Special Report
Parts I and II: Perceiving Forex Volatility through Descriptive Statistics

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Forex markets often display significant volatility catching many traders by surprise. However, with a simple understanding of descriptive statistics and moving averages, many could soon find themselves ahead of the curve.

Many traders – both new and experienced – often find themselves at a loss attempting to understand why Forex markets tend to experience extended volatility. In simple terms, the reasoning behind extended volatility is that of continued buying, or selling beyond easily observable technical points found in charting. While the aforementioned explanation is almost infuriating simple, it is also true at the same time. Because technicals can sometimes lie, many traders often find themselves stopped out at high and low prints, leaving frustration and exasperation in the wake.

The question is then, how can traders transcend both technicals and volatility to achieve greater insight and perception into jagged movements within Forex. In other words, "How can we perceive volatility before it occurs?" Over the following pages, I will attempt to explain how using moving averages and descriptive statistics can help to identify trending and reversals, while also foreseeing volatility within almost any charting timeframe.

Note: *The information provided here is a small snapshot from my upcoming book on Forex. I am expecting the book to be available in late September, early November 2008. If you would like to receive information about the book and the expected release date, please email: Mark@WallStreetRockStar.com*

Words of Caution

1. *Within Forex, there is no "holy grail", so please do not read this article thinking that what I am about to show you will solve any/all trading issues. What you are about to learn is an incredibly effective guidance tool that helps identify trending, volatility and at times, reversals; however, it must be used with common sense.*
2. *You are about to read about descriptive statistics, which within itself has many different approaches, methodologies and studies. I will not delve into the math underneath the model in this article.* ***Instead I am presenting descriptive statistics from a simple, conceptual framework****. However, there are many resources available to explain the empiricism of descriptive statistics; you will find several at the end of this article.*
3. *Never forget that economics and fundamentals rule all. Traders who do not take the time to properly uncover the true economic paradigm within the market – and the future possibilities of such – will likely often find themselves on the wrong side of the trade, especially those who hold for longer timeframes. Technicals lie, fundamentals do not.*

Simple Descriptive Statistics for Forex Traders

Within the framework of this article, we will measure volatility within Forex through simple descriptive statistics. Again, I will not justify the "conceptual framework" here with the actual math, as it would be a book in itself. However, it is important to note that we will be using simple descriptive statistics to measure volatility through a normal distribution.

Wikipedia.com defines descriptive statistics as:

Descriptive Statistics *are used to describe the basic features of the data gathered from an experimental study in various ways. They provide simple summaries about the sample and the measures. Together with simple graphics analysis, they form the basis of virtually every quantitative analysis of data. It is necessary to be familiar with primary methods of describing data in order to understand phenomena and make intelligent decisions.[1] Various techniques that are commonly used are classified as:*

- *Graphical displays of the data in which graphs summarize the data or facilitate comparisons.*
- *Tabular description in which tables of numbers summarize the data.*
- *Summary statistics (single numbers) which summarize the data.*

My question for readers is this: How can anyone make an intelligent decision without understanding the data at hand? See, so many traders use technical analysis to decipher their entry and exits without truly evaluating the data that is presented before them. What's more, tack on complete oversight of the commonsense economic fundamentals and truly it's no wonder their trades are often stopped out at the top, or bottom. Economic fundamentals aside, let's discuss how technical analysis completely overlooks the "real data" traders need. Foremost, technical analysis is a "lagging event", meaning that the visual representation we see on our charts can only be there insofar as the event has already occurred. In short, an equity, index, option, commodity, futures contract, or even currency must have already witnessed a trade "print" before the data ever even shows up on a chart. What this means is that virtually ALL empirical technical analysis is that of a lagging event to predict a future occurrence. The problem is this: so many simply do not understand what the historical data is representing.

We can measure buying and selling volume all we want, but the true wealth in technical analysis is the easily identifiable, or representative display of descriptive statistics. When we change the way we think about technical analysis and understand that it is not a simple "chart, or indicator", we begin to see that the "charts" are really the "historical data" we need to statistically measure volatility and potentially infer a future trading range, trend and/or reversal point.

