Efficient Market Hypothesis and Implications

The efficient market hypothesis states that financial markets are informationally efficient and prices on assets already reflect all known information and change instantly to new information. If this is accepted then there is no strategy that can consistently beat the market, however recent economic research suggests the efficient market hypothesis doesn't hold. Instead there are certain behaviors of the market that are not rational, a consequence of the human (or human programmed computer) agents that interact on it. [1]

There are two avenues that have historically been used to produce stock picks - fundamental analysis and technical analysis. While more complex financial products are available, it is easiest to think of the financial markets as a large market for stocks. Stocks represent ownership of companies. Fundamental analysis focuses on the underlying business strength of the company the stock represents. Important fundamental quantities include earnings and book value. Technical analysis is concerned with the conditions of the market. Key technical quantities are price and volume. [2]

Method:

Technical analysis can be implemented as a search for a digital filter. A filter can implement many different manipulations of the signals from integration to moving averages. An evolutionary algorithm was designed to find a good filter. A good filter is one that can be used with a trading strategy to generate a profit above the real cost of money. The prediction of the Dow Jones 30, the thirty stocks currently in the Dow Jones Industrial Average were examined using historical technical indicators of those thirty stocks.

A starting population is created of random filters where every branch must terminate in a source. These filters are evaluated for fitness. Then the population is breed, with the likelihood of being chosen as a parent for each filter proportional to fitness value. Each filter is composed of elementary pieces of a digital filter: delay, gain, IIR feedback, FIR (gain and delay), addition, and subtraction. Thus a complex filter must be created from many elements. The filter is stored in a binary tree, hence one input and two input filters are allowed. Every filter branch must terminate in a source. New filters are breed by randomly choosing a breed point within the tree on both parents and keeping everything above that point on the father and copying over everything below the mother’s breeding point on to the father’s.

Breeding Example:

Results:

All thirty Dow Jones stocks were tested with a daily dataset that extended over the last ten years. One hundred generations of two-hundred-fifty individuals with a three percent chance of mutation were tested. A two hundred timestep window was used for each up/down prediction. The results show prediction accuracy over eighty percent is possible. The tests took approximately one hour per stock on an AMD dual core 5400+ machine.

Conclusion:

It is difficult to fully quantify the risk associated with using the generated filters with a trading strategy. It would be better to fully encompass the strategy selection within the evolutionary algorithm in order to take advantage of its derivative-free nature. Additionally this method would produce good filters if the environment changes frequently, that is whether the underlying conditions that line up the signals have changed. The correlation was strong, but the transition into a trading strategy hasn’t been demonstrated.

References: