

Linear regression

Explanation

“Linear regression [LR] is a statistical tool used to predict the future from past data, and commonly used to determine when prices are overextended.”¹

“Linear regression is used to explain and/or predict. The general form is:

$$Y = a + bX + u$$

Where Y is the variable that we are trying to predict, X is the variable that we are using to predict Y, a is the intercept, b is the slope, and u is the regression residual.

Regression takes a group of random variables, thought to be predicting Y, and tries to find a relationship between them. This relationship is typically in the form of a straight line (linear regression) that best approximates all of the X to Y.”²

Reread the last explanation. It looks complicated but it's not.

Here's another explanation from [Prohet.net](http://www.prophet.net).

”A **Linear Regression Channel 100%** is created by drawing parallel lines above and below the Linear Regression line.

“Parallel and equidistant lines are drawn two standard deviations above and below a Linear Regression trendline. The distance between the channel lines and the regression line is the greatest distance that any one closing price is from the regression line. Regression Channels contain price movement, the bottom channel line provides support and the top channel line provides resistance. Prices may extend outside of the channel for a short period of time but when prices remain outside the channel for a longer period of time, a reversal in trend may be indicated.

“A Linear Regression trendline shows where equilibrium exists but Linear Regression Channels show the range prices can be expected to deviate from a trendline.”³

¹ <http://www.linnsoft.com/tour/techind/linReg.htm>

² <http://www.investopedia.com/terms/r/regression.asp>

³ <http://www.prophet.net/learn/taglossary.jsp?index=L&entry=LRC>



Prohet.net

And here's one last explanation from danielstrading.com

“The Least Squares Linear Regression line indicates the dominant market trend relative to time. In simple terms, is the market trending lower or higher with respect to time? It can inform you when the market is diverging from an established trend, but only when prices fluctuate uniformly around the trendline and within a narrow range. The better the fit of the equation to the data, the more reliable the linear trend. Once the calculations are completed, FutureSource draws the trendline on the screen.

“Do not rely on this study when prices deviate widely about the trendline. The fit of the trend to the data is most likely not very reliable. If the price chart flows uniformly about the regression line, the market should have a tendency to continue in the direction of the statistically fit trendline. Any large deviation from the regression line implies a change in the dominant market trend.

“The least squares methodology can be found in most books on basic statistics. It is a rather intense calculation process.”⁴

⁴ http://www.danielstrading.com/content/reso_inte_lear_pag13.php

There are different types of LR models. One type allows the user to specify a specific start and end point in time. Another model self adapting or automated moving regression lines. I'm interested in the automated LR's. They are often called Dynamic Regression Channels.

The interpretation of how to trade the LR is important. [Paritech.com](http://www.paritech.com) explains this very well.

“The interpretation of a Linear Regression indicator is similar to a moving average. However, the Linear Regression indicator has two advantages over moving averages.

“Unlike a moving average, a Linear Regression indicator does not exhibit as much *delay*. Since the indicator is *fitting* a line to the data points rather than averaging them, the Linear Regression line is more responsive to price changes.

“The indicator is actually a forecast of the next periods (tomorrow's) price plotted today. The Forecast Oscillator plots the percentage difference between the forecast price and the actual price. Tushar Chande suggests that when prices are persistently above or below the forecast price, prices can be expected to snap back to more realistic levels. In other words the Linear Regression indicator shows where prices should be trading on a statistical basis. Any excessive deviation from the regression line should be short-lived.”⁵

[On a side note, I wanted to point something out. The name that appeared in the paragraph above, Tushar Chande, is important. His book, [Beyond Technical Analysis](#), is nothing short of awesome. I will be getting into his work in a later paper because I'm currently working with his indicators.]

Here's another way to trade LR, as told by [Keystone-web.com](http://www.keystone-web.com).

“There are two ways to use linear regression. The first is to trade in the direction of the linear regression line. The second is to plot the linear regression line and two parallel equidistant lines above and below it. To determine the distance, use a point which is the furthest away from the linear regression line on the price bar. The two lines act as support and resistance. Once the lines are broken for a sustained period of time, this is an indication that the trend has reversed or gained tremendous momentum.

“The space inside the channel is where equilibrium exists, where prices can be expected to deviate from the original linear regression line. As with Bollinger Bands, when prices move outside or to the extreme channel line, price tends to move back to the opposite channel line.”⁶

⁵ <http://www.paritech.com/paritech-site/education/technical/indicators/trend/linear1.asp>

⁶ <http://www.keystone-web.com/technicals/trend.html>

LR channels are probably the most common way to trade on a short-term basis. To set this up on a chart you'll have to put in standard deviations to tell the charting software where you want to set the channels.

Standard Deviations Settings:

The web site [RT Investor](#) has a tool box that describes this part of the inputs very well.

“The following approximations offer a few rules of thumb for using the standard deviation settings:

- Plus or minus one standard deviation takes in 68.3% of all expected outcomes (historical price moves)
- Plus or minus two standard deviations takes in 95.4% of all expected outcomes (historical price moves)
- Plus or minus three standard deviations takes in 99.7% of all expected outcomes (historical price moves)

“For example, excursions of price more than 2 standard deviations above or below the regression line represent an unlikely event (less than 5% probable). Such excursions usually represent overbought or oversold conditions.”⁷

Start experimenting with Linear Regression on your charts in different time frames and see what you come up with.

Thank you,
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Chicago

References:

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<http://www.keystone-web.com/technicals/trend.html>

⁷ <http://www.linnsoft.com/tour/techind/linReg.htm>

