Currency Trends And Volatility

Volatility is at once one of the more fascinating, useful and misunderstood topics in finance. The fascination derives from its ephemeral nature. It is the market's price of insuring against uncertain events arriving at uncertain times and with uncertain impacts. Risk is quantifiable; uncertainty is not. But the world is an uncertain place, and thus we must hedge ourselves the best we can.

Why is volatility misunderstood? Too many view a time series of volatility as if were a continuous process such as a stock or bond price. It is not an asset, attempts by various exchanges to make it one notwithstanding. Volatility has no natural return such as a coupon or dividend. At best, volatility is an attribute of other asset classes, not an asset class per se.

Finally, why is it so useful? Markets are a convergent search process by price for some underlying economic value. As price rises and falls, the direction of volatility tells us who the more anxious party is, the buyers or the sellers. That is useful information to have. Moreover, volatility often leads changes in price as its patterns effectively carve out a path of least resistance in the market: Money flows toward calm and away from anxiety.

Currency Volatility

It stands to reason volatility would be particularly useful in currency markets. The fundamental currency equation, after all, has three unknowns and therefore cannot be solved exactly, and much of the trade in currencies is in options and option-like instruments. Demand for caps and floors must, by definition, be reflected in the prices for these instruments, and higher volatility by definition must discourage further demand for these hedging vehicles.

Let's take a look at how volatility interacts with price trends over long periods of time for the Canadian dollar (CAD), Japanese yen (JPY) and British pound (GBP). The euro would be a preferable choice, but its history begins in 1999.

We need to define some of the measures used, in particular Parkinson's high-low-close (HLC) volatility and its associated trend oscillator. First, we need to create an N-day trend speed, the number of days between 4 and 29 that minimizes the function below where P is price, MA is a simple moving average and Vol^2 is the N-day HLC volatility measure.

Function 1:
$$\frac{1}{N} * \sum_{i=1}^{N} \frac{N}{Vol^2} * \left|P_i - MA_i\right| * \left|\Delta MA_i\right|$$

Once N is selected, the trend oscillator is calculated. This oscillator is normally distributed; movements outside of the range of ±0.40 tend to indicate overbought and oversold conditions.

Function2:
$$TrendOscillator = \frac{\left[\frac{\mathrm{Pr}\,ice - AdaptiveMovingAverage}{High - Low - CloseVolatility}\right]}{\mathrm{Pr}\,ice}$$

The HLC volatility is calculated from the same N-day critical trend speed. This historic volatility has the advantage of incorporating both intraday true price range and interday change into its calculation. As a market meanders in a trading range, intraday range dominates interday change and volatility rises. As a market moves in a strong directional trend, interday price change dominates intraday range and volatility - uncertainty - falls.

