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OPTIMIZATION: What Does It Mean?

Many system developers rely on the art of optimization as a means of convincing themselves and others that they have found a better way in which to trade the market. The optimization process usually involves the study of past data for a given commodity contract or stock by altering a handful of parameters to produce a measurable outcome of hindsight profit or loss. To achieve the best possible profit, the time series is repeatedly examined as all combinations of the parameters are evaluated.

The process of optimization can be a worthy exercise, but it has become a buzz word with some negative connotations because of tendencies to introduce a number of invalid assumptions in a given system's fundamental conceptual design. Here are some of the mistakes or flaws that are often made:

- **Too Many Parameters** - The developer often introduces so many control parameters that in many cases no computer could produce an exhaustive solution in the years remaining in a lifetime. Suppose the system under study can take on 5 parameters of which each can take on 20 values. This scenario would require $20^5=3,200,000$ passes through the data to produce an exhaustive analysis. If your computer can make one pass every 10 seconds, you will wait several months for your answer. The parameter count should be minimized for best results and the parameters (which are actually classified as independent variables) should not be correlated. If a parameter is highly correlated with another

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parameter, then double weight is given to whatever characteristic the parameter is attempting to explain.

- **Too Few Samples** - An equation can be easily produced that will pass through 10 precise daily closing prices over a two-week period by writing out a 9th degree polynomial. This model would have 100% predictability for the past data and a hindsight simulation would produce 100% perfect predictability over the past. If we were to use this model to predict day number 11, what would you expect as far as accuracy in predicting the 11th price? It would not be possible to accurately predict the price because the forced 9th degree polynomial has consumed all the possible freedom in the 10 points of data, leaving 0% confidence of assessing any future event.

In the case for the above system with 5 control parameters, each parameter removes a statistical degree of freedom and serves to increase the number of freely-discovered samples required to certify the optimal solution.

In statistical theory, there is the requirement that the number of samples must be sufficient to approach a normal distribution of outcome. Achieving this goal gives one the right to make

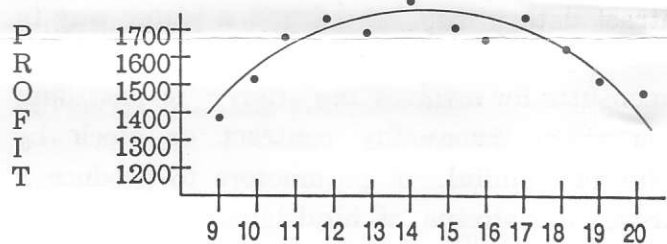
probability statements about future results. The Central Limit Theorem used in statistical analysis requires a sample size in excess of 30 to approach normality. As a rule of thumb, the required sample size should exceed 30 by one or more for every parameter introduced. A sample, by the way, is the profit or loss of a single completed trade which in this example, becomes the exercise's dependent variable.

Daily open-high-low-close summary information on a given contract with finite longevity can seldom produce the required sample size to yield meaningful results. Furthermore, the analyst must contend with the actual contract's inherent lack of stationarity described and illustrated in detail in last month's August 1990 CSI News Journal. The time series stationarity discussed is something that must be achieved to produce a realistic result that can be relied upon to produce unbiased future estimates. Some analysts use nearest futures contracts to extend the data's longevity thereby inflating the sample size. Nearest futures contracts are seriously flawed innovations which, because of troublesome price discontinuities caused by frequent contract expirations, tend to strongly distort the results. Stationarity can't be achieved with such meaningless data; predictions will be worthless.

Only Perpetual Contract® data can remove the flaws of actual contracts or nearest futures contracts concerning stationarity, and only Perpetual Contract data can give you the necessary time series longevity to significantly overcome the adequate sample size problem (well known to students of reliability and statistical theory).

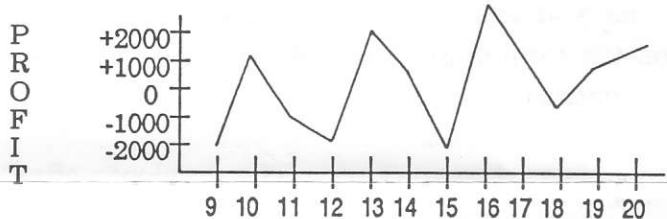
In the above parameter study, suppose you were analyzing a 15-month-long contract where the trading frequency produced a completed trade once every 20 days. You would be lucky to log 15 trades. This is the second flaw. The sample size is too small.

