script** button:

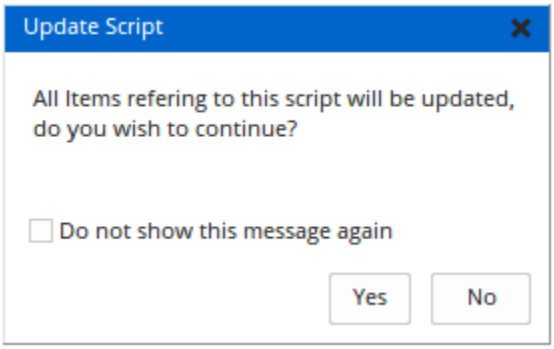


As you name the script in the **Script Name** field it will update in the list on the left:

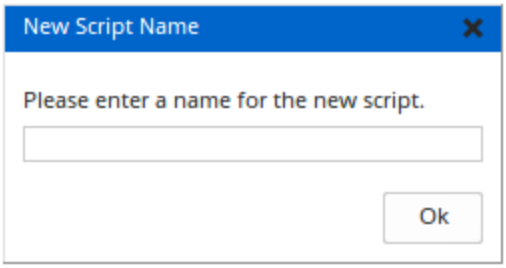


If you choose not to save the script, then it will not appear in the list and will only be available in the tool/feature being used.

When the saved script is subsequently modified and the **Apply** button clicked, a warning message will pop up advising you that **the change will be reflected in all other tools/features referencing the script**.



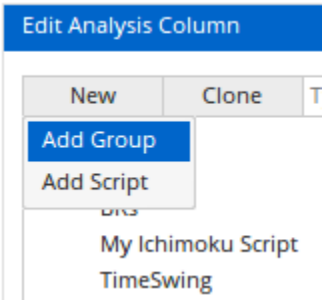
If you don't wish to overwrite, then click the **Save Script As** button and type the new name when prompted.



Grouping your Script Formulas

To make it easier to manage your saved scripts you can create groups for certain types of formulas (e.g. custom tools, watchlist columns or scans). By default, custom scripts will be added to the My Scripts folder. Click on the **New** button in the Script Manager to add groups. These can be expanded/collapsed using the **+** and **–** buttons.

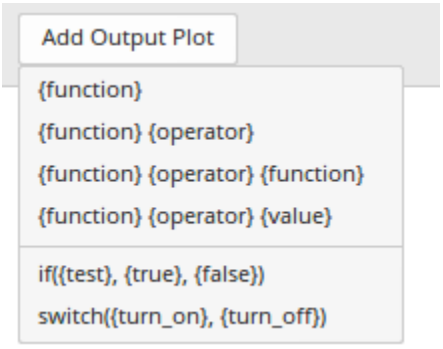
Click and drag the scripts between group folders as needed.



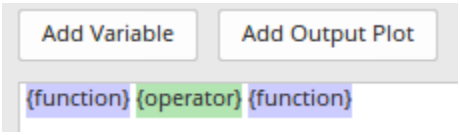
Using the Template Buttons

We understand not everyone is a programmer. The Script Manager also includes two template buttons to **Add Variable** and **Add Output Plot** to make it easier to create formulas.

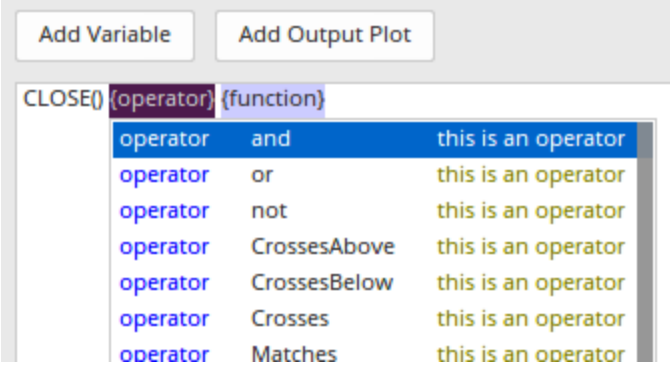
Clicking **Add Output Plot** opens a wizard where you can select the formula template required:



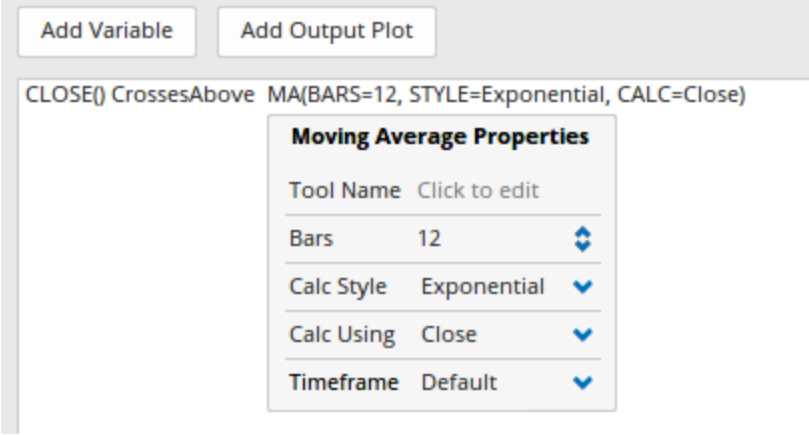
To create a formula to scan where the closing price crosses above a 12 period exponential moving average, click the **{function}{operator}{function}** option to bring up the following:



Click on the first **{function}** field to see the list of functions available, type **CLOSE** and press **enter**. Next click on the **{operator}** field to select (ie CrossesAbove in this example).



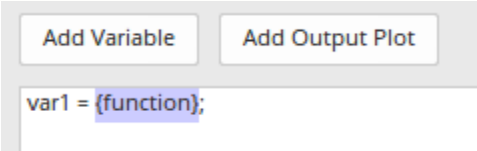
The last function is MA() for moving average, which can be clicked on to change the settings:



Again, no need to know the syntax as the wizard will add the required text!