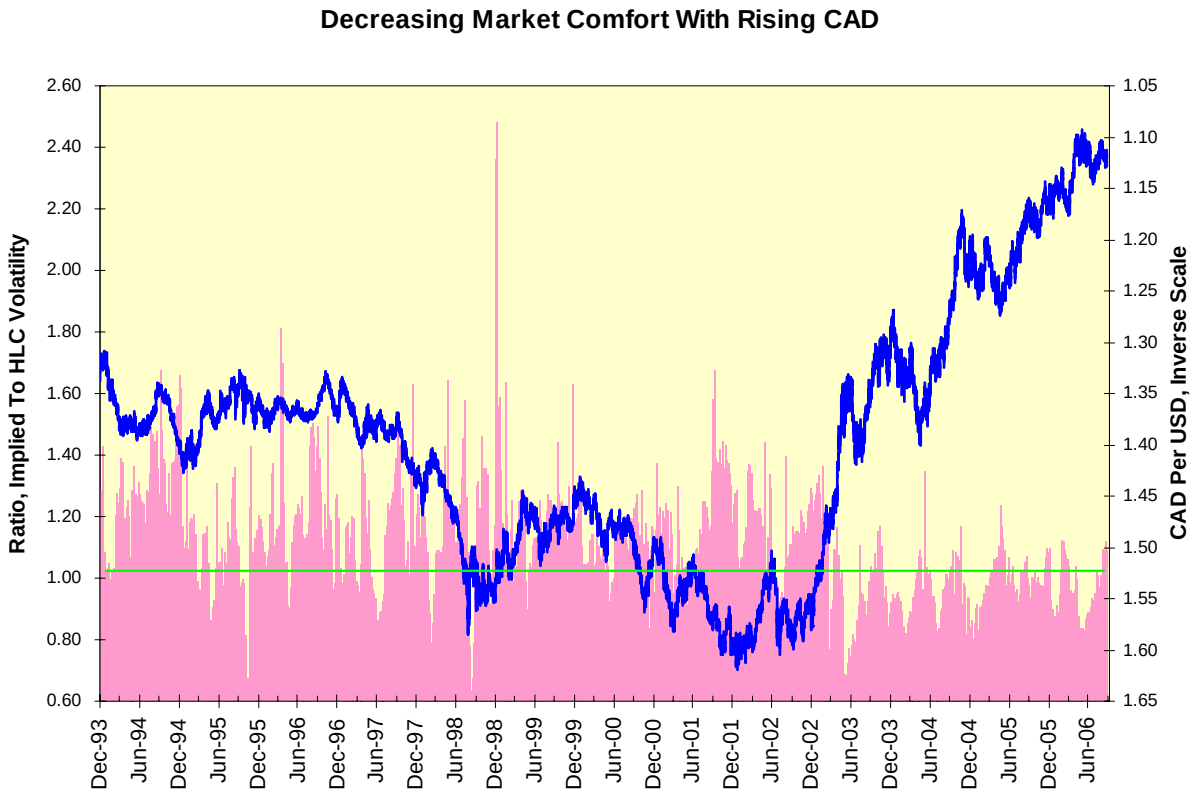
Function 3:
$$HLCVol \equiv \sum_{i=1}^{N} \left[\frac{\left[.5 * (\ln(\frac{\max(H, C_{t-1})}{\min(L, C_{t-1})}))^2 - .39 * (\ln \frac{C}{C_{t-1}})^2 \right] * 260}{N} \right]^{.5}$$

Volatility does not exist in a vacuum, however. If we view the options market as a form of insurance, we can see readily how forward-looking implied volatility in an option needs to be placed into context against backward-

looking HLC volatility. It is the excess of price insurance against a historic relative frequency measure that counts; this is similar to comparing flood insurance costs between coastal and upland regions. Yes, it costs more to buy flood insurance near the water, but relative to the actual risk, the price of the insurance itself may be cheap. We will use the ratio of implied to HLC volatility to measure the fair value of insurance in a market.

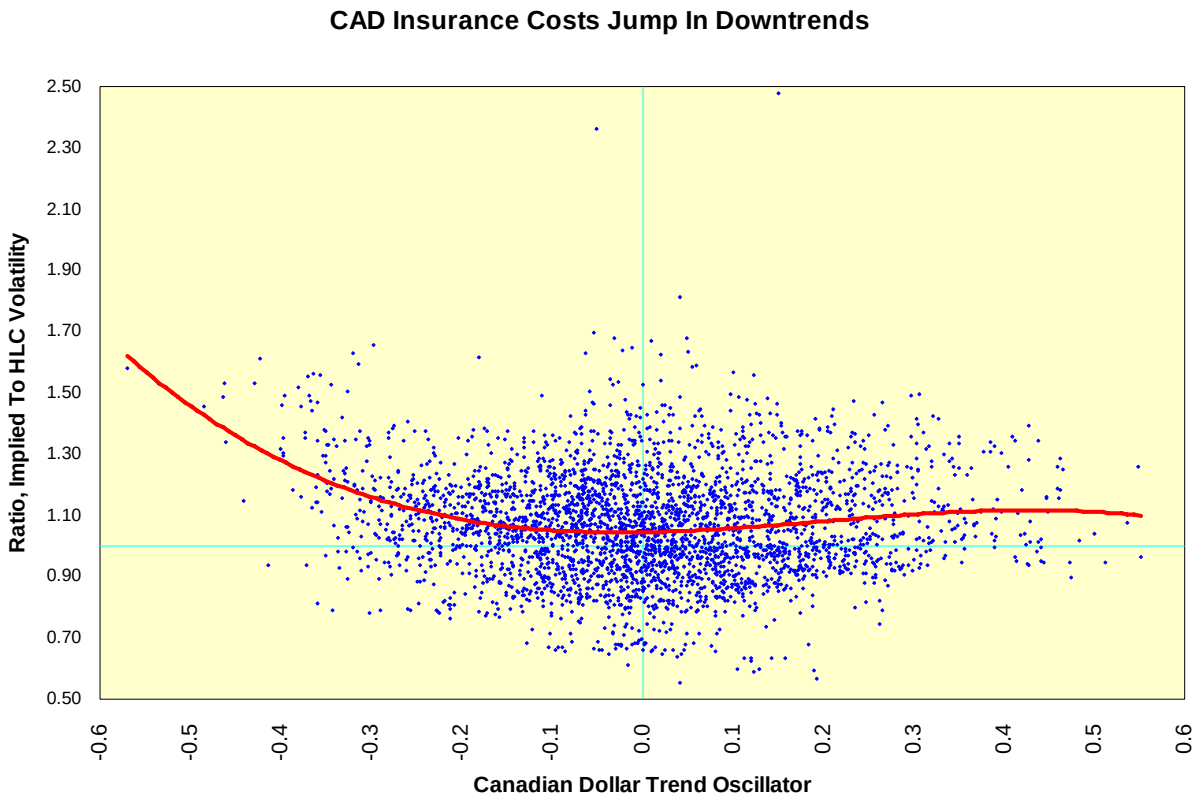
Case Study One: The Canadian Dollar

Over the available data sample, the CAD has undergone one secular trend change. It weakened precipitously into 1998, stabilized and then made a low in January 2002. The trend since then has been almost continuously higher. Given the comment above about HLC volatility declining during strong trends, we would be within our rights to expect excess volatility to rise against this smaller denominator.



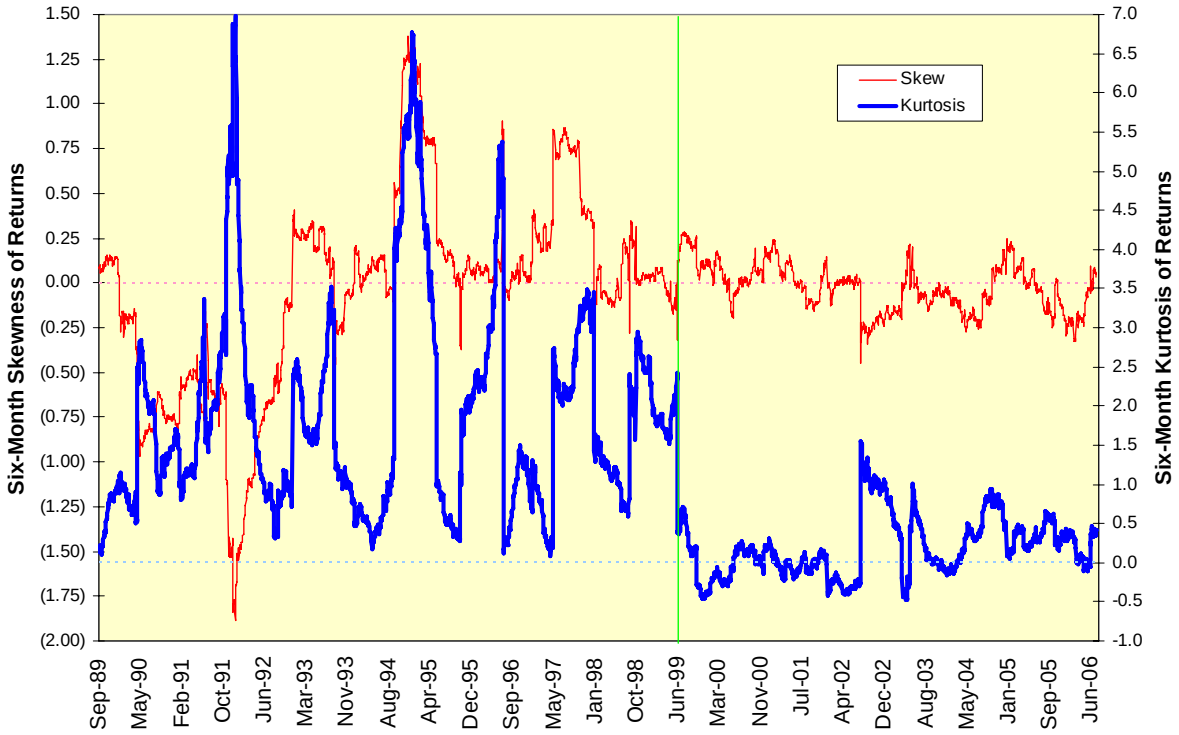
In practice, however, excess volatility trended lower from its 1998 peak until mid-2006. We can interpret this as saying the market had been quite comfortable with the rising trend level of the CAD. Until quite recently, those who were long the CAD see no reason to pay more for floors, and those who were short the CAD saw no reason to pay more for caps.

