Price Volatility

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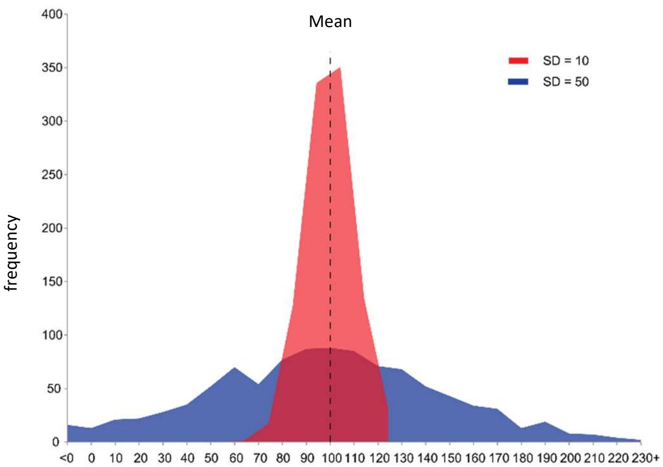
Volatility

Volatility within the discipline of financial economics is a fundamental measure of statistics describing dispersion in the returns of given assets, indexes, or similar sets of data. Dispersion is a measure that notes the extent to which data vary about the mean. To some degree, dispersion notes stability within the data. Generally, the greater the dispersion, the greater the risk, with the risk being a derivative of uncertainty (though dispersion is not always synonymous with risk). For example, a beta coefficient less than 1.0 implies there is less dispersion, or uncertainty and subsequently, risk, in an asset's historical data. Volatility refers to the degree of uncertainty, or risk, existing within data, or in our case, pricing data. Essentially, volatility and dispersion are one in the same, but if it helps, consider volatility as a function of time. Even further, consider volatility as a form of annualized variance or annualized standard deviation, realizing that variance and standard deviation are measures of volatility. So, as to not continue confusing the definitions, standard deviation is expressed graphically and mathematically below as a depiction of dispersion; sometimes statistical definitions are better expressed mathematically rather than narratively.



Example of Statistical Dispersion

Eq. 1 Standard Deviation of a Population

$$\sigma = \sqrt{\frac{\sum(x_i - \mu)^2}{N}}$$

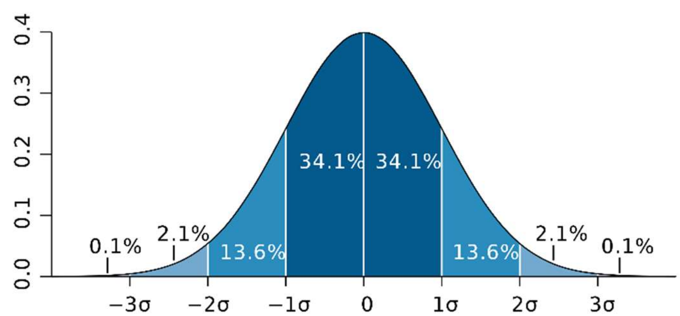
where,
σ = population standard deviation
x_i = value in the population
μ = population mean
N = population size

Eq. 2 Standard Deviation of a Sample

$$S = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n - 1}}$$

where,
S = sample standard deviation
x_i = value in the sample
$\bar{x}$ = sample mean
n = sample size

Some persons prefer to think in terms of variance rather than standard deviation. Standard deviation is the square root of the variance, so variance is merely the square of the standard deviation. Regardless, a normal curve using standard deviation to determine dispersion from the mean (μ=0) is noted below. Note that plus and minus 1SD includes 68.2 percent of the population (34.1%+34.1%), plus and minus 2SD includes 95.4 percent of the population, and plus and minus 3SD includes 99.6 percent of the population, with only a small portion of the population outside plus and minus 3SD.



Example of a Normal Curve

However, at this point, we really have only described volatility narratively and noted a couple of equations and graphs associated with volatility. Standard deviation is not volatility, per se, though such is a strong measure of dispersion of price movement of an asset. Statistically, volatility is expressed as a rate. As such, volatility is a function of standard deviation and the square root of time, or in our case, the square root of trading days (or months); such *annualizes* dispersion within an asset. Volatility then becomes the following expression when annualized:

Eq. 3 Annualized Volatility

$$\sigma_T = \sigma\sqrt{T}$$

where,
σ_T = annualized volatility
σ = standard deviation
T = time (252 trading days or 12 months)

And as is often the case, there are more advanced methods for computing volatility, such as using log returns, but in its simplest form, we simply compute volatility in terms of standard deviation and time to express volatility annually. And likewise, there are several types of volatility, including various forms of historical volatility, current volatility, and future volatility, each with its own twist. But such is irrelevant for our purposes today.