Variables

When formulas are long and repeated it can clutter and complicate the Script Editor window. To overcome this, functions can be assigned to a variable by clicking the **Add Variable** template button:

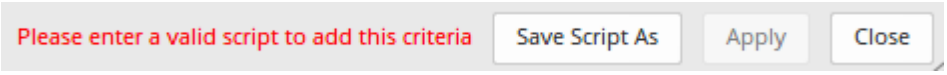


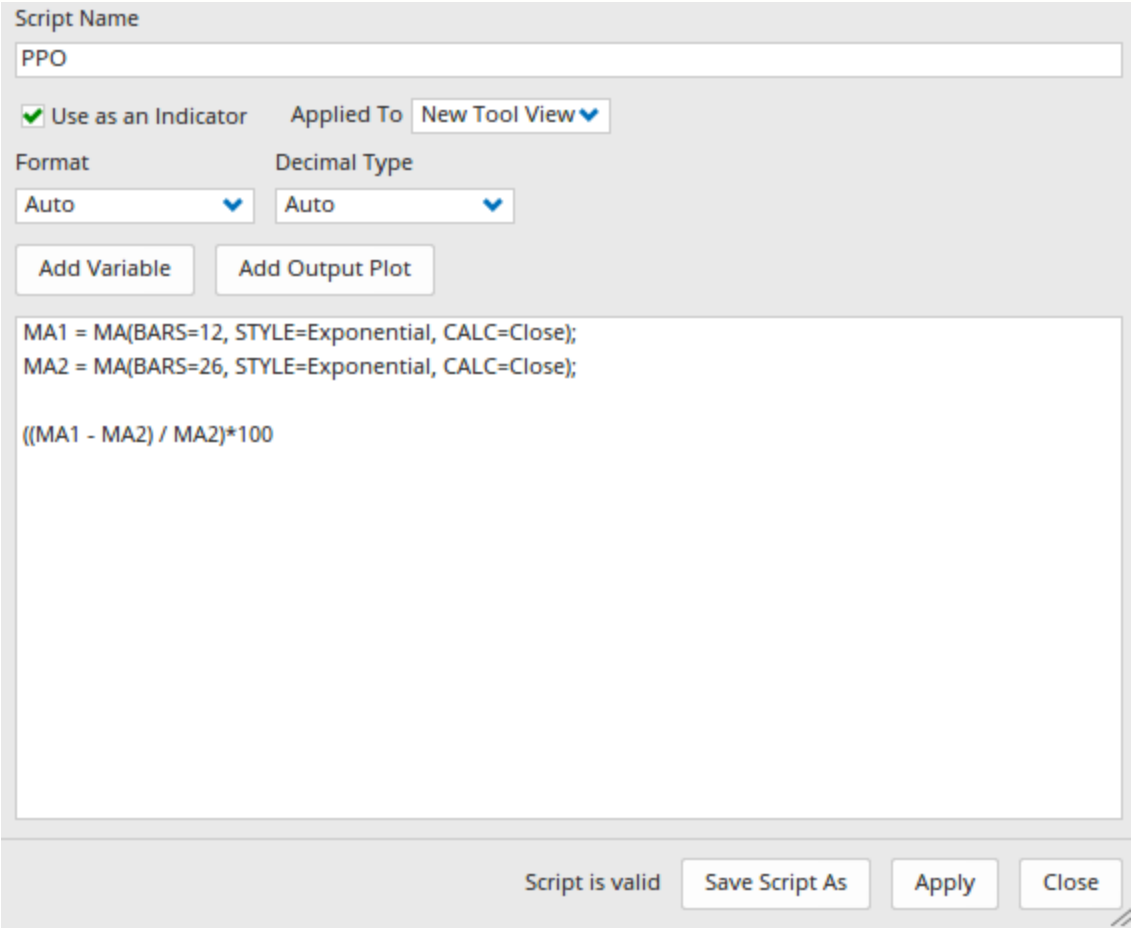
In this example a new tool will be created called Price Percentage Oscillator (PPO) - taking the percentage difference between two moving averages.

Click **New** button in the Script Manager and give the script a name (e.g. PPO). Note that if the formula is to be used as an indicator, tick the box and whether it is to be applied to a new view on the chart (i.e. a panel below the price chart, such as volume or RSI) or same view as the price bars (such as Bollinger bands). In this case we want the tool in a new view beneath the chart. Click the **Add Variable** button.

In the **{function}** field select **MA()** and change the settings to 12 period exponential. The 'var1' name can also be changed to anything you wish, such as MA1. Click the **Add Variable** button again and set the second moving average to 26 period exponential. To complete the script, add the formula to calculate the percentage using the variable names (ie MA1 and MA2).

Note: the script cannot be applied unless the formula is valid, at which point the warning message will disappear and it will say that it is valid:





Advanced Formulas

There are a number of other scripting shortcuts that make advanced formulas easier to compose:

OFFSET

This option allows for easy comparisons between bars. By default the offset is set to zero, meaning the last bar is to be used. This is represented by empty brackets after a function: CLOSE() for example is the most recent closing price, whereas CLOSE(1) is yesterday's close (or last week's if a weekly chart).

