The notion of an optimal forecast horizon

The financial market has too many unknown driving forces pushing on it at different time frames. So we try to understand as much as possible from one or more time series, such as price, volume, advances & declines, etc. If we assume, for the moment, the market is not driven by random external forces, then theoretically, we can attempt to reconstruct the inner dynamics of the market using Takens Theorem. (ref 1). Takens Embedding Theorem states that a chaotic process can be predicted by a smooth function if properly embedded. Nonlinear models (e.g., neural nets, fuzzy logic) may be used to model the smooth functions. Over the last two decades, this has led to a wide variety of new techniques for analyzing and manipulating time series, including algorithms for the measurement of fractal dimensions and Lyapunov exponents, for the prediction of future behavior and noise reduction.

With regards to predicting future behavior, the Efficient Market Hypothesis, which held sway until the early 90s, suggested that the time progression of the markets would appear as a random walk, that history does not influence the future. However, evidence of limited predictability forced onto the table the Coherent Market Hypothesis, which takes discoveries of chaos and non-linearity in financial series into account.

One aspect of chaos analysis, the Lyapunov exponent (L), measures the degree current states about a system will persist in the future. When L<0, you have a "dissipative" system where the noise evaporates and the system settles into a steady state. For example, smacking your hand into a pot of water will create a lot of disturbance but after a short while, all the noise has dissipated and the stable state returns. When L>0, the reverse occurs. It's the current state of the system that eventually dissipates, and the noise remains, such as the weather. Some states have both types running simultaneously, such as the markets.

The fact that a state (e.g. the market is trending) does not disappear immediately, means the system has memory, albeit a fading one. This raises an interesting point about forecasting. With a positive L, the further the forecast horizon, the more difficult it is to make an accurate forecast. That's intuitive. However, because of a large amount of noise present in the market (due to random external driving forces), very short range forecasts are also very difficult to make accurate. For example, one needs to wait until trend accumulates sufficiently to break through the noise before it becomes clear. That is why we prefer using 8 bar momentum rather than 4. That latter is too noisy to be of much use.

So we are squeezed on both sides: noise deteriorates short term forecasts and memory loss (L>0) deteriorates long term forecasts. This suggests there might be an optimal forecast horizon somewhere in between. I proposed an algorithm for determining the optimal horizon in a journal in 1993 (ref 2) and in a book (ref 3) that we currently sell.

This theory explains why my software greatly enhances trading system performance: system noise and information dissipation are the two buggers one needs to work around when trying to get a semi-clear picture of a system (e.g. the market) and it's future behavior. That's why low lag and low noise indicators are so important: they offer the broadest forecast horizon.

REFERENCES

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