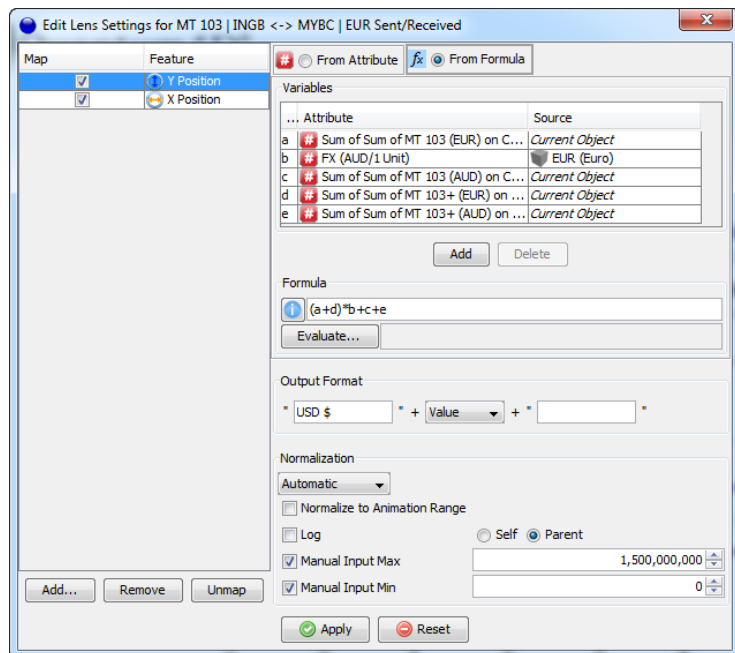


## Formulas

A significant part of the power of Quantum4D is contained in the one radio button "From Formula." This allows you to apply formulas to a lens or space. You can also create attributes that are formulas.



### TYPES

The formula system has built-in support for a variety of types:

- Time series
- Floating-point numerical types
- Integers
- Dates
- Boolean values, including predefined values true & false
- Strings
- The predefined value null
- Lists, defined using [] syntax
- Ranges of dates or numbers, defined using the operators x:y and x:y
- Moving Correlation & Covariance

Some examples:  $a/b$ ,  $a*b$ ,  $(a-b)/c$ ,  $avg(a)$ ,  $var(a)$

Comparing two different periods of the same time series:  
 **$reldate("-1y", a)$  on one,  $a$  on the other**

Moving correlations with endpoints

**$((mvcorr(endpoint(a,true),endpoint(a,false), "-1w")) > (0.95))) || ((mvcorr(endpoint(a,true),endpoint(a,false), "-1w")) < (-0.95))$**

### OVERVIEW

Just as in a spreadsheet, Quantum4D provides support for various mathematical functions through its formula system. There are two ways to create a formula in Quantum4D:

#### Create an attribute of type formula Map a lens feature to a formula

Both function the same way, using the same formula editor.

### EXAMPLES

Percent change relative to a date

**$pctchg(a, reldate("-3m"))$**

Sum of values up to that point

**$Sumcum(a)$**

If then statements to get color bands

**$if((a) >= -3, 1, if((a) < -6, -1, 0))$**

One Week Moving Correlation

**$mvcorr(endpoint(a,true), endpoint(a,false), reldate("-1w"))$**

Using if/then statements to get three color bands - two examples:

**$if((a) >= -3, 1, if((a) < -6, -1, 0))$**

**$if((a) >= 3, 1, if((a) >= 1.5, 0, -1))$**

Use this formula to get three bands of color showing three distinct ranges of values.

Using Absolute Value

**$if(abs(a) <= 5, 0, if(abs(a) <= 10, 1, -1))$**

Comparing values with different names

**(apples to oranges)  $if(a==null, b, a)$**

Where a = "bonds" and b = "Gold"

### EDITING FORMULAS

A formula consists of zero or more **variables** and an **expression**. Variables can be added or removed in the table at the top of the formula editor. These variables can be mapped to attributes and are defined using a naming convention similar to a spreadsheet column ("a," "b," "c," etc.).

**The expression is a general mathematical expression using the given variables, parentheses, and mathematical operators.** Clicking the "Show Functions" button displays a list of the operators and functions that are recognized by Quantum4D.

**When you are finished editing your formula, be sure to click on the "Apply" button to apply any changes you have made.** While editing, you can abort any changes you may have made since the last "Apply" by clicking on the "Reset" button