Example: three consecutive higher closes:

(CLOSE(2)>CLOSE(3)) and (CLOSE(1)>CLOSE(2)) and (CLOSE()>CLOSE(1))

The **OFFSET()** function can also be used. The value of the 12EMA five days ago can be expressed as:

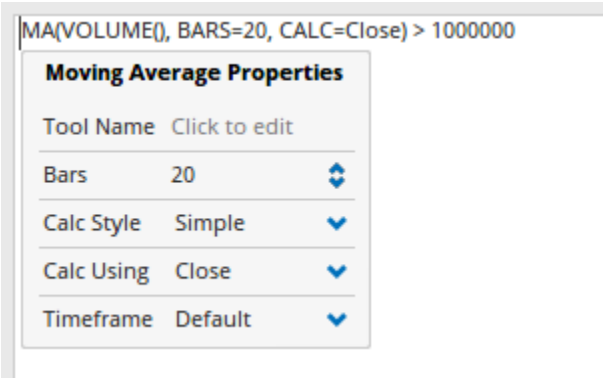
OFFSET(MA(BARS=12, CALC=Close, STYLE=Exponential), OFFSET=5)

Nesting functions

Multiple functions can be nested inside another, such as volume within a moving average, to determine average volume. Here is a formula to show a True/False result for 20 day average volume above one million:

MA(VOLUME(), BARS=20, CALC=Close) > 1000000

Here the VOLUME function has been nested inside the moving average parentheses **MA()** and clicking on the **MA** text will bring up the wizard to select the properties:



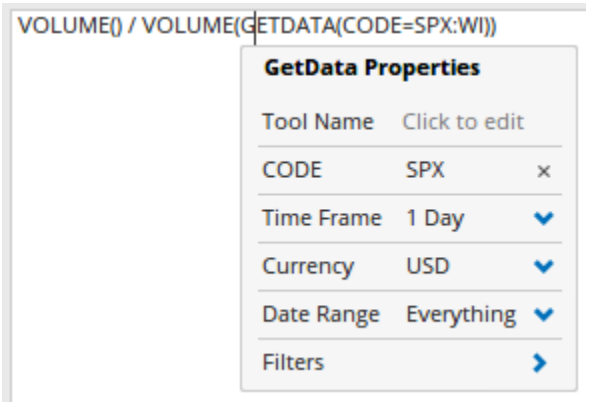
Note: You may be wondering why we used **Close** in the Moving Average script. Functions in Market Analyst can return either Open, High, Low, Close or just a Close. Every function puts the primary result data in "Close" and uses the other fields if required. This way we can easily apply functions to functions since we know we are always working with the Close. In our Moving Average script above, we are essentially saying "Calculate a 20 period Moving Average on the Close field of the Volume function".

GETDATA

When looking to write scripts to compare between different datasets, the **GETDATA** function is extremely useful. For example, to compare relative volume between Apple and the S&P500 index, the formula for the Show View tool on an Apple chart would be:

VOLUME() / VOLUME(GETDATA(CODE=SPX:WI))

Again, clicking on the GETDATA text and the wizard makes it easy to select the comparison code and correct syntax:



INDEX

Following on from the GetData example above, the **Index** function is similar but the values returned will be for the code's primary country index:

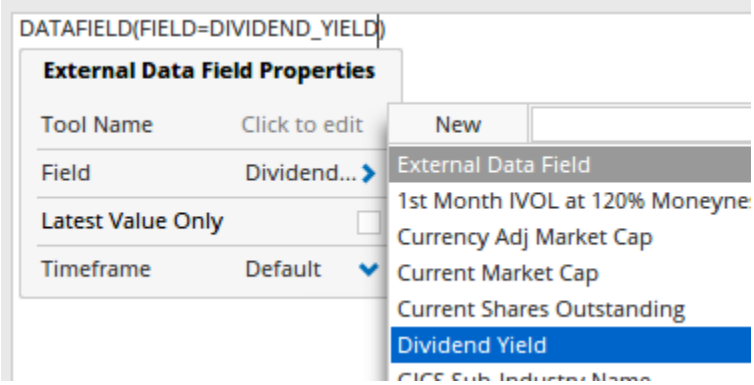
VOLUME() / VOLUME(INDEX())

For Show View on AAPL this formula will return the relative S&P500 volume. **Note:** this function will only work with a Bloomberg datafeed, otherwise you would use the GetData function above.

DATAFIELD

Many areas of Market Analyst have been optimised for use with a Bloomberg datafeed. Available with a Professional Services subscription, this option allows any data from Bloomberg such as market cap, P/E ratio, or shares outstanding to be

used in a script. Once the **External Data Field** has been imported from Bloomberg it will be available in the **DataField** function. Here is an example using Dividend Yield:



With Bloomberg data it is also possible to nest a **GetData** and a **DataField** together. This formula will get the market cap (FIELD=CUR_MKT_CAP) value of the S&P500 index (GETDATA (CODE=SPX:BLMB):

DATAFIELD(GETDATA(CODE=SPX:BLMB), FIELD=CUR_MKT_CAP)

Currency conversions

If you need to change the currency of a code, you can use the **FX()** script to do that too. This formula will return the S&P500 in Japanese Yen.

FX(GETDATA(CODE=SPX:BLMB), CURRENCY=JPY)

HIGHESTHIGH and LOWESTLOW

These functions will look back over a defined period for the highest or lowest values of price or indicator value.

To scan for codes with a close above the highest high over the previous 252 bars, or approximately 52 weeks:

CLOSE() > (HIGHESTHIGH(HIGH(),BARS=252))

For the lowest RSI(14) value over the previous month (22 bars):
LOWESTLOW(RSI(BARS=14), BARS=22)

BARSTRUE

This function will count the number of bars that meet a specific criteria over a defined period. This example will show how many days out of the previous 20 where the RSI(14) was above 70:

BARSTRUE(LOOKBACK=20, (RSI(BARS=14) > 70))

TIMESINCESIGNAL

This function will count the number of bars since a particular technical signal occurred. When used in a Watchlist column, the following formula will count the number of days since the last higher 6 month high (approx. 130 bars in the HIGHESTHIGH function).

