A Bull Flag Pattern Analysis of the New York Stock Exchange Composite Index

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Abstract: - We match a template depicting a “bull flag” 60-day price behavior to closing prices of the New York Stock Exchange Composite Index to detect buying opportunities at a 5 trading day horizon. The results of the experiment indicate that the technique is capable of returning results which are superior to those attained by random choice and constitute evidence that the stock markets are not efficient.

Key-Words: - Stock market forecasting, pattern recognition, heuristics, financial decision support, efficient markets hypothesis, technical analysis

1 Introduction

Every day an army of individual investors, stockbrokers, and financial analysts attempts to predict stock market price activity, many on a full-time, professional basis. This mass behavior runs counter to the counsel of the many academic studies which advance the hypothesis that the prediction of stock market prices is futile. This point of view is codified as the generally accepted efficient markets hypothesis [4], [5].

A large proportion of the security price predictors practice technical analysis, also known as charting. These individuals choose to ignore the efficient markets hypothesis totally. Technical analysis is concerned solely with the dynamics of the market price and volume behavior as a basis for price prediction and ignores the efficient markets hypothesis. Charles Dow developed the original theory of technical analysis in 1884, and a modern explication is found in Edwards and Magee [3]. Papers and books on technical analysis appear frequently in the practitioner literature (for example [6],[7]) but rarely in the academic literature and then usually in an indirect, pejorative, or defensive form (for example [8], wherein technical analysis is defended using the argument that information requires time for dissemination, and the induced lags may be perceived as patterns in the market response.)

This paper constitutes a direct assault on the efficient markets hypothesis and a direct confirmation of one bit of technical analysis lore. Specifically, we take one price pattern heuristic from technical analysis that is thought to be a signal for a price increase; implement a recognizer for this pattern; and use the output of the recognizer to predict whether there will be a price increase or not. Our results are statistically significant and fail to confirm the implied null hypothesis that predictions using the method are no better than random choice.

2 Pattern Identification

Our work concentrates on one technical analysis pattern, the bull flag, which is considered to signal an imminent increase in price. The definition of flag from Downes and Goodman [1, p.212]: “a technical chart pattern resembling a flag shaped like a parallelogram with masts on either side, showing a consolidation within a trend. It results from price fluctuations within a narrow range, both preceded and followed by sharp rises or declines.”

A bull flag pattern is a horizontal or downward sloping flag of consolidation followed by a sharp rise in the positive direction, the breakout. The template that we use for the bull flag pattern, shown in Figure 1, is represented with a ten-by-ten (10X10) grid, the cells of which contain weights ranging from –2.5 to +1.0. The pattern of positive and negative weighting defines areas in the template for the descending
consolidation and for the upward-tilting breakout portions of this bull flag heuristic pattern.

The leftmost time series data point in the 60 day window represents the trading day which precedes the current day by 59 trading days, and the rightmost time series data point in the window corresponds to the trading day which is being analyzed. Values for the earliest 10% of the trading days (6 trading days) are mapped to the first, leftmost, of the ten columns of the grid, values for the next-to-earliest 10% of the trading days are mapped to the second-from-the-left column of the grid, and so on until the most recent 10% of the trading days are mapped to the rightmost column.

The fitting process is adaptive in the vertical dimension: the highest value in the window is made to correspond with the top of the grid, and the lowest value in the window is made to correspond with the bottom of the grid, and the intervening vertical cells are made to correspond with linearly with the values in between. For a fitting to the time series data, we enter into each cell of a column the percentage of price values which fall into the respective cell in the column; for example, if all of the values in a column were between the lowest value in the 60 trading day window and a value which is higher than the lowest value by 10% of the difference between the window lowest and highest values in the window, then that column’s lowest cell would be coded with 100%, and the rest of the cells in the column would be coded with 0%.

To compute the degree of match between the bull flag template and the grid of values derived from the time series data, the percentage of values which falls in each cell of a column is multiplied by the weight in the corresponding cell of the bull flag template. This cross-correlation computation is done for the 10 cells in the column and summed, resulting in a fit value for the column. Thus, 10 column fit values for price are computed for each trading day. Summing all 10 values for a trading day results in a total fit for the trading day.

This process is an example of template matching ([2]), a pattern recognition technique used to match an image to a template.

3 Data and Implementation

This study focuses on the prediction of increases in the New York Stock Exchange Composite Index with a 5 day horizon for the period from 08/06/80 to 09/15/99. The price data used are obtained from the Standard & Poor’s DRI database. We programmed the template matching procedure in Microsoft Corporation’s Excel spreadsheet.

4 Results

Table 1 shows how many trading days (N) have a certain value fit or better. Significant values for one-tailed t-test probability are found for fit values of 5.5 and better.

References:

Figure 1: Bull flag template used in this study. The first 7 columns represent a consolidation and the last 3 columns represent a breakout.
Table 1: Results showing cumulative values for successively poorer fitting trading days.

<table>
<thead>
<tr>
<th>Fit Value</th>
<th>Mean Price Change</th>
<th>Standard Deviation</th>
<th>t-test probability</th>
<th>N</th>
</tr>
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<tbody>
<tr>
<td>7</td>
<td>0.012587639</td>
<td>0.016677838</td>
<td>0.011824</td>
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<tr>
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