• **Robustness of Optimization Design** - Flaw number three focuses upon the behavior and sensitivity of each selected optimizable parameter. Following an exhaustive study of all parameters to achieve a candidate solution for a market, each parameter should be analyzed for its robustness while all other parameters are held constant. What is required in this exercise is a well behaved profit function that has an insensitive localized maximum over the selection of parameter choices. A curve like the following would be considered robust:



In the above chart the choice of 14 as the setting for the given study parameter would represent a reasonably good choice and such a result would be considered desirable.

Unfortunately, a more likely outcome for many of the systems I see being offered looks like this:



A small error of one or two in a parameter setting can change a large profit into a large loss on a hindsight basis. In real trading, such a dubious parameter choice should be discarded. Heavy market losses are the only outcome that you can be sure will result if this is your hindsight experience.

• **Random GradientSM Techniques** - Where continuous variables are involved, there is a way to solve a many-parameter problem even though each parameter may take on an infinite number of possibilities. Unfortunately, in market analysis,

price action is not continuous and cannot be defined with a differentiable equation.

There is a way to find a very superior solution using differencing methods. We have perfected a random technique at CSI which will solve the problem, but will not necessarily find what may be considered the optimum result. Since we are dealing with hindsight analysis, the best solution when observing the past will not likely be the best solution for the future, so we don't consider this factor important. We call this approach a Random Gradient Improvement study.

One significant advantage to the proposed random differencing process is that every user of the same system can trade with a uniquely different set of market entry and exit signals. It would be more or less up to the user to discover a system variation that is best for him.

A significant advantage to the Random Gradient approach is the reduction in time required to solve the problem. The Random Gradient can produce an answer in a very small percentage of the time necessary to exhaustively examine all combinations of a process. The Random Gradient approach will be a feature of Version 4.0 QuickStudy® and The Unfair AdvantageSM.

- **Formulation of a Meaningful Design** - As we have said in this space many times, the technical analyst has a tendency to conceptualize systems and market trading approaches which are zero-sum in nature. Such systems win half the time and lose half the time and in either case you must pay a fee with every trade that includes the commission plus slippage.

In the conception and formulation of a trading system, the following features should be given careful consideration:

- Limit the number of variable parameters
- Select non-correlated independent variables

- Utilize a sample size greater than 30 with a sample being a single completed trade
- Each parameter should demonstrate robustness
- Consider alternate market schemes where relative relationships are exploited
- Employ gradient stepping procedures in place of an all-exhaustive search of parameter settings.

A number of tool kits have very attractive graphics, including highly flexible windowing capability which are often associated with innovations that improve your PC's speed and responsiveness. Some developers claim that they have spent millions on development. No doubt they are being truthful, but there is no substitute for substantive, conceptual and analytical design techniques using state-of-the-art statistical concepts. These are the areas of importance from which profits are derived.

Best wishes for prosperous trading,

Bob Pelletier

For more information on optimization, refer to "Managing Risk and Reward," Ralph Vince, John Wiley and Sons, Inc., New York, NY, 1990.

ERROR (BUG) FOUND IN 4.0 affecting some CompuTrac Users.

An obscure error was discovered in QuickTrieve 4.0 by a CompuTrac user while attempting to process in excess of 62 contracts. We have corrected the problem. If you have experienced a similar difficulty or feel that you may need this capability in the future, please contact us and request an updated disk. There will be no charge for this update.

Ask Customer Service

Topic: QuickTrieve® 4.0

We have filled the backlog of orders for QuickTrieve version 4.0, and have had some questions which may be of interest to all. The Customer Service staff: Karen, Ron, Rudi, Susan and Tami have presented a few of these below:

Q. I'm sort of in limbo with the QuickTrieve version 4.0 because it does not include QuickPlot®. When will the QuickPlot version 4.0 be available?

A. We're expecting a late Fall '90 release of the graphics program. The release of QuickTrieve/QuickManager®, without QuickPlot, has caused some confusion among our customers. We apologize for any misunderstandings. Our decision to adopt this seemingly awkward release procedure was motivated by both practical and functional reasons.

Software developers who exclusively use CSI prefer that we do not promote our study products in competition with theirs. Furthermore, CSI users who use CompuTrac, Metastock or a similar tool kit may not want to pay for the similar capability which is offered by QuickPlot/QuickStudy. This is the practical reason we separated the two products.