Consequentially, we will be using a normal distribution within our statistical measurement of trading action to imply volatility, trend and/or reversals. The application of a normal distribution applies to trading insomuch as the data we are measuring is constantly moving with the periods studied. Because the "mean" is the moving average, data will never stay skewed on one side or another. Eventually, the data will cross back over the mean (moving average), as the moving average eventually travels in the same direction as the data. The "traveling factor" behind a moving mean proves that the data measured will eventually return to the mean and likely cross above, or below and even possibly extend in the opposite direction. It is the concept of the mobile mean (where old data drops off – i.e. the 51st day of a 50-period Simple Moving Average 'SMA'.), that justifies measuring volatility through standard deviations under a normal Gaussian curve. What's more, as John Bollinger points out in his book Bollinger on Bollinger Bands, the Central Limit Theorem tells us that even when data is not normally distributed (as is the case with virtually every financial instrument, including Forex), "a random sampling will produce a normally distributed subset for which the statistical rules will hold."[1] In short, smaller samples within the market will not produce the *kurtosis* of the larger data set.[2]

Gaussian Curve Revisited

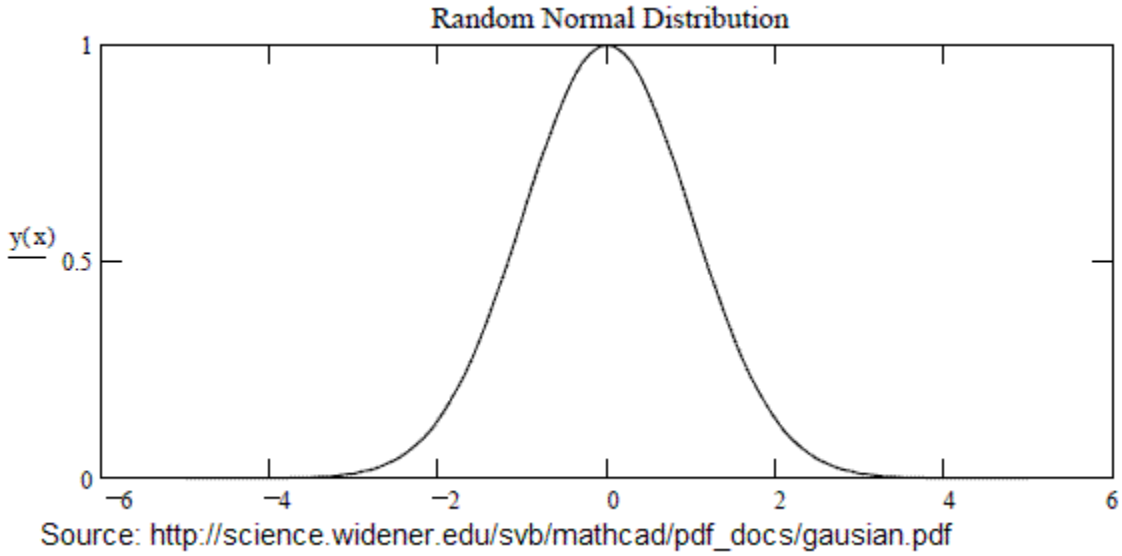
Within descriptive statistics, we will use a random normal distribution (Gaussian Curve) to measure volatility via standard deviations. In terms of the Gaussian Curve, we are looking at a normalized distribution where the sum of all values of x, are meant to equal 1. What this means is that if we are measuring price movement within 21-periods on a 5-minute chart (for example), the end result should equal a probability of 1. In other words, the sum of all values that have transpired in the measured period will give us a probability of 1 (an empirical absolute) that the events have happened. What we're referring to here is a probably of 1 that the chart you see, is

[1] Bollinger, John. Bollinger on Bollinger Bands. 2001, McGraw Hill, New York, New York. Page 70.
[2] Bollinger on Bollinger Bands. Kurtosis, Page 72: "*What is a non-normal distribution again? And what has a fat tail? The graph in Figure 9.2 illustrates the concept nicely. The taller hump is a normal distribution, the way things ought to be. The shorter hump is a distribution like the stock market's, less small changes than one would expect and more large changes. The amount of difference between the two humps is known as kurtosis and it is a significant quantity for stocks.*"

the chart you see. However, using the historically measured occurrences, we can also use the data to infer probability of future events. Measuring probability via moving averages, via standard deviations, will allow us to infer the potential range of volatility, before it ever surfaces. What's more, when a currency pair extends beyond a certain point of probability, we will also know to cut our trades loose, perhaps precisely where/when extended volatility ensues - and thus – find the ability to quickly and insightfully cut losses. Even more enticing, when extended volatility strikes our measured probability "cut off" we will also know to begin looking for a reversal, though we will also know to watch for a dangerous continuation at the same time.

