

POLYNOMIAL FORECASTING

Predicting price based on historical price patterns

Forecasting market direction can be easy if you are using the correct tools. Our Polynomial Forecasting indicator provides unparalleled insight in to the markets. This document will teach you how to mathematically predict market movements with ease.

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Table of Contents

What is a Polynomial?	2
Applying Polynomials to Trading.....	4
Using the Polynomial Forecasting Indicator.....	6

WHAT IS A POLYNOMIAL?

In mathematics, a polynomial is an expression of finite length, constructed from variables and constants, which uses only the operations of addition, subtraction, multiplication, and non-negative integer exponents. An example of a polynomial would be:

$$y = x^2 - 6x + 12$$

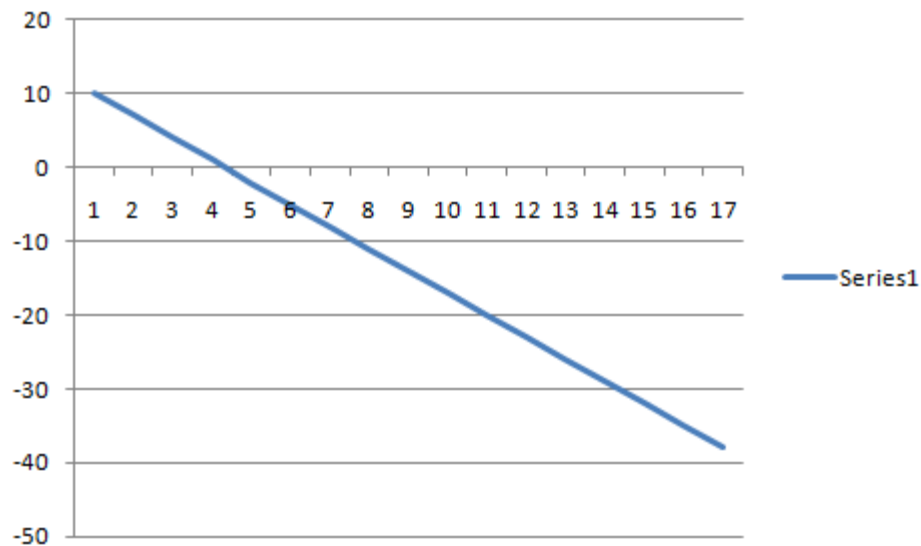
In algebra, polynomials are used to define the points on a line. For example, a common polynomial used to define the slope and y-intercept of a line is:

$$y = Mx + b$$

In the formula above, x and y represent the coordinates of a particular point on the graph, b represents the y-intercept, and M represents the slope of the line. Using the (x, y) points (2, 4) and assuming a y-intercept of 10, we can calculate the slope of a line (M).

- $4 = 2M + 10$
- $-6 = 2M$
- $-3 = M$

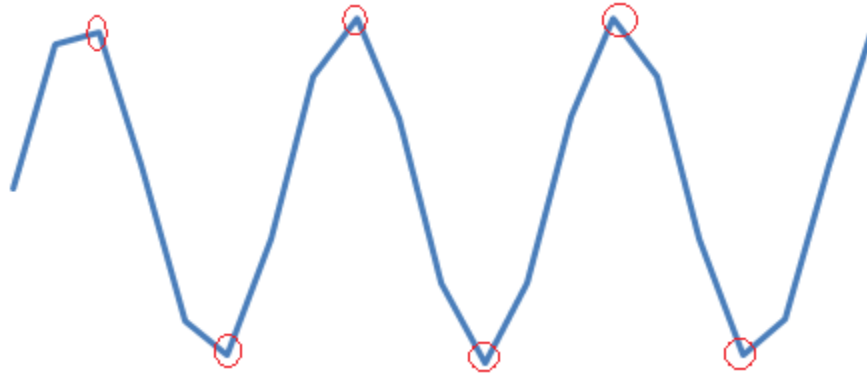
Now that we have calculated the slope of our line, we can graph the results, extrapolating the line in either direction to define an infinite number of points on that line.



This example is known as a first degree polynomial. In simple terms, the degree of a polynomial is determined by the highest degree of any of the exponents. For example:

<i>1st degree</i>	$y = Mx + b$
<i>2nd degree</i>	$y = Ax^2 + Bx + C$
<i>3rd degree</i>	$y = Ax^3 + Bx^2 + Cx + D$
.....	
<i>8th degree</i>	$y = Ax^8 + Bx^7 + Cx^6 + Dx^5 + Ex^4 + Fx^3 + Gx^2 + H$