We can see the same phenomenon in another way by mapping excess volatility against the CAD's trend oscillator. The pattern is asymmetric; excess volatility rises during selloffs such as 1997-1998. Very strong uptrends see only a modest increase in excess volatility. From this we can conclude the more anxious party in the CAD market is the put option, or floor, buyer.



Now let's introduce two measures used to evaluate many dealer options in the currency market, skewness and kurtosis. Skewness measures the degree to which a normal distribution of returns is biased toward higher or lower values; a symmetric distribution has a skew of zero. Kurtosis is the degree to which a distribution of returns is peaked; positive values of kurtosis describe a market with a greater than expected number of observations clustered about the mean, while negative kurtosis describes a market with a greater than expected number of large deviations from the mean.

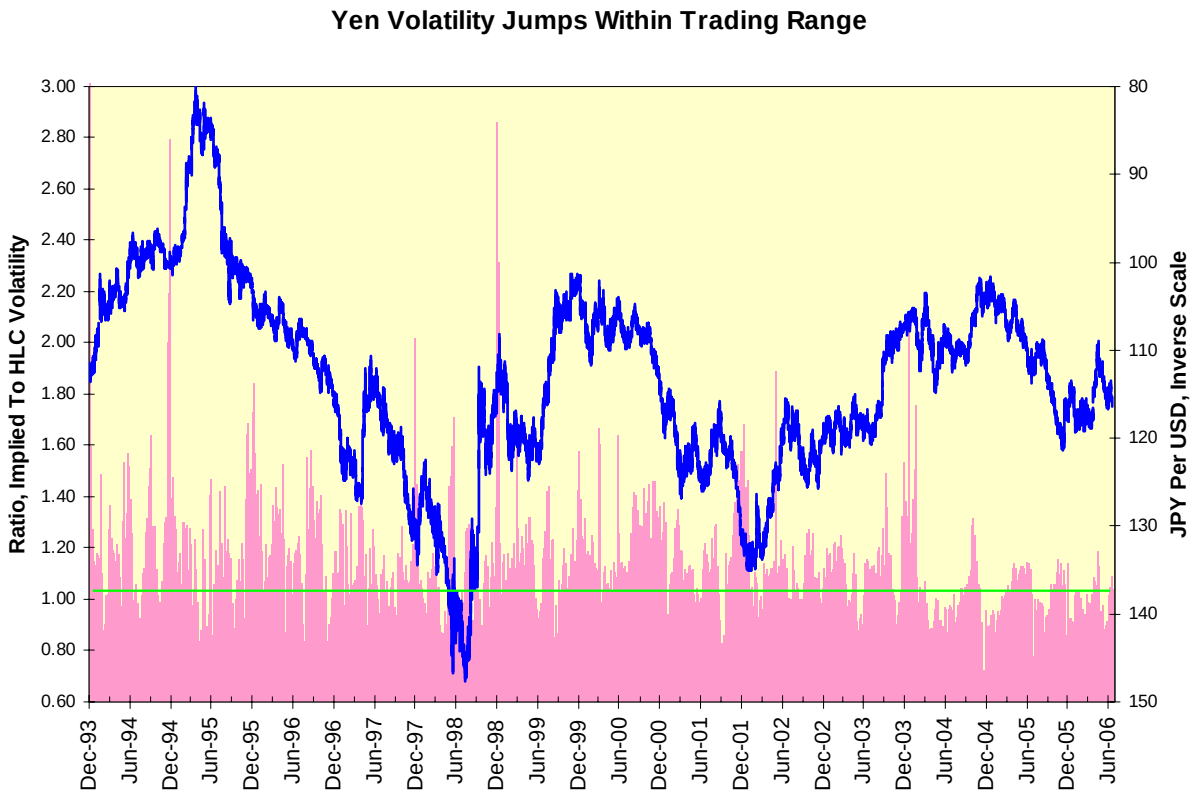
How have CAD skewness and kurtosis evolved over time? If we take a rolling six-month data sample, we see how both measures flatten immediately after June 1999, a demarcation corresponding to the introduction of the euro. This is prima facie evidence that the presence of the euro led to significantly lower volatility in global, and not just European, currency markets.