TIMESINCESIGNAL(CLOSE()>HIGHESTHIGH(CLOSE(),BARS=130))

VALUEWHEN()

Returns the value of indicator X when Y occurs. For example, to display the 20 period moving average value when the RSI last crossed below 70:

ValueWhen(MA(BARS=20), RSI() CrossesBelow 70)

Smart Operators

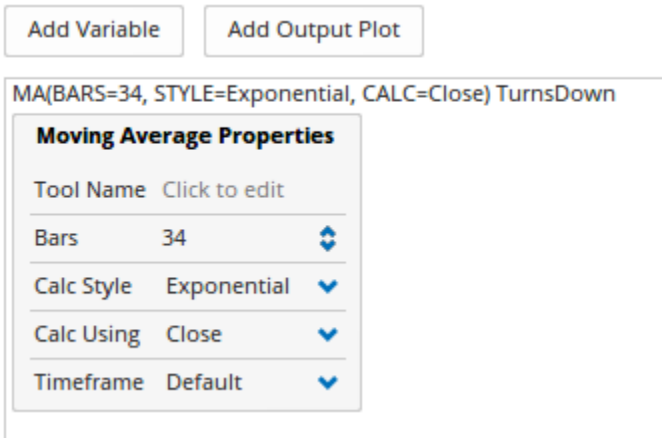
As well as the standard operators (such as ==, >, <=, <>, etc) there are some in-built smart conditions designed to speed up formula creation. These include:

- Crosses, CrossesAbove and CrossesBelow
- IsUp and IsDown
- Turns, TurnsUp and TurnsDown

All of these return a True/False result. Suppose you want to set an alert for a 34 period exponential moving average that changes from upward sloping to downward, the script would be:

MA(BARS=34, STYLE=Exponential, CALC=Close) TurnsDown

Again, you won't need to remember the syntax for the text, as this appears automatically in the formula when clicking on the function properties in the wizard.



Conditional Operators

IF

If you are familiar with Excel, this condition is based on the same principle. It introduces decision-making into the formula. If the condition is true, then one result will be given. If it is false, then an alternative will be given.

IF (CLOSE()>MA(BARS=50),CLOSE(), MA(BARS=50))

The above formula will return the closing price if it is higher than the 20 day moving average, or the moving average if it is lower.

The following nested IF statement will return a value between 1 and 4 depending on the slope of the 50 and 13EMA:

MA1 = MA(BARS=50, STYLE=Exponential, CALC=Close);
MA2 = MA(BARS=13, STYLE=Exponential, CALC=Close);

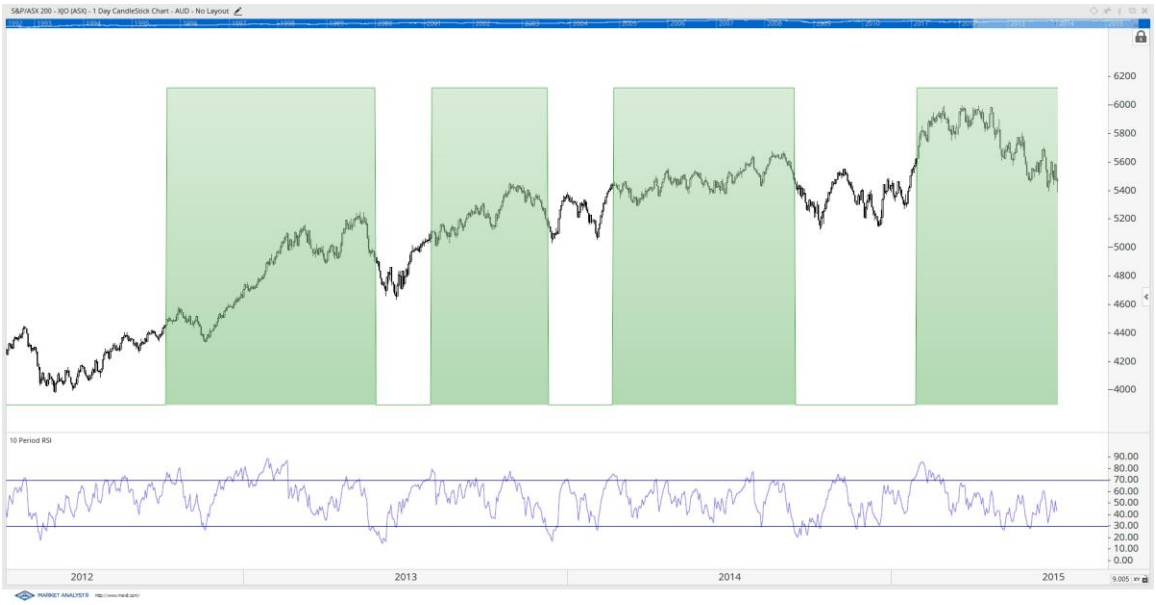
IF(MA1 IsUp, IF(MA2 IsUp, 1, 2), IF(MA2 IsUp, 3, 4))

SWITCH

The primary use of the Switch function would be with oscillators, however it can be used in any situation where you may wish to set an upper value target and a different lower value target as true/false flags.

In the following example, the chart of XJO displayed with a Show View tool applied based on RSI, the script has been set to:

SWITCH(RSI(BARS=10)>75, RSI(BARS=10)<25)

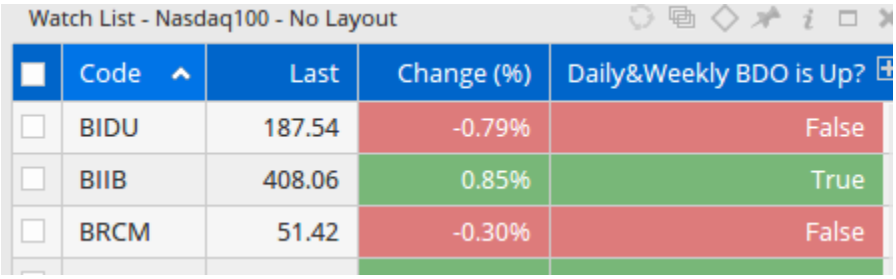


The green areas of the Show View tool begin where the RSI is greater than 75, and remains until the value is less than 25.

