POULIN-HUGIN
PATTERNS & PREDICTIONS

Poulin-Hugin, an international software firm that specializes in multi-factor analysis and Bayesian software, addresses the key research and analysis related challenges that face aggressive fund managers, and proposes a new means of addressing them through their "Patterns and Predictions" software suite.

In developing a unique 'edge', there are at least six primary research and analysis related challenges that face the forward looking fund manager.

- Uncovering market inefficiencies and the windows of opportunity to exploit them.
- Identifying, tracking and managing investment risks.
- Building and operating a proprietary, multi-factor analytic decision making model for the firm.
- The ability to easily test security or market related assumptions before making them a part of the firm's investment process.
- Establishing a structure for consistent implementation of the research and analysis process by the money manager.
- Demonstrating to prospective investors the transparency of the firm's investment process.

Historically, the larger money management firms have had an easier time meeting these challenges with in-house quants teams. Now, however, with the new Poulin-Hugin Patterns and Predictions software, even small money management firms, which make up the majority of hedge fund managers, have the potential to more affordably and effectively address these challenges and benefit from enhancing their proprietary research capabilities.

Poulin-Hugin's software enables a fund manager to develop their own custom model and run analysis using any variables/factors they wish (e.g., stocks, indices, other factors such as econometric). The money manager can import historical data and run real time data feeds (e.g., from P/Es to moving averages, etc.). In constructing their model the money manager can easily aggregate a series of factors, additionally employing personal expertise to rank and/or give weight to variables in their model. Of greatest note, model construction with Poulin-Hugin Patterns and Predictions software enables the

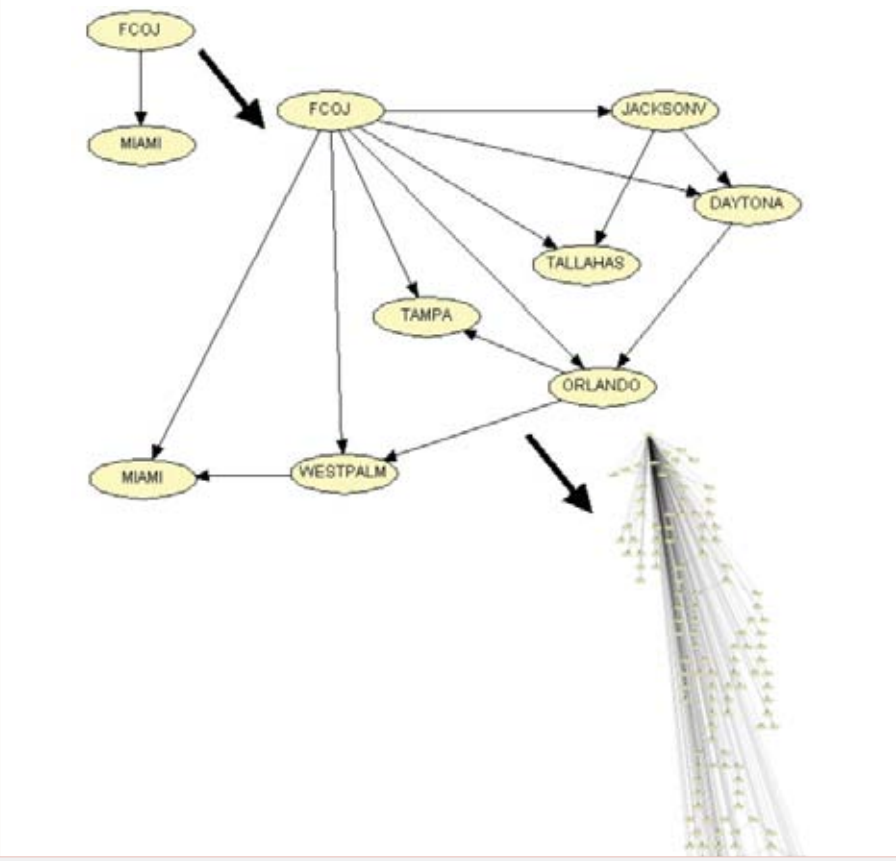

Figure 1.

hedge fund manager who is not an expert in data modelling to easily visualize the construction and interrelation of the multiple factors comprising their trading model.

For example, in predicting the daily closing price of a commodity (one of the model templates included with Patterns and Predictions Professional software) you can see how our technology may be used to predict the daily frozen concentrated orange juice (FCOJ) contract close level, based on average daily temperatures in more than 150 different US cities. The application is designed to identify patterns in the correlation between average daily temperatures that impact on the level of the futures contract's closing price (e.g., the FCOJ price).

The knowledge base in this model template can be used to make inferences about FCOJ pricing. (That is, the FCOJ model generates a trading signal for the level on the FCOJ price for the next day given certain temperature ranges. The baseline accuracy is a 60% probability of being correct on any given day.). The system can further perform various types of analysis such as "value of information analysis" (determining which city or group of city temperatures is the most informative when trying to predict the FCOJ contract) and scenario based sensitivity analysis (how a change in one city temperature affects all others).

In Figure 1, each oval represents a variable or factor, illustrating progressive complexity. The factor with label "FCOJ" represents the level of the FCOJ price, while each of the other factors represents the average daily temperature in a certain city.