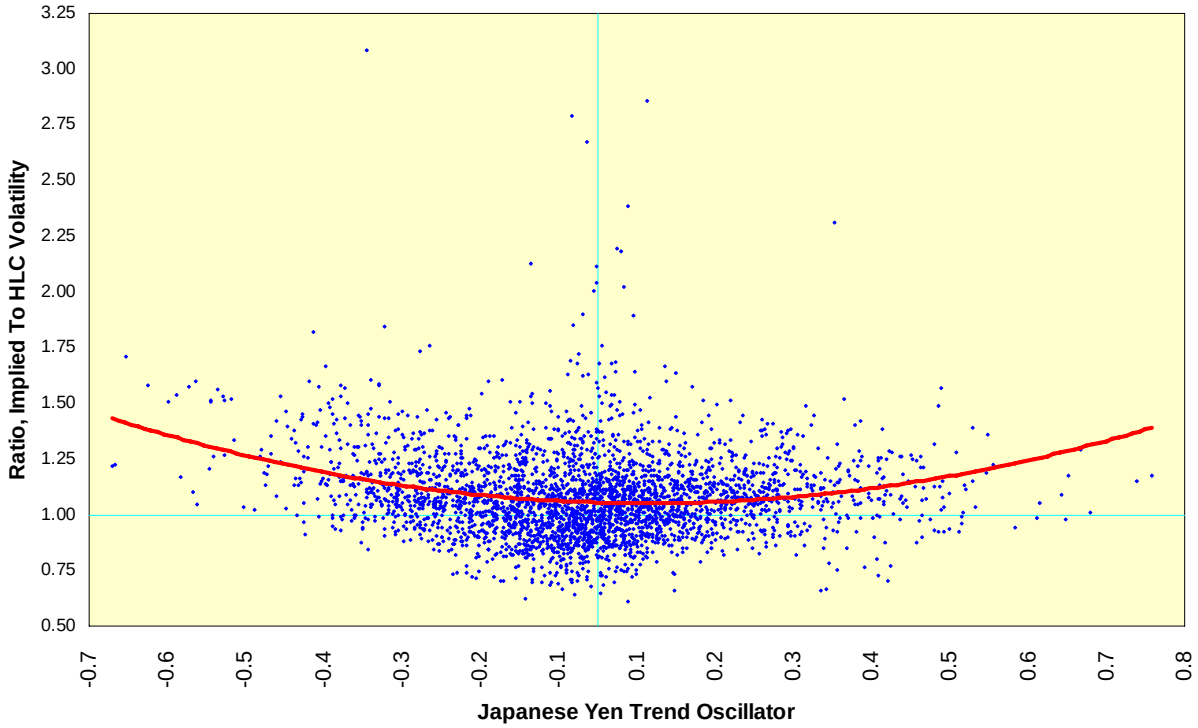
Case Study Two: The Japanese Yen

Over the available data sample, the yen has only one dominant feature, and that is a strong selloff from its 1995 high down to its 1998 low. Once the violent rebound occurred in October 1998, the market leveled off into a trading range between 100 and 125, with the exception of the post-9/11 period. During this trading range, a large number of event-driven spikes in excess volatility occurred, but unlike the case with the CAD, there really is no trend of significance.

We can infer from this pattern the market is comfortable with the official Japanese policy of managing the JPY-USD rate.