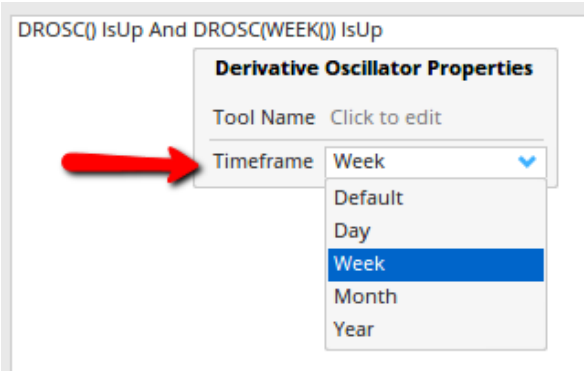
Incorporating Timeframes

You may have noticed in the above screenshots the Timeframe option in the script pop-up window. The 'Default' setting will depend on the chart and feature the formula is being used with. For example, when used in a Watchlist column the calculation is based on daily values. By changing this criteria to Weekly, the column will be based on weekly values. This example shows a True/False result depending

on whether both the daily and weekly Brown Derivative Oscillator are higher than the previous period or not:



Click on the DROSC() text and change the Timeframe to Week:



Another example - using the **Show View** tool - places a panel below the price chart displaying the results of the formula. Here's a weekly MACD below a daily chart using **MACD(WEEK(), BAR1=12, BAR2=26, OSC=9)**

Summary

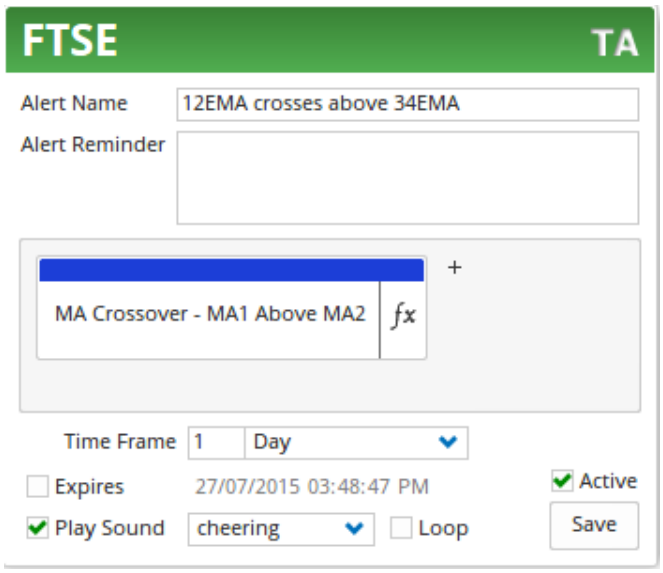
I hope this paper helps you understand the power available to you with Market Analyst scripting. The following Appendix gives an example of the features in Market Analyst that utilise scripting. But the best way to get started with your own scripts is to just give it a go. I would always recommend using either the Show Plot or Show View tool and starting from there. Our support staff are available almost 24 hours a day around the world. If you need any assistance, let us know. We are happy to help.

Appendix

Below is an alphabetical list of the tools and features that utilise the scripting language. If any are of particular interest, contact us for more detailed information.

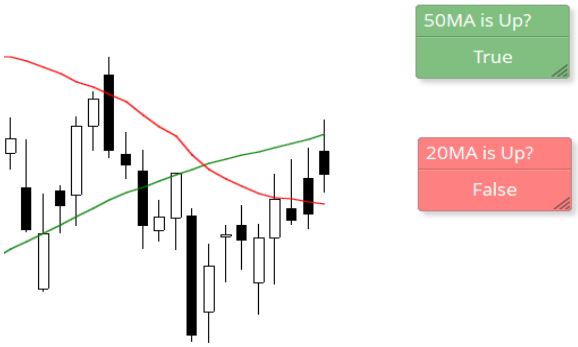
Alerts

Technical Alerts can be set for a code that will be triggered when the condition is met. For example when the 12EMA crosses above the 34EMA on the FTSE:



Analysis Tiles

Accessed as a standard tool, these can be placed on the chart to show true (green) and false (red) results of any script.



BackTester

Use scripts to define simple or complex entry and exit conditions and compare your results against a benchmark.