Trading on Volatility

There are numerous ways through which investors and traders use volatility to their advantage. More advanced traders may use volatility with call and put options, while others may use volatility simply as some variation of "risk" in everyday stock trading. With a disciplined approach, traders can increase profitability while leveraging risk. But in so doing, remember, volatility is a scalar quantity; it is not a vector quantity. Volatility only provides the magnitude of swings, not direction. However, as volatility, or magnitude, of price swings increases, so does the *opportunity* for increased profitability. When prices push the upper Bollinger band, the chances of generating profit increase, especially as price movement pushes through the upper band. Simply be prepared to sell. Subsequently, systematic discipline becomes a mandate when trading on volatility, for trading on volatility is not for the faint of heart; it can be risky—very risky. The trading methods must be well defined and adhered to like no other method. Trading on volatility requires one to be a master of self-discipline, knowing not only what to trade, but when to trade. Hence, strict rules must be followed when trading on volatility, for here, discipline drives success, and conversely, a lack of discipline drives failure.

Of course, likely the best method for trading on volatility involves the development and use of algorithms that mandate what to trade, as well as when to trade. Of course, to utilize this method to the fullest, it requires solid programming skills, accommodating hardware, and any interfaces to accommodate such. However, the seasoned investor can also trade on volatility if they know a little math and have substantial discipline. Simply use probability theory to determine what stocks to trade and when to trade. For example, first establish several assets to trade over a given period initially based on various acceptable levels of risk using beta, Sharpe ratio, and forms. From that list, establish operating parameters associated with buying and selling using probability theory, such as the probability that during a given period volatility will reach certain levels and trades can be executed, along with profit.

For instance, assume your trading platform allows you to trade with minimal-to-no fees, and you have established you intend to trade roughly up to 10 stocks today, resulting in approximately 10 trades at $10,000 per trade, or $100,000 total. Knowing that the probability of these 10 stocks reaching acceptable volatility levels, you buy, wait for that volatility to occur, then sell. And repeat. The same can be accomplished trading on price alone. Determine the assets you intend to trade over a period, be it a day, two days, week, and so forth. Next, calculate the probabilities of prices or returns hitting specific price points or ROIs during that period, and the moment that occurs, execute the trade. And repeat. And do the same with sells. Here, you must have stop losses in place in some form; simply adhere to them. Take your gains—and accept your losses.

Hope to the Weary

I know. If it were this easy, everyone would do it. But they don't. In fact, very few traders have the mental discipline to trade on volatility, especially without using volumes of algorithms and accommodating computer interfacing. Here, discipline is almost more important than your probabilities or algorithms, as a systematic trading strategy must be followed with every situation, every time. It is when the trader attempts to overrule the established trading rules does he end up seriously losing, hastily attempting to regroup, and losing more. *Plan your trade and trade your plan.*

Herbert M Barber, Jr, PhD, PhD serves as the Managing Partner and Chief Investment Officer of Xicon Economics. Intersecting the fields of engineering, finance, econometrics, and statistics, Dr. Barber is an expert in computational financial economics as it relates to the management of random walk theory and navigation of constructs surrounding efficient market hypotheses, especially within assets operating under extreme uncertainty. For over 30 years, he has provided advisory, consulting, and management of large capital investments in the private and public sectors. Additionally, Dr. Barber has published numerous scientific papers in refereed journals. Complementing his experience, Dr. Barber holds 5 academic degrees, including two research doctorates.

Xicon Economics provides investment research, financial and investment advisory, and asset management for corporations and investors. More specifically, we conduct scientific and applied research coupled with advanced statistical and econometric analyses and modeling to render complex financial and economic decisions to ensure investments are realized. While we have solved countless complex financial and economic problems, we concentrate our practice on leveraging our expertise to increase output on hedge funds and alternative investments. Additional information regarding Xicon Economics and its expertise can be found at www.xiconeconomics.com.

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