How will we do all of this?

Data on a Gaussian Curve is measured in terms of "standard deviations" from the mean. The arithmetic mean, of course is the average of all prices recorded in the time period we are studying. Thus, by being able to calculate the average prices for a particular period of trade data, we can also measure probability of movement away from the mean through standard deviations.

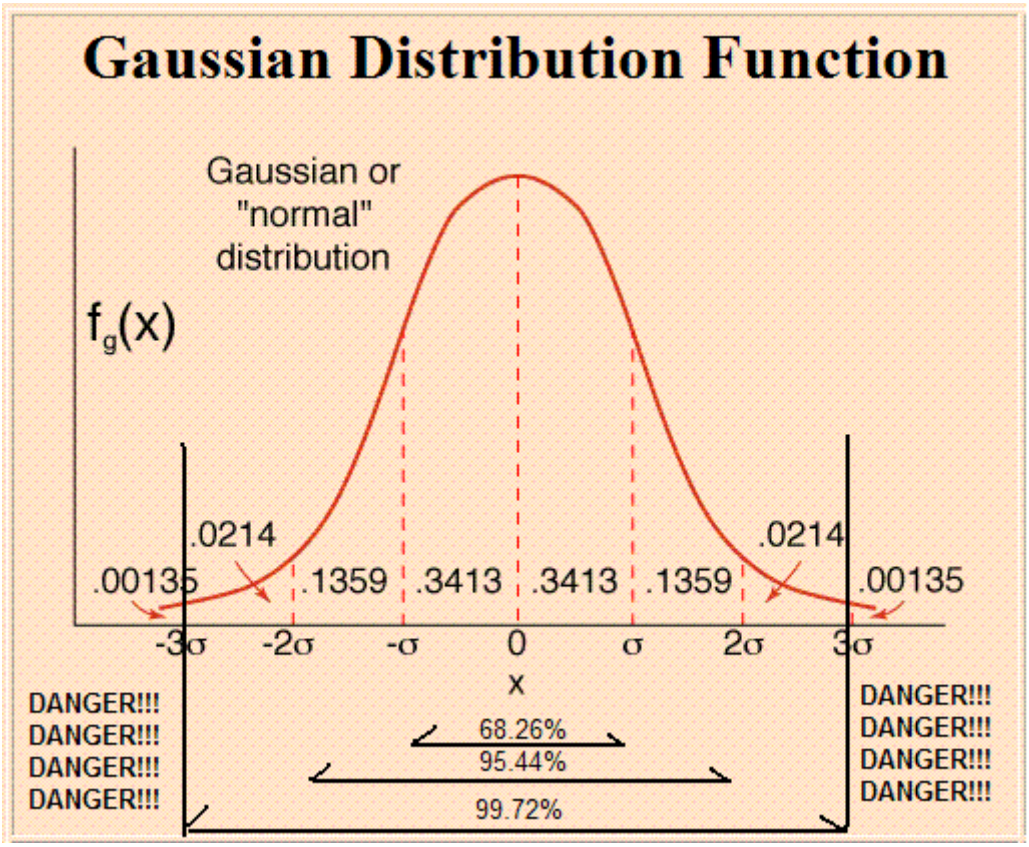


Source: http://science.widener.edu/svb/mathcad/pdf_docs/gausian.pdf

If you remember your old statistics days, you may also recollect that the majority of all probability falls within three standard deviations of either side of the mean. In fact, all three standard deviations on one side of the mean, equal 49.86% of all the data. In translation, measuring three standard deviations on both sides of the mean, equates to 99.72% of the data within the measured time frame. In other words, there is a 99.72% probability that the sum of all data totaled - in the time measured – will theoretically fall within three standard deviations of the mean…

Breaking the standard deviations down, there is a 34.13% probability that the data rests within one side above, or below the mean. Moving out a little further, there 47.72% probably that the data will sit within two standard deviations of one side of the mean and a 49.86% probability that the data rest within three standard deviations of one side of the mean. However, while there is one standard deviation above the mean, there is also one standard deviation below, and thus, we

know that multiplying 34.13 by two, we can infer that there is a 68.26% probability of all data resting within one standard deviation above, or below the mean, a 95.44% probability of all data lying within two standard deviations of the mean and a 99.72% probability of all data in our period measured is sitting within three standard deviations of the mean.