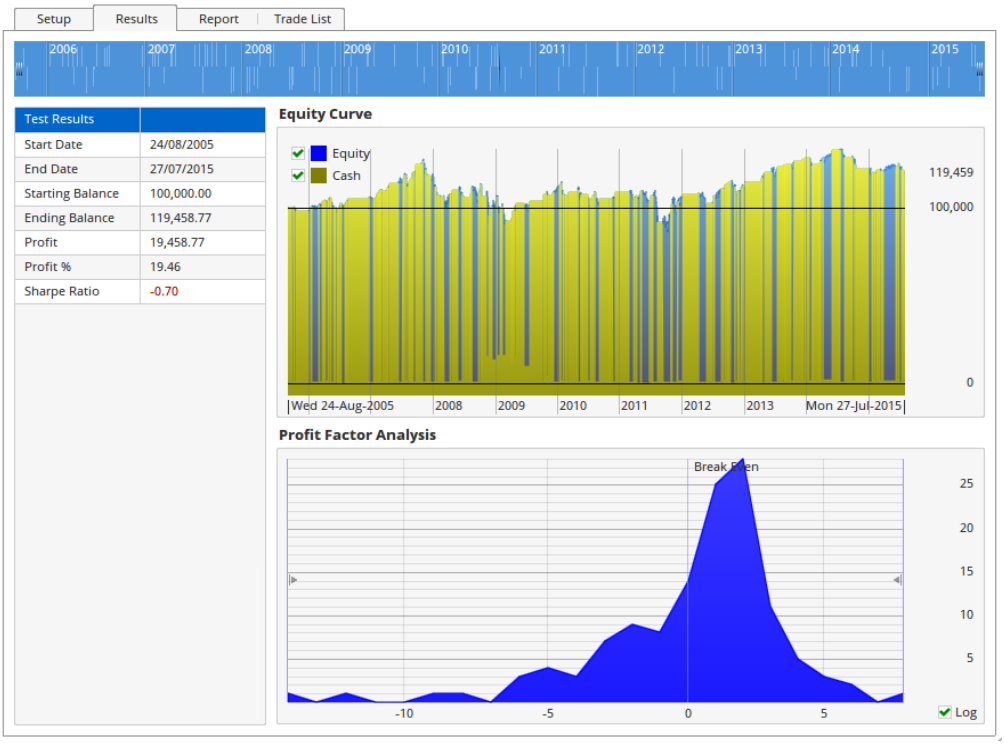
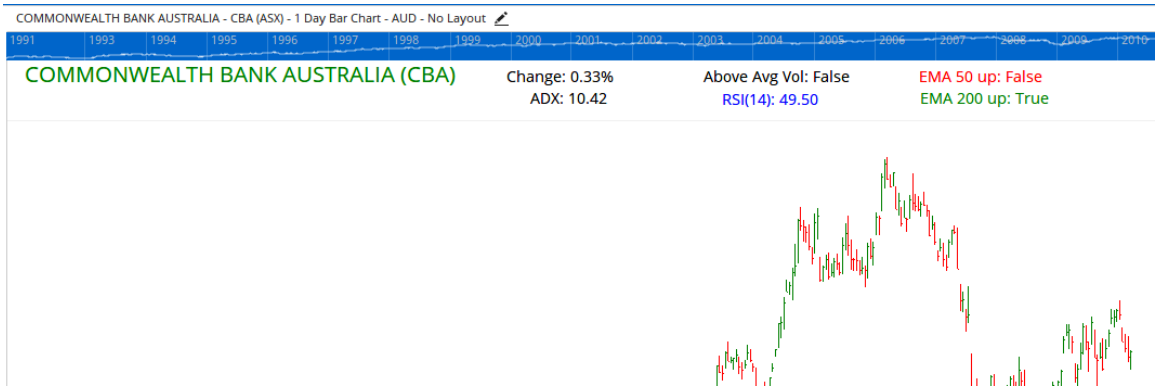


Chart and Page Headers

Professional Services clients have the ability to add chart headers containing data calculated from script formulas:

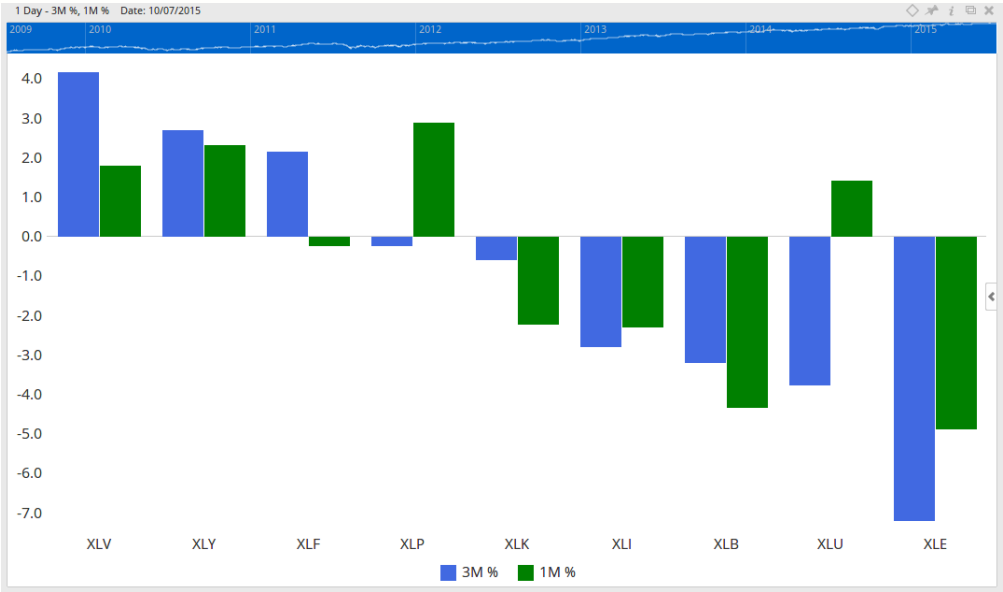


Custom Colour Bar Schemes

Set your own rules on how to colour bars & candles.