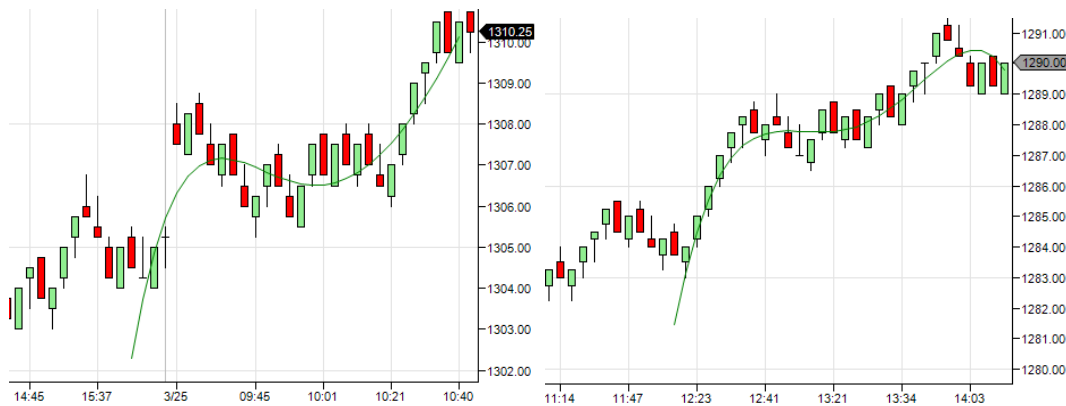
A polynomial can extend to an infinite number of degrees. The number of degrees in a polynomial determines the number of inflection points on the line. In differential calculus, an inflection point is a point on a curve at which the curvature changes sign. In other words, it is the point at which the slope of the line switches from positive to negative, or vice versa. The graph below shows six inflection points. This line would be represented by a 6th degree polynomial.



APPLYING POLYNOMIALS TO TRADING

Because a polynomial can be used describe the points on a given line, we can also use polynomials to describe patterns in the markets.

Once we have identified the polynomial that best describes the current market, we can compare that same polynomial to those calculated historically. To accomplish this, we measure the correlation between the current polynomial, and the polynomials that we have calculated historically. Correlation is a measure of the relationship between two lines. The higher the correlation, the more alike the two lines are. The correlation between the lines is used to identify the closest matching historical patterns.



The images above show the polynomials at two different points in time. Though not exactly the same, the lines are very similar, meaning they have a high correlation to one another. By identifying similar patterns in history, we can see what the market did after forming those similar patterns.



The image above displays a both a green and a red line. The green line represents the polynomial that has a high correlation to the to the most recent polynomial. The red line represents the polynomial that best describes the price of the market for the next ten bars after the green line. In other words, the polynomial that is used to calculate the red line would have been the best price *forecast* at the time that the green line ended.



Because we can identify numerous matching patterns using polynomials, we can make numerous forecasts. We repeat the process above for a user specified number iterations, and plot each *forecast* in to the future as a price projection. This view allows you to easily see what the market has done historically when a price pattern has occurred.



Using these historical *forecasts*, we can utilize statistical analysis to make projections for price in to the future. The image above shows our projections in the upper left corner. It is telling us that four of the ten *forecasts* are in the positive direction, while six of the ten are in the negative direction. Additionally, the average of all ten projections is 0.75. This information is displayed to show the trader the likelihood of the current price pattern resulting in a positive or negative price movement. The information displayed in the chart is telling us that based on history, there is a 60% likelihood that the market will go down, and the average move based on that history was -0.75.

USING THE POLYNOMIAL FORECASTING INDICATOR

The Polynomial Forecasting indicator contains several user defined parameters. These parameters allow you to modify the indicator for your specific needs.

Parameters	
ForecastBars	10
ForecastDegree	3
ForecastLines	10
Limit	0
PolyDegrees	5
PolyLength	30

- **ForecastBars** - Determines the number of bars in to the future that the indicator will project price.
- **ForecastDegree** - Determines the degree of the polynomial used to forecast price
- **ForecastLines** - Determines the number of forecasts made in to the future
- **Limit** - Determines the length of the data used to find pattern matches. For example, a length of 500 means that we will use the most current 500 bars to identify the closest matching polynomials. A setting of 0 will disable this parameter, meaning the strategy will use all historical data to find matching patterns.
- **PolyDegrees** - Determines the degree of the polynomial used find historical matching patterns.
- **PolyLength** - Determines the number of bars used to calculate the polynomials used for pattern matching.



The Polynomial Forecasting indicator also contains a group of four buttons on the left hand side of the chart. Below these buttons is a list of the current *forecasts*, ranked in order by which historical pattern had the highest correlation to our current polynomial pattern. The buttons allow us to easily scroll through history to find and analyze these matching patterns.

- **<< (Far Left)** - This button will scroll to the lowest correlated pattern displayed on the chart.

- **>> (Far Right)** - This button will scroll to the highest correlated pattern displayed on the chart.
- **< (Left)** - This button will scroll to the next highest correlated pattern displayed on the chart. For example, if we are currently looking at the highest correlated pattern (#1), clicking this button would scroll to the next highest correlated pattern (#2).
- **> (Right)** - This button will scroll to the next higher correlated pattern displayed on the chart. For example, if we are currently looking at the lowest correlated pattern (#10), clicking this button would scroll to the next higher correlated pattern (#9).