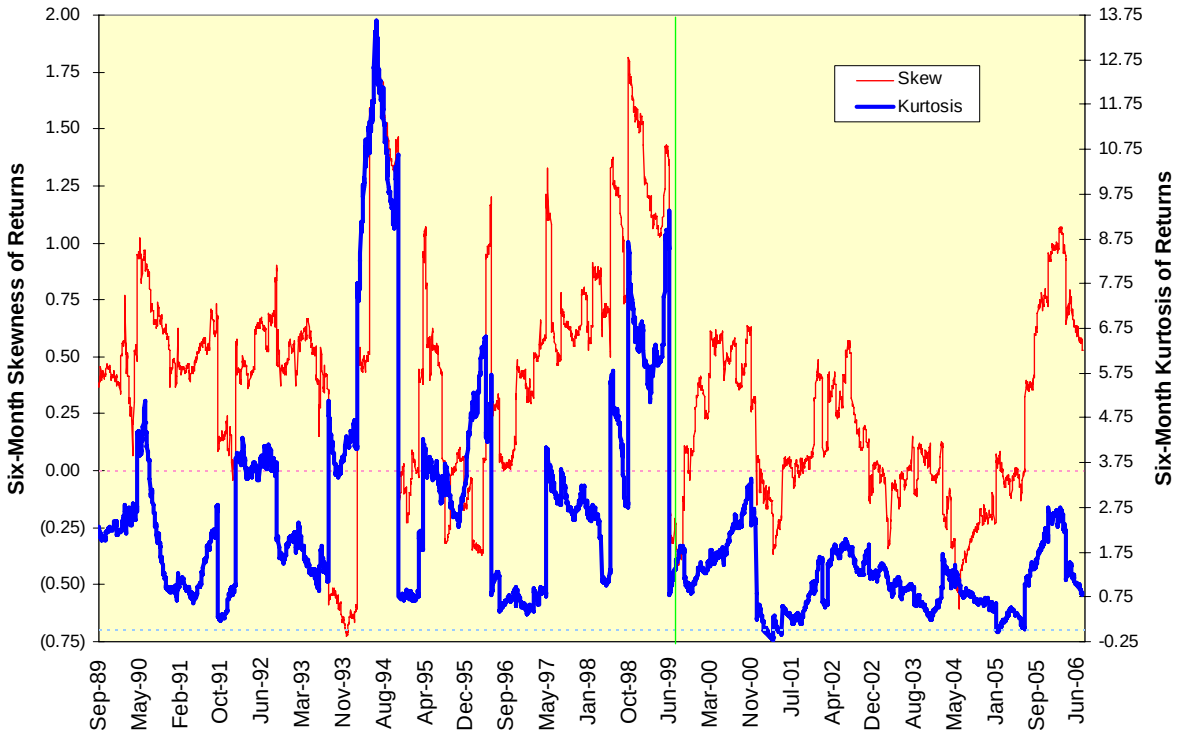
The inference above is bolstered by the map of excess volatility against the JPY trend oscillator. The increase in insurance costs occurs relatively symmetrically between strong uptrends and strong downtrends. The market senses, correctly, that the Japanese official policy will be to prevent emergence from the range.



Despite this symmetric distribution of volatility, we cannot conclude the sentiment of JPY traders is symmetric. The six-month rolling skew of JPY returns remains strongly biased toward positive values, indicating the yen call option and cap buyers are the more anxious to seek protection. The large quantities of JPY borrowed during the 2001-2005 quantitative easing campaign created a large number of traders with short JPY positions; the JPY they borrowed had to be repaid at some point. This biases the distribution of returns to the upside.

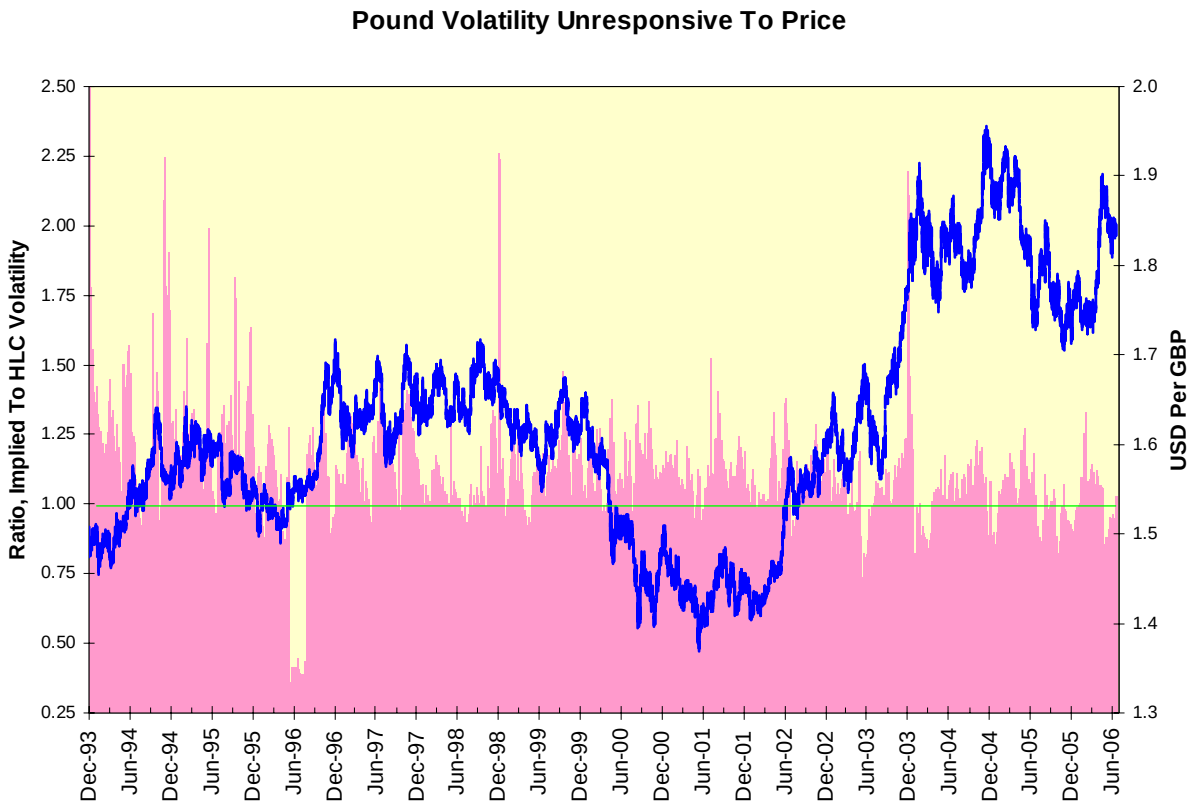
Even with this positive skew, the distributions of returns remain fairly normally distributed around the mean. Just as was the case for the CAD, the key date remains mid-1999, six months after the introduction of the euro. Prior to 1999, JPY returns clustered about the six-month rolling means with little deviation. Traders sensed there was a right place to be in this market, and everyone sensed it at once.