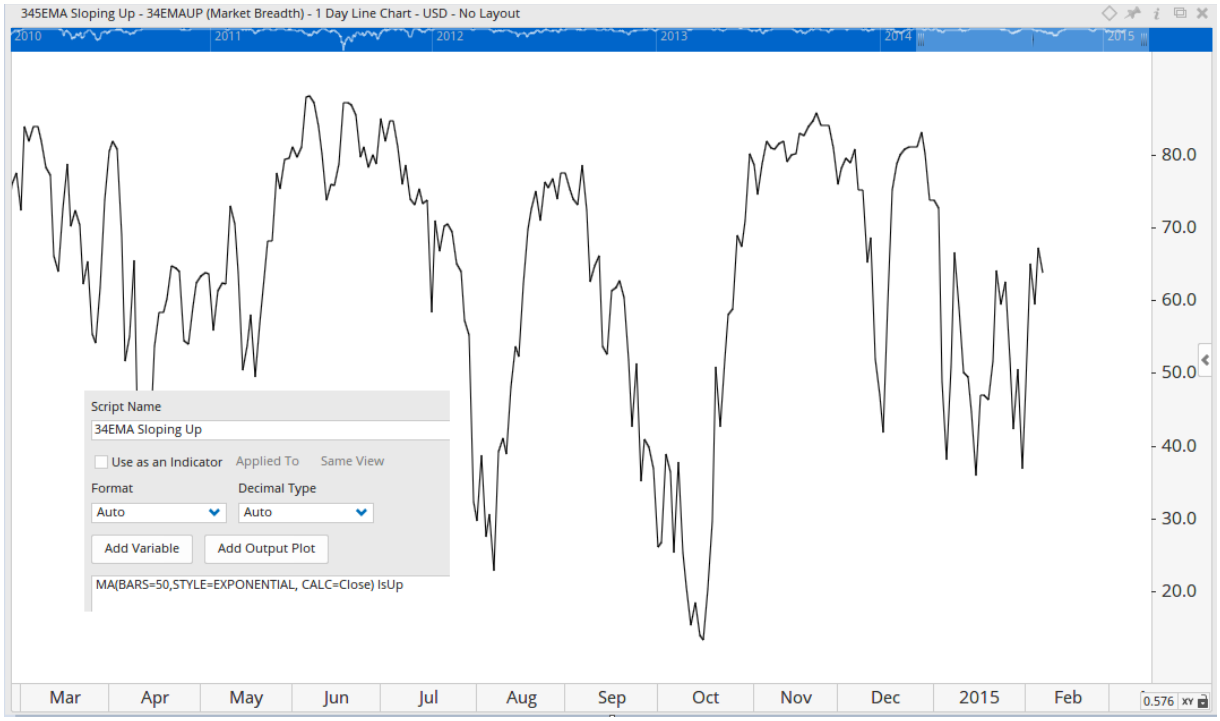
Market Intelligence Column Chart

View the results of a script for multiple equities in a portfolio.



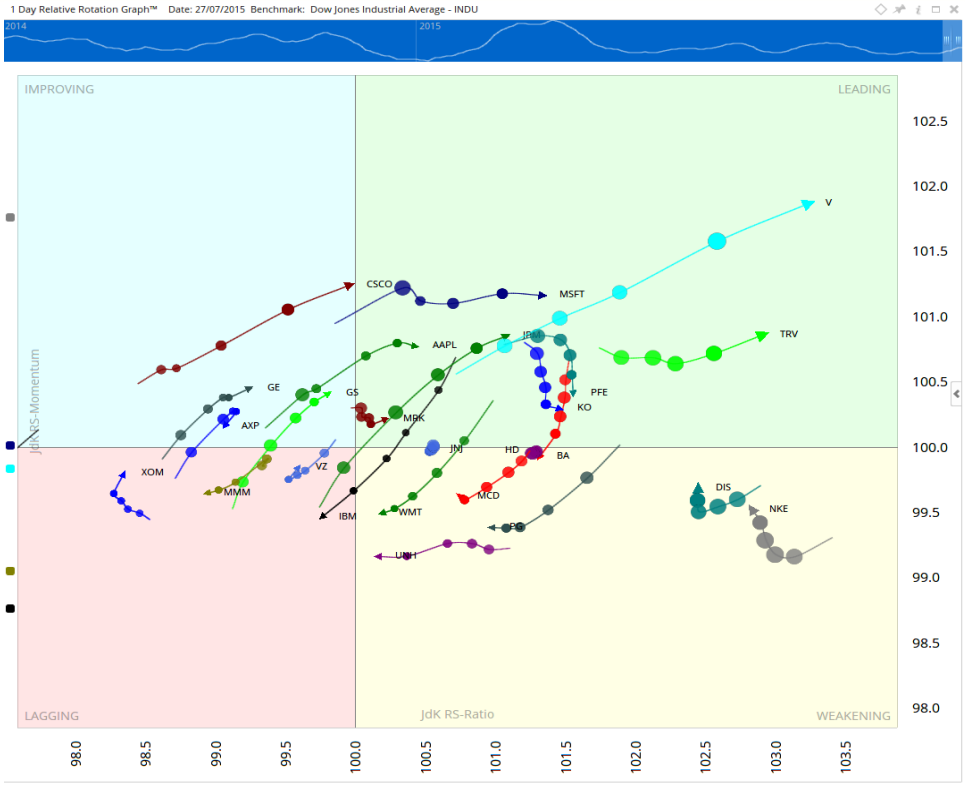
Market Breadth

Create your own custom Market Breadth measure on a script result, such as the % of stocks in the S&P500 with a 34EMA sloping up.



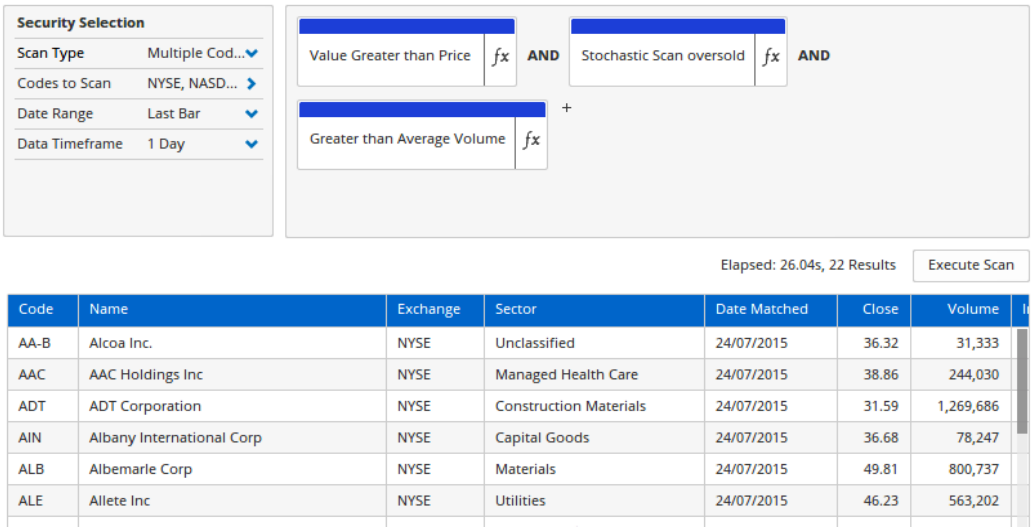
Relative Rotation Graph Bubble Size

Add a new dimension to RRGs by entering a script in the **Size Script** field.



