

# Linear Regression

To draw a Linear Regression line on a chart, click the Linear Regression button. The cursor will change to a pencil while in the draw mode. Move the cursor pencil to a starting bar and then click the left mouse button and click again at an ending bar point. The line will stay selected until the mouse is clicked somewhere else on the screen. At that point, the regression line will be calculated and the line will be repositioned. The price levels for the starting and ending points will be determined by the Linear Regression formula. The formula uses the bar prices between the start and end points to calculate a straight line best fit using the least squares method. Line parameters can be set to extend the regression line forward and back, to mirror at different angles, and to change the color.

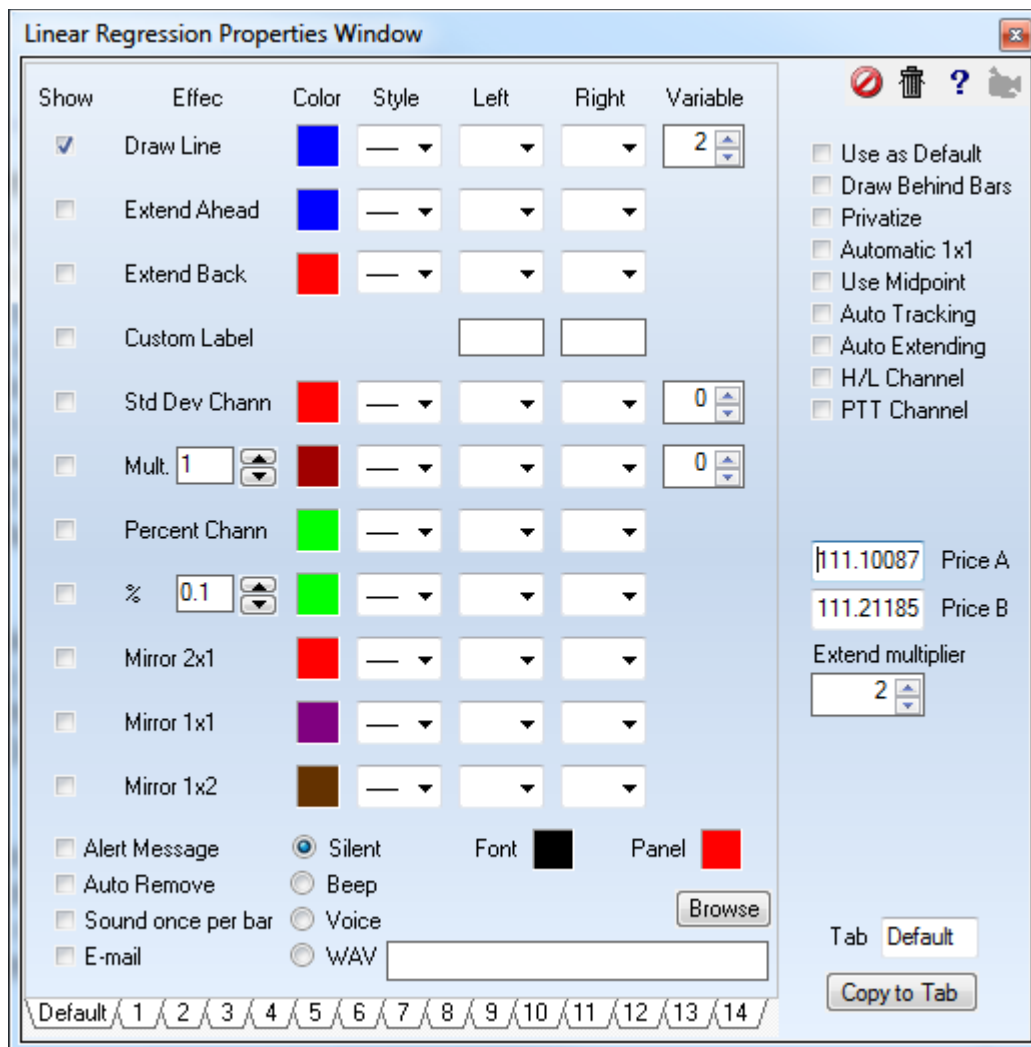
## Adjusting a Line

Re-selecting the Regression Line will activate the ability to move and adjust it to a different location. Click the mouse on the Line to activate it. The cursor will change to a pencil and square bullets will mark the start and end points. Drag the square bullets to a new location and the Line will adjust. Drag the line from the center to move the whole line at once.

## Properties

After drawing a Regression Line on a chart, click the Chart Objects button, select Linear Regression, and then click Properties to view the properties window. The properties window can also be displayed by re-selecting the line and then right-clicking the mouse. The following options are available on the right side of the properties window:

- **Use MidPoint** - Uses the Midpoint of the bar  $(High+Low)/2$  instead of the close, for calculations
- **Auto Tracking** - Will move the Regression line to the right as each new bar is completed. The start and end points remain a constant distance apart. For example, a 10 bar Regression line will recalculate to the most current 10 bars at the completion of each new bar.
- **Auto Extending** - Will leave the start point in place, and extend the end point to the most recently completed bar. The distance between the start and end point will increase as new bars are completed.
- **H/L Channel** - Place a check mark here to plot parallel lines from the High and Low points surrounding the Regression line. This makes a nice set of channel lines. The color of the channel lines can be changed with the 'Std Dev Channel' and 'Mult' color boxes.
- **PTT Channel** - A Price Time Target line can be plotted on the chart by selecting this box. Ensign will find a swing point between the start and end points of the Regression line, and plot a parallel line from this swing point.
- **Points Channel** - Parallel channel lines can be plotted by selecting this box, and the 'Show' box for points channel. Specify the price distance in the 'Pts.' entry box. Lines will be drawn at this price distance away from the main Regression line. This box will toggle the lines between 'Percent Channel lines' and 'Points Channel lines'.
- **Extend Multiplier** - Enter a multiplier. The Regression line will be extended forward/back by this multiplier amount.
- **Custom Label** - Place a check mark in this box to display custom labels. Enter the label text in the entry boxes in the Left Side and Right Side marker columns (on the Custom Label row).
- **Above/Below** - Causes the custom labels to print above or below the line (adjusts the location)



See the documentation for the [Draw Line](#) tool, as these tools have similar property forms.

A Linear Regression (LR) line is a trend line that is drawn mathematically so that it represents the 'best fit' for the data points it passes through. The formulas use the least squares method to determine the line's placement. This minimizes the distances between the data points and the trend line.

## Formula

The algebraic expression for a straight line is:  $y = b * x + a$  where **b** is the slope of the line and **a** is the y-intercept. The linear regression formula calculate both the **b** and the **a** values.

$$a = \frac{\sum y - b \sum x}{n}$$

$$b = \frac{n \sum (xy) - (\sum x) (\sum y)}{n \sum x^2 - (\sum x)^2}$$

$x$  = **The current time period**

$n$  = **The number of time periods**

## Regression Channel

One technique is to draw equally spaced channel lines at a distance based on Standard Deviation. The Linear Regression draw tool in Ensign Windows has a multiplier parameter for the Standard Deviation offset. The following example shows red channels lines drawn at 2 times the Standard Deviation. Prices that stay outside of the regression channel indicate a change in trend.

