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Chart School

Standard Deviation (volatility)

Standard deviation is a statistical term that provides a good indication of volatility. It measures how widely values (closing prices for instance) are dispersed from the average. Dispersion is difference between the actual value (closing price) and the average value (mean closing price). The larger the difference between the closing prices and the average price, the higher the standard deviation will be and the higher the volatility. The closer the closing prices are to the average price, the lower the standard deviation and the lower the volatility.

The calculation for the standard deviation is based on the number of periods chosen. 20 days, which represents about a month, is a popular number of periods to use and will be used in the example below.

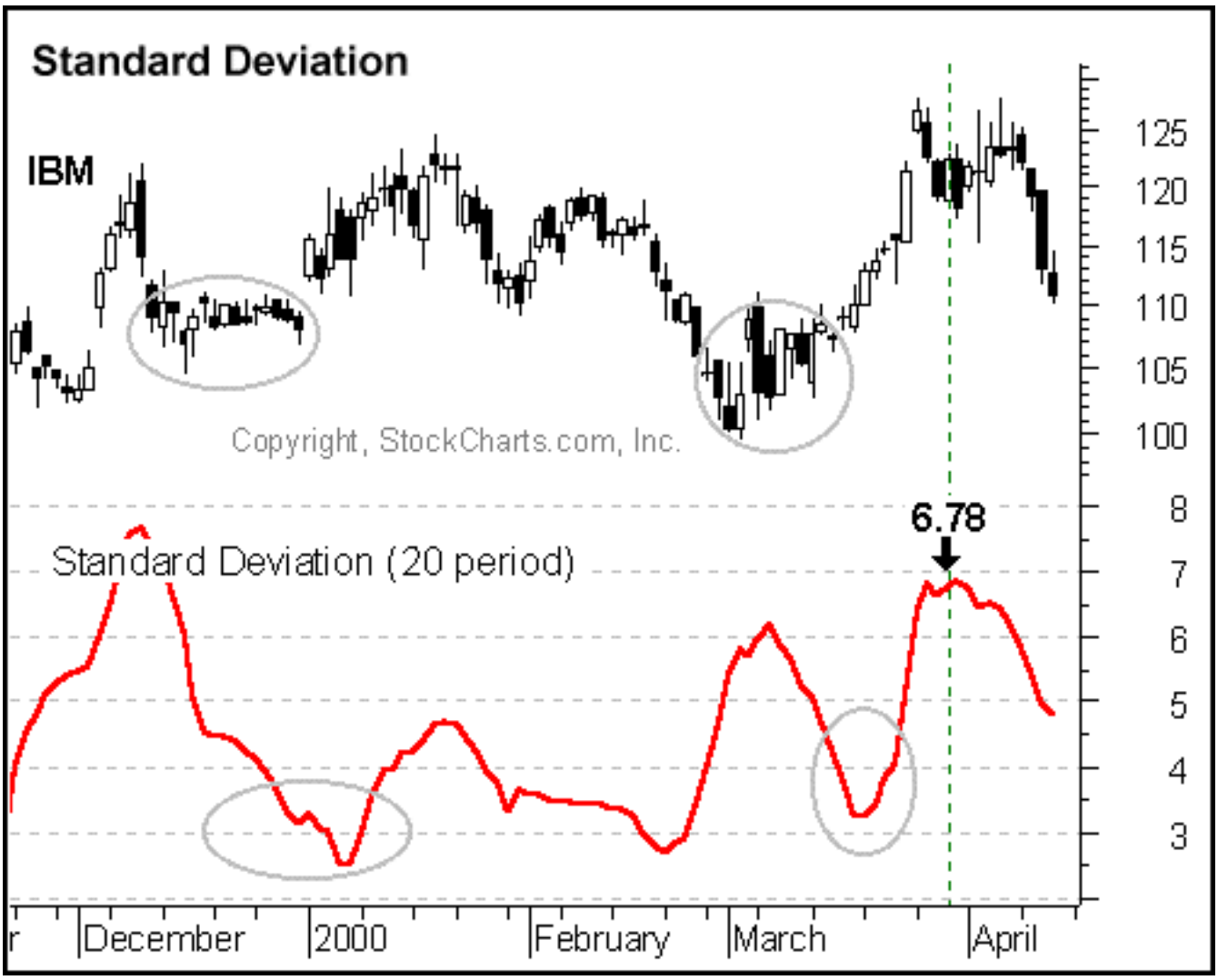
	Close	20-day Mean	Deviation	Deviation squared
1	109.00	112.30	-3.30	10.91
2	103.06	112.30	-9.24	85.38
3	102.75	112.30	-9.55	91.26
4	108.00	112.30	-4.30	18.52
5	107.56	112.30	-4.74	22.47
6	105.25	112.30	-7.05	49.75
7	107.69	112.30	-4.62	21.30
8	108.63	112.30	-3.68	13.53
9	107.00	112.30	-5.30	28.12
10	109.00	112.30	-3.30	10.91
11	110.00	112.30	-2.30	5.30
12	112.75	112.30	0.45	0.20
13	113.50	112.30	1.20	1.43
14	114.25	112.30	1.95	3.79
15	115.25	112.30	2.95	8.68
16	121.50	112.30	9.20	84.58
17	126.88	112.30	14.57	212.34
18	122.50	112.30	10.20	103.97
19	119.00	112.30	6.70	44.85
20	122.50	112.30	10.20	103.97