Scanning Manager

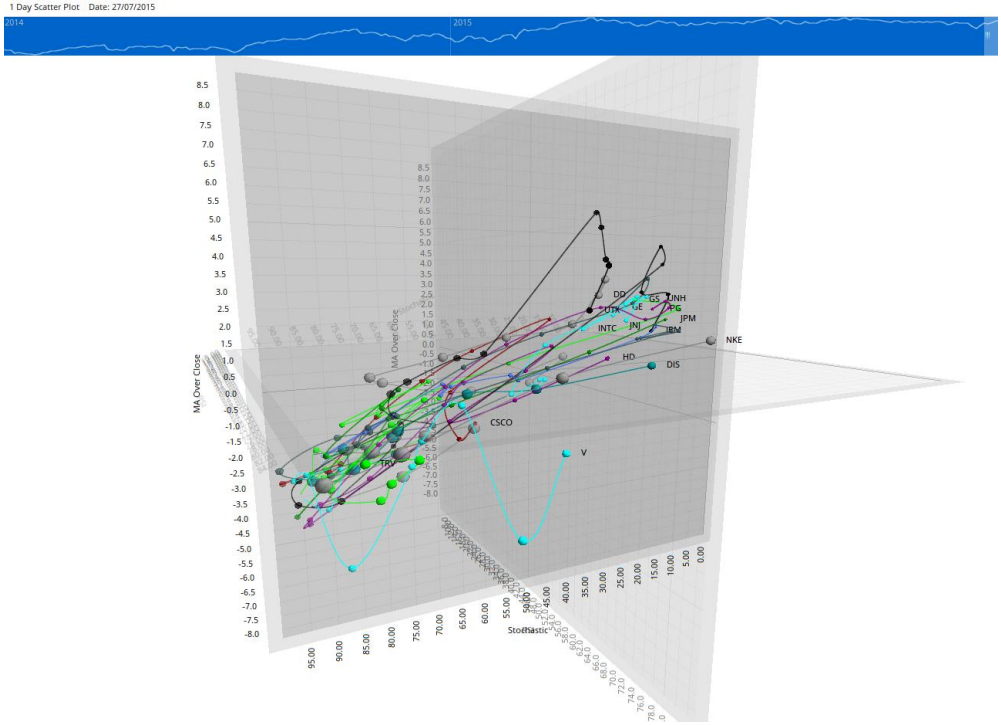
Find equities matching your criteria by using scripts. Scanning also allows multiple scripts to be used together.



Code	Name	Exchange	Sector	Date Matched	Close	Volume
AA-B	Alcoa Inc.	NYSE	Unclassified	24/07/2015	36.32	31,333
AAC	AAC Holdings Inc	NYSE	Managed Health Care	24/07/2015	38.86	244,030
ADT	ADT Corporation	NYSE	Construction Materials	24/07/2015	31.59	1,269,686
AIN	Albany International Corp	NYSE	Capital Goods	24/07/2015	36.68	78,247
ALB	Albemarle Corp	NYSE	Materials	24/07/2015	49.81	800,737
ALE	Allete Inc	NYSE	Utilities	24/07/2015	46.23	563,202

Scatter Plot and 3D Charts

Full three dimensional scatter plot driven completely by scripts.



Script Tool

Create your own tools in Market Analyst using scripts. The tools will be available to be used like any of the standard Market Analyst tools and indicators. Select **Script Tool** from the **New** menu.

Show Bar

Show the result of any True/False script on your chart.

Signal Tester

Create formulas to test historical outcomes on stocks. For example, the average performance of IBM over the course of one year after the price crossed the weekly 50 period moving average:

Watchlist Columns

View your whole portfolio and in real-time scan to see which equities are passing the criteria you specify. Equities can also be grouped and sorted based on these custom script columns.

Watch List - No Layout

Code	Name	12Month Range	3Mo%	1Mo%	5 day %	RSI	Weekly RSI	50MA sloping up?	YTD Rel SPX
AGU	Agrium Inc		2.2	3.2	-4.2	48.7	53.6	True	118.8
ATD.B	Alimentation Couche-Tard Inc		20.6	8.3	0.3	73.6	72.5	True	118.3
BAM.A	Brookfield Asset Management Inc		-0.3	1.9	-3.6	51.7	56.8	True	115.5
BCE	BCE Inc		-1.5	-0.5	-3.5	48.0	48.6	True	99.3
BIP.UN	Brookfield Infrastructure Partners L		-1.6	-2.2	-6.1	38.5	49.7	True	109.9
BMO	Bank Of Montreal		-8.5	-2.7	-2.9	37.0	40.1	False	88.0
BNS	Bank Of Nova Scotia		-6.4	-5.4	-3.2	34.1	41.7	False	93.0
CCT	Catamaran Corp		9.6	6.4	0.3	74.7	78.4	True	131.8
CIX	CI Financial Corp		-7.1	-5.1	-4.7	31.6	36.0	False	99.6
CM	Canadian Imperial Bank of Comme		-6.7	-4.4	-1.5	37.5	40.0	False	89.8