Statistics can be boring, but what we're seeing here is actually very, very interesting, especially when considering we have the ability to make hordes of money when taking a moment to understand the volatility probabilities within measured trading ranges. Fact is, by understanding probability ranges via standard deviations, we will know where extended volatility could hit in terms of "outliers." Moreover, using standard deviations, we can also begin to understand where trending begins and ends, while also being able to spot when reversals are potentially at hand.

Incorporating Probability into Charts with Moving Averages and Bollinger Bands

Over the next section, we will cover moving averages and Bollinger Bands, while also taking a look into why and how the two combined present a significant representation of the total potential volatility range within the time frame we are examining. We will first start with moving averages.

Moving averages are simply a tool which allows traders to analyze a time series of data within Forex. Helping to keep myself from writing an entire novel on moving averages, we will really only examine simple moving averages in this article. It should be noted though, that Exponential Moving Averages (EMAs) more closely track true price action, as more weight is given to near-term data, than the latter. What's more, referencing John Bollinger again, he argues that simple moving averages may provide more reliable results, as when we add in the "exponent" factor of an EMA, we are simply adding one more variable to an already complicated scenario. I believe what he's saying is Keep It Simple Stupid (KISS).

A Simple Moving Average (SMA) though, is derived by calculating the mean of measured data points. For example, on a five minute chart, a 20-period SMA will present the "arithmetic mean", or average of all price for the past 20-periods of the past 105 minutes (5-minutes times 20-periods) of trading action.

The Simple Moving Average, then, is the "mean" which we are basing our standard deviations off of, when attempting to measure descriptive statistics within the Gaussian Curve. The below chart shows a 20-SMA, which will be the basis of our analysis here. Please note that what you're seeing is more than "just a moving average", instead, we are seeing a visual representation of the "mean data range" of the past 20-periods. In effect, we are seeing the basis of the curve, which we will derive statistical data and volatility from. Again, keeping to Bollinger, we will use 20 periods for our base time measurement, as on a daily chart, there are about 20 trading days in a month.[3] Really though, I use 20-periods, because it will help predict the "self fulfilling prophecy" of volatility, given that most other Bollinger Band users are likely using the same number.

Taking our discussion one step further, we will look into the application of moving averages and Bollinger Bands to derive volatility within trading. According to BollingerBands.com:

"Bollinger Bands are a technical trading tool created by John Bollinger in the early 1980s.

They arose from the need for adaptive trading bands and the observation that volatility was dynamic, not static as was widely believed at the time. "

[3] [3] Bollinger, John. Bollinger on Bollinger Bands. 2001, McGraw Hill, New York, New York. Page 53.

From Bollinger's Website, *"Bollinger Bands consist of a set of three curves drawn in relation to securities prices. The middle band is a measure of the intermediate-term trend, usually a simple moving average that serves as the base for the upper and lower bands. The interval between the upper and lower bands and the middle band is determined by volatility, typically the standard deviation of the same data that were used for the average. "*

In essence, Bollinger Bands measure the volatility of a measured time frame though standard deviations. What this means is that with a proper understanding of the Gaussian Curve and the probabilities behind standard deviations, we can identify the extent of a trading rage, thus predicting the outlying volatility that may ensue within a trend, the trend itself, and potential reversals that may be presenting themselves within the charts before us.

The chart to the left shows a typical Bollinger Band (measuring 20 periods from the Simple Moving Average – seen on the 5-minute chart above) two standard deviations offset from the mean.

As you will note, the upper and lower Bollinger Bands visually represent two standard deviations above and below the mean (the Simple Moving Average). What this means is that within the moving 20-periods measured (if you remember our earlier discussion on the Gaussian Curve and standard deviations), there is a 95.44% probability that all the data measured should (in theory) sit within two standard deviations (the upper and lower bands) of the mean (the 20-SMA.)

As you look at the above image, it's pretty easy to see – on a common sense basis – that truly, 95% of the EUR/USD trading range does indeed sit within two standard deviations. The point here is that we are able to perceive – ahead of time – where the outlying highs and lows of the EUR/USD should be within the case of lateral trending. As we are able to perceive where two standard deviations are and will be, we then also understand that there is a 95.44% chance that the EUR/USD will remain in the range denoted by the Bollinger Bands, when trending laterally. The concept that I have just mentioned is extremely effective to aid in identifying highs and lows for profit targets (and even potential reversal entries) when attempting to channel trade, again, in

a lateral market. I will go over this concept in greater detail in a few moments, but for now, it was simply important to show how the statistical data we are working with can be used in everyday trading. What's more, please keep in mind, that the concepts we are discussing here can be applied to anytime frame; however, the shorter the time frame, the greater the chance of breaching our second and third standard deviation outliers; thus it is always a good idea to look at multiple timeframes, especially 4-hour and daily charts so we retain a sense of where jagged moves on shorter term time frames can extend to, on a longer-term basis.