Positive Skew, Flatter Distribution For JPY

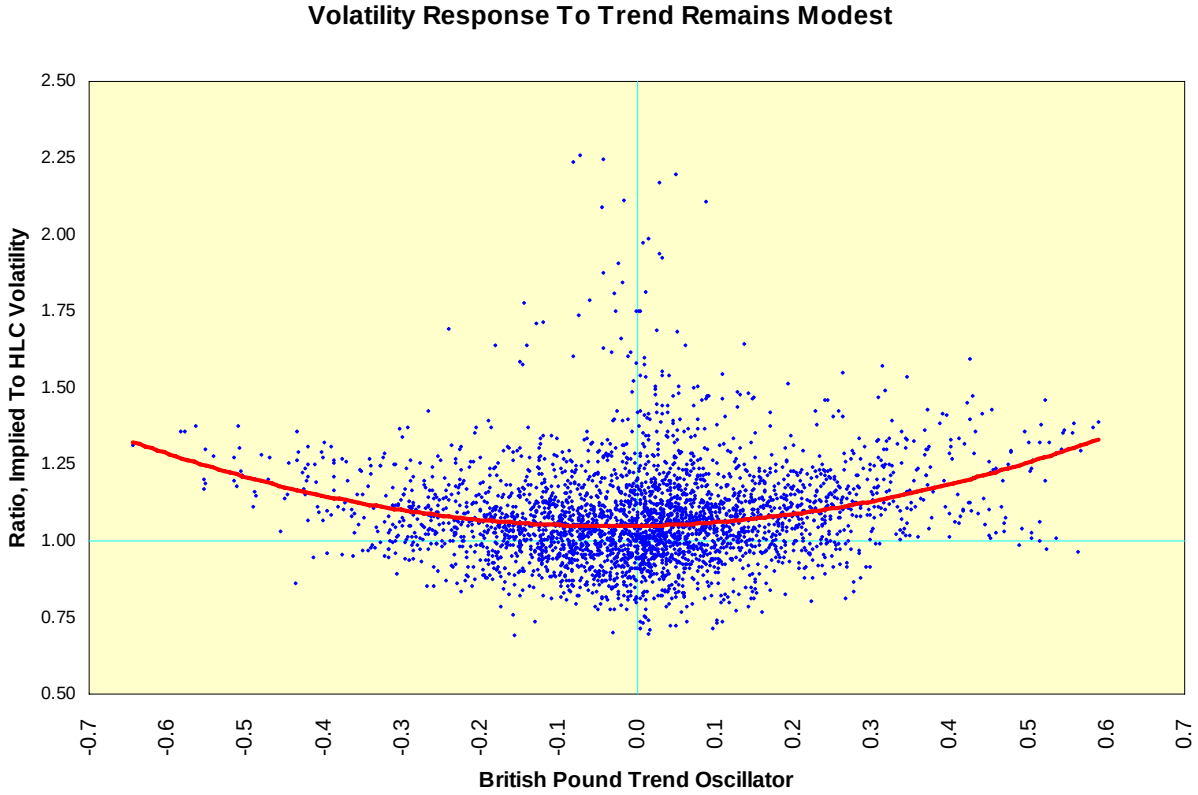


Case Study Three: The British Pound

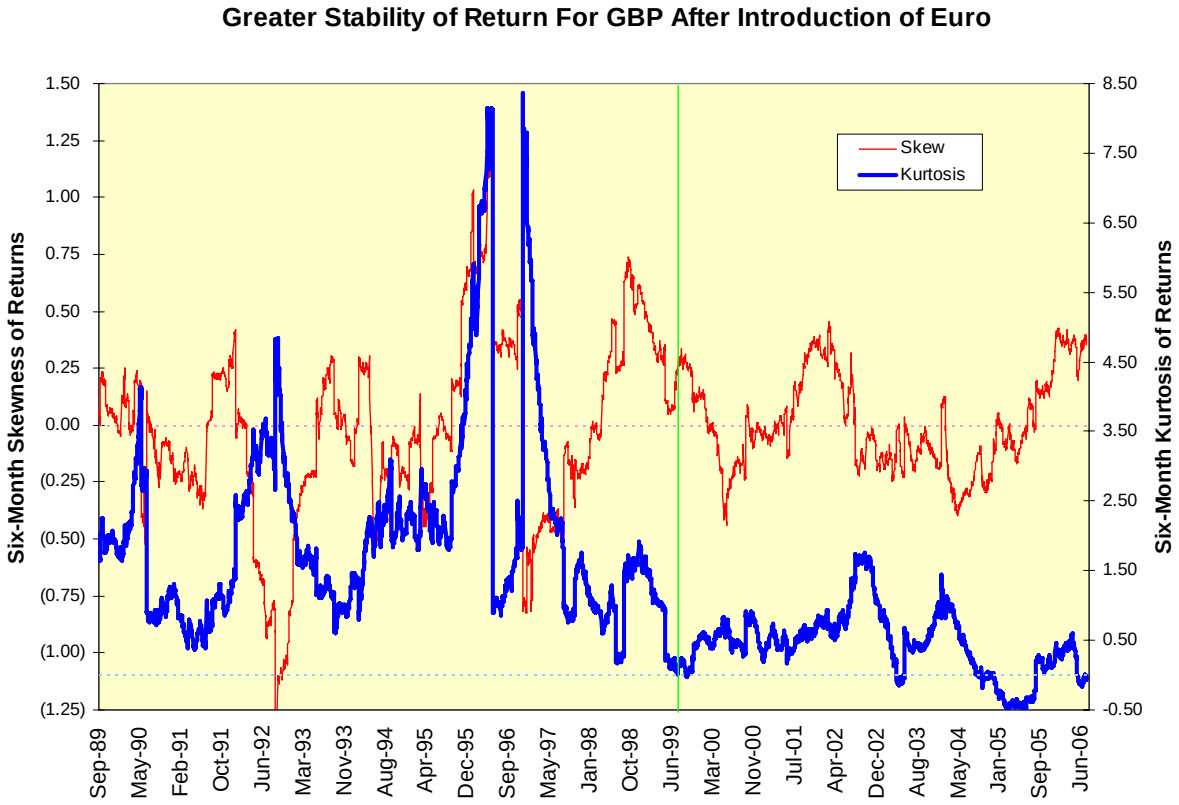
The GBP exchange rate against the U.S. dollar is nowhere near as important to the British economy and its financial markets as is the cross-rate against the euro. As a result, its volatility against the dollar has been largely unresponsive to price. Only a few episodes, such as the January 1999 introduction of the euro and the strong uptrend of late 2003-early 2004 are exceptions to this observation.



While we should expect trend and volatility to be somewhat unrelated given the observations above, the data indicate otherwise. The same symmetric increase in discomfort with strong trends we saw in the JPY occurs here even thought the GBP chart is replete with sustained price trends. Each move toward an extreme in trend invites an insurance response.



Finally, both the skewness and kurtosis of the GBP market remains clustered around zero; this has especially been true since the 1999 introduction of the euro. Traders in the GBP/USD rate have no particular hedge bias, and the relatively small importance of this rate against the GBP/EUR cross means few traders feel exposed in a major way.



Too many technicians persist in treating markets symmetrically. They say each one is "just numbers" with a smugness designed to hide their own laziness. The lesson from volatility, though, is each market has its own unique characteristics and rhythms. Trading them on a single system as if they are substitutes is an approach destined to end in failure.