2246.06	112.30		921.28
		DevSqr/20	46.06
		StdDev	6.787

The steps for a 20-period standard deviation formula are as follows:

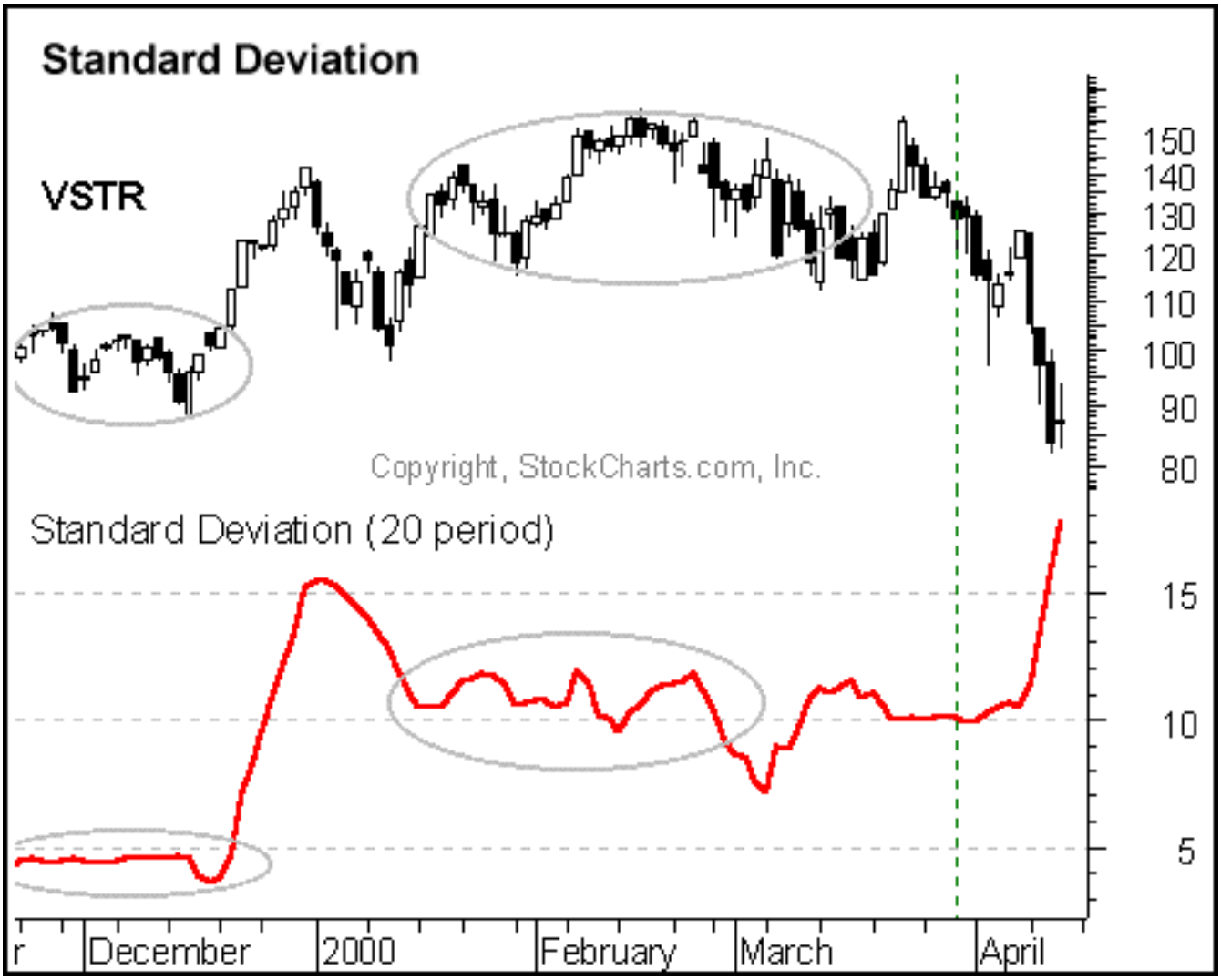
1. Calculate the mean price. Sum the 20 periods and divide by 20. This is also the average price over 20 periods. (2246.06/20 = 112.30)
2. For each period, subtract the mean price from the close. This gives us the deviation for each period (-3.30, -9.24....).
3. Square each period's deviation (10.91, 85.38...).
4. Add together the squared deviations for periods 1 through 20 (921.28).
5. Divide the sum of the squared deviations by 20 (921.28/20 = 46.06).
6. Calculate the square root of the sum of the squared deviations. The square root of 46.06 equals 6.787.

The standard deviation for the 20 periods is 6.787. This example was formed with a price series for IBM. The chart below shows how the standard deviation can change over time.



After extended periods of consolidation, the standard deviation (or volatility) dropped. Notice that in late

December the stock traded in a tight range and volatility dropped. Later in mid-March, the stock also traded in a tight range and volatility dropped. When the stock took off in the second half of March, volatility also rose.



VSTR, which is in the same price range as IBM, has a higher standard deviation. Until late December, the standard deviation was below 5. With the sharp advance in late December, the standard deviation rose from 5 to above 15. Since then it leveled out around 10 and has recently risen above 17. This is quite a volatile stock and its options will have more premium than IBM options. The higher the volatility for a particular stock, the higher the option premiums. The lower the volatility is for a particular stock, the lower the option premiums.

Written by Arthur Hill

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