CAUTION: *While I have presented the above standard deviation percentages in true form, there another paradigm that must be heeded. Within John Bollinger's book Bollinger on Bollinger Bands he states that through his studies, two standard deviations measure only 89% of the contained data, versus the statistical norm of 95.44%. His explanation is that of the non-normal distribution overall in prices. I am not going to reinvent the wheel here, but what we can assume is for each standard deviation, there is the possibility of a (roughly) 6% reduction in containment. However, there can be no more data lying outside of the true standard deviation percentages, without breaching the standard deviation. What I'm saying here is that while there is no floor, there is a ceiling. Regardless, we know that when the third standard deviation is applied, we're looking at roughly 93% containment all the way up to 99.7%. This is why when we are viewing standard deviations to locate volatility endpoints we are doing so from a common sense relative stance of concept. Good traders are dynamic, not rigid robots. The descriptive statistics here are to aid in identifying volatility outliers, not present a precise trading system. Fact is, trading systems eventually breakdown: however, perceptive traders with common sense do not.*

Moving on, if we now insert the third standard deviation Bollinger Bands on our chart, we find some even more interesting information. As the below chart shows, there is a 99.7% probability of the all of the data (read: trading range) will sit within three standard deviations of the mean.

As the five minute chart shows us visually, the statistical probability holds true, as the EUR/USD only touched the third standard deviation Bollinger Band twice in the data we have here. What we begin to see, then, is when we are in a position, long, or short, if we are trading on the five minute chart and the EUR/USD strikes the third standard deviation, we are truly trading at a statistical outlier, and we should perhaps consider closing the trade that has already moved in our favor, and/or implement a short-term reversal, knowing that there is significant likelihood that the currency pair will revert from the third standard deviation and potentially move back to the mean, which in the case of the below chart, is the moving average.

There's more to the story here though. By understanding where the second and third standard deviations are, we can also have some predictability of the potential points where excessive volatility could take the currency pair. As an example, (using the above chart), imagine that we had just implemented a short position on the above chart on the last candle to the right. Obviously, this position is

reasonable, as we are trading with the descending trend (in the relative range for the 5-minute chart), while also implementing a short at the mean, which in this case is the moving average, which we have derived our Bollinger Bands (predictions of volatility though standard deviations.) What the Bollinger bands are telling us is this: If the trade does begin to move in our favor and the EUR/USD falls – and the EUR/USD breaches the second standard deviation we would be wise to take our profits off the table if the EUR/USD strikes the third standard deviation. The moral of the story is that if we are trading a short-term channel, when the EUR/USD strikes the third standard deviation, it will likely retrace the mean, before either staging a continuation in the original direction of trend, or commencing a larger reversal, which is often confirmed with a full candle close above/below the mean in the opposite direction of the third standard deviation that was most recently touched.

In the case of the above trade, the decision to take a short position was a logical one, based on the descending trend that was already in effect. However, the position would have been a loser… Here's why: the paradigm (read: trend) changed and the EUR/USD did not continue falling, but instead traded laterally, before staging a bullish move upward the following day. There are a few points to note here. First, the candle following out entry opened and closed above the mean, which should have been a clear signal that something changed within the market and the previous descending trend was finished, at least on a short-term basis. What's more, it is visually apparent that the Bollinger Bands had begun to narrow, which from a common sense perspective should alert us that volatility is decreasing and lateral trading could potentially ensue, while traders decipher any new information that has (or has not) presented a reason for trending. However, as you are about to see, there is a tool we can use to decipher when trending has ended and lateral trading has begun. Before I show you how to identify periods of lateral trading ahead of time, please note that in the below chart, when the third standard deviation was hit (after lateral trading began), the EUR/USD retraced the mean in every occurrence.

What is this telling us? Traders who enjoy scalping could have made three short-term reversal trades at the third standard deviation, by having electronic orders outstanding at the third standard deviation… By knowing where the third standard deviations are, we can predict ahead of time, where volatility extremes will be on both short and long-term time frames, whereby we can predict reasonable points for profit taking, or for reversal entries.