Our functional motivation has to do with the management of such an undertaking. We released the 4.0 QuickTrieve in advance of QuickPlot so that our customers could take advantage of the new features before the entire package was complete. These include support of multiple data directories, autcreation of CompuTrac and QuickTrieve files during daily distribution, custom definition of ASCII files and support of 2400 baud retrieval on Tymnet.

Many of these benefits appeal to the users of our data base who don't use QuickPlot. We expected

that users who rely on QuickPlot for graphics and don't require the benefits listed above would continue to use their current QuickTrieve.

Once the 4.0 QuickPlot is ready, we'll recommend that QuickPlot users upgrade to the 4.0 to take advantage of both new programs.

Q. I got the 4.0 QuickTrieve to facilitate use with CompuTrac, but in the past, I've used QuickPlot for graphics too. How can I use my old QuickPlot?

A. Those QuickPlot users who are collecting data with 4.0 QuickTrieve can plot the data by storing it in your older \QT directory. To do this, list C:\QT as a data path in your Master Path File. After data retrieval and distribution, exit QuickTrieve 4.0 and enter QuickTrieve 3.1 normally.

There are two limitations you should be aware of in doing this:

1. You will need to collect a daily update with your 3.1 QuickTrieve at least once a month to avoid disk termination.
2. The \QT subdirectory can hold no more than 120 data files. If you have more than 120, you'll need to use the SUBST command as explained in the index of the 3.1 manual. Call the Customer Service Department if you need assistance.

Q. I'm using the 4.0 QuickTrieve and I'm having a hard time transferring data to a diskette. Drive A isn't listed on my menu of data paths. How can I activate the diskette drive?

A. If you use only one data directory, you must *force* the appearance of the *data path menu* by pressing <ALT> F before attempting the desired procedure. (You won't see any difference on the screen.) When the time comes to pick a source path, you'll see a menu that lists your single data directory. Users of multiple data paths

automatically see this menu. At the data path menu, press <F10>. You'll be asked to name an alternate data path. Here you enter A:\ or B:\ to use a diskette. The path you list will become part of the data path menu for the entire QuickTrieve session. This is explained on page A4 of the manual.

Sale on Perpetual Contract Data

In last month's News Journal, Bob Pelletier wrote about CSI's Perpetual Contract Data. Perpetual Contract data is superior to actual contract data for analysis purposes because its design compensates for a time series' lack of stationarity. If you missed the article, you should call us for a reprint so you can read how this product can improve your trading success.

Traders interested in any type of analysis should have a good background of historical data, preferably Perpetual Contract Data. This month we're offering a special price on groups of Perpetual Contract Data on diskettes.

You may choose the commodities you want, as long as you order at least three markets and request a minimum of five years on each. The more contracts you buy, the less you will pay.

Perpetual Contract Sale

(minimum 5 years per commodity)

3 to 5 commodities - 10% discount

6 to 10 commodities - 15% discount

11 + commodities - 20% discount

We seldom offer Perpetual Contract Data at a discount, so plan ahead for your future needs. Perpetual Contract data can be added to your portfolio for automated daily updates.

If you ordered Perpetual Contract Data during

August in sufficient quantities to qualify for these sale prices, we tried to adjust your data cost in compliance with the discounts shown above. If we missed yours, please call the MARKETING DEPARTMENT to arrange for a credit. On the other hand, if you didn't order enough data to qualify for a discount and you order more this month, we will give you credit for your prior purchase and figure your discounts on your combined total.

Fire in New York

An August 13th power outage caused by a fire in New York's financial district affected data from the New York Mercantile Exchange, the New York Cotton Exchange and the New York Commodity Exchange. Each of these markets opened for trading, but halted the session in early afternoon. We captured and posted data from the abbreviated sessions for commodity numbers 7, 8, 12, 13, 16, 30, 69, 77, 202, 89, 187, 188, 191, 224, 252, 263 and 264 on Monday, August 13. On Tuesday, August 14, these exchanges decided to treat Monday's trading activity as though it were part of Tuesday's trading.

The official open for Tuesday is actually Monday's opening price. The official high is the high for the combined Monday and Tuesday sessions and the low is the lowest price for both sessions. Tuesday's official close is the actual close for Tuesday. There is no official data for Monday, August 13.

If you collected August 13 prices for any of the commodities listed above, you may handle the data in either of two ways:

- 1) Keep the data - it is an accurate representation of the short trading session.
- 2) Delete the data with QuickManager's Editor Subsystem. Use the Edit Contract Data File feature to change the Day of Week entry for 900813 from 1 to 9.