Further analysis of this model illustrates another powerful feature of Poulin-Hugin Bayesian 'Hierarchy modeling'. In this approach, 'new' or 'dark' factors are discovered. In each case the new factors represent a relationship between the factors below it. Therefore, we 'discover' the new factors COMODTY, NFACTOR, and TFACTOR (see Figure 2). These relationships may or may not be accounted for by publicly available information or even by generally accepted economic theory, but appear nevertheless.

- COMODTY = A 'Commodity' factor that accounts for a variety of non-FCOJ farm raised commodity prices. Any number of commodities can be entered to test the relevance of this custom indicator.

- NFACTOR = A 'New' undefined factor that "discovered" the relationship between Weather and Commodity data. This factor accounts for the unknown similarities in TTfarm raised commodity prices, including FCOJ.

- TFACTOR = A trading factor that accounts for BOTH market volatility and econometric factors. We would then assume that this factor was in fact representative of other active trading also responding to these sub-factors. It's called TFACTOR because the non-linear relationship is probably due to behavior of other automated trading programs that we can't quantify.

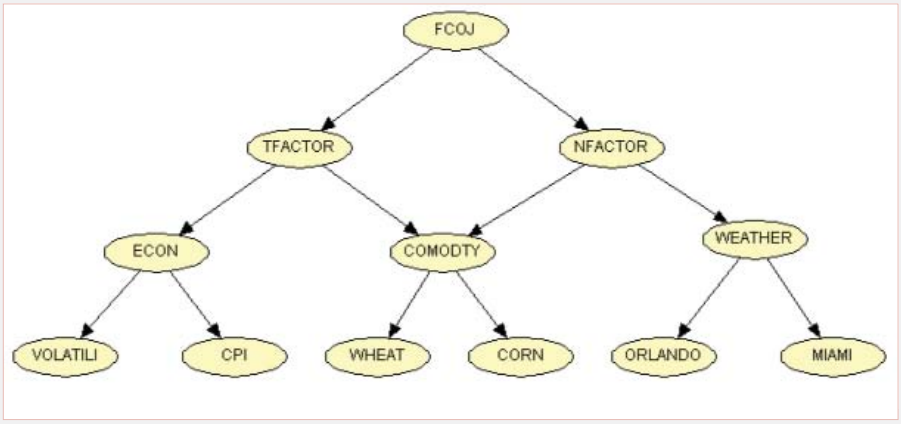

Figure 2.

FCOJ Model Summary

The FCOJ/Weather model predicts the FCOJ historical price with a predictable accuracy. By combining the use of Value of Information analysis and Sensitivity 'What-If' analysis, we can focus in greater detail on the parts of the model that are more predictive, thereby improving accuracy. This technique can be used to isolate parts of a data feed that are worthy of more attention, and thereby further increasing the accuracy of our models.

Finally, by using hierarchical analysis we can quantify unknown factors influencing events, perhaps even the trading patterns of another investment entity. Through a combination of this software and our professional services group (a resource for helping hedge fund managers develop or refine models for their own confidential investment process), any firm can create similar original analysis.

However, those familiar with advanced modelling might still ask why they should go with a Bayesian algorithms solution at all. A Bayesian-based investment analytics approach has advantages over other algorithmic methods such as Markov Chain Monte Carlo, Neural Network and Rule Based problem solving. Table 1 sets out the dramatically different capabilities that a Bayesian system makes available to financial analysis.

Handling of Uncertainty

Often the connections between different factors - reflected by the rules defined by user assumptions - are not absolutely certain. Bayesian-based analytics excel at handling uncertainty.

Understanding of Assumptions

An analyst/expert can understand what elements correlate with what other elements; something you can't accomplish

	Bayesian	Rule Based	Neural Network	MCMC (Markov Chain Monte Carlo)
Handling of Uncertainty	✓	–	✓	✓
Heterogeneous Modeling	✓	–	–	✓
Provable Probabilities	✓	–	–	–
Understanding of Assumptions	✓	✓	–	–
Analyst/Expert Modification	✓	✓	–	–
Contextual Nodes	✓	✓	–	–
Test Data Independent	✓	✓	–	–

Table 1.

using a neural network or strict Monte Carlo.

Analyst/Expert Modification
Probabilities can be assessed using a combination of theoretical insight, empiric studies independent of the constructed system, training and various more or less subjective estimates such as well known economic factors/rules.

Provable Probabilities
It can be proved that the method calculates the new probabilities correctly (e.g., based on the axioms of the classical probability theory).

Contextual Nodes
Neural Network Perceptrones in the hidden layers only have a meaning in the context of the functionality of the model's network. (A neural network consists of several layers of nodes. All nodes in a layer are in principle connected to all nodes in the layer just below. A node along with the in-going edges belonging to it is called a perceptrone.)

Heterogeneous Modeling
Multiple data types can be combined in a model.

Test Data Independent
While purely frequentist approaches (MCMC) require test data to define a pattern, the Bayesian approach can measure the data and then calculate the statistical relevance to the value observed.

Poulin-Hugin - leaders in the field of Bayesian-based multi-factor analysis modeling software - is an international software firm whose business divisions include the U.S. headquartered Poulin Holdings LLC and Denmark headquartered Hugin Expert A/S. The company's software has been adopted by leading R&D departments in 25 countries and is used where reasoning under uncertainty is required. Bayesian-based multi-factor analysis is particularly useful in areas such as decision analysis, decision support, prediction, and risk management.

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