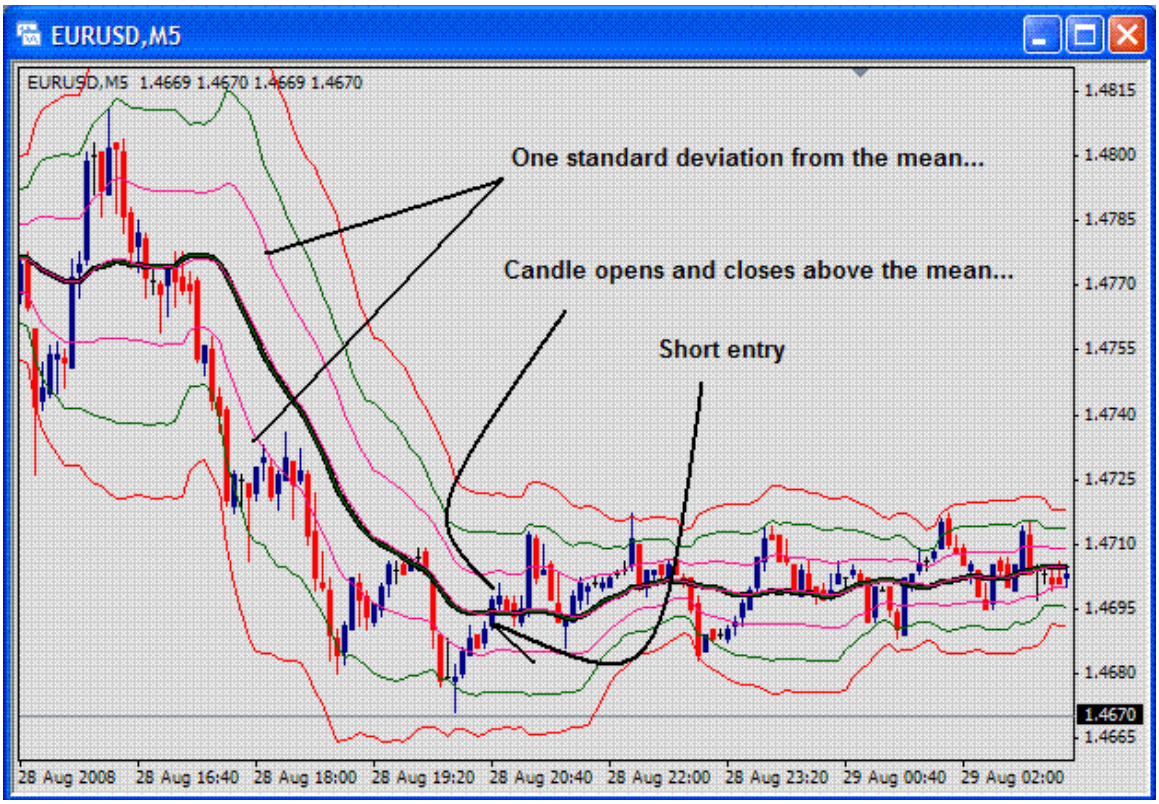
It's important to note that when taking a position on the third standard deviation, in hopes of capitalizing on a reversal, we must remember to keep stops tight because:

1. We are looking at a short-term chart and the longer-term chart could be showing something very different.
2. If the third standard deviation is breached, the movement into the fourth standard deviation (or more!) can be treacherously dangerous.

Therefore, if we are taking a reversal position (on a short-term chart), we should keep our stops tight at 10, or 20 PIPs from the third standard deviation.

If the pair moves beyond the third standard deviation, chances are a larger paradigm shift has occurred and the previous lateral movement is likely over.

At this point we should switch our mode of trading from lateral trading techniques to trending. We must be able to understand that lateral trading and trending are two distinct animals and we should approach them differently in our trading strategies.



This concludes Part I of this special two-part series.

Now, we will begin Part II of II: Perceiving Forex Volatility through Descriptive Statistics – Deriving Trending and Reversals.

> NOTE: The conceptual framework provided here is intended to pave the way for a greater understanding of the larger paradigms behind trending and reversals within Forex markets. Adding on just a few more indicators, as Part II will show, can aid traders in actual day to day trading.
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> Please send any/all feedback to Mark@WallStreetRockStar.com, or please visit me at www.WallStreetRockStar.com.