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An Information Explanation of the Survival of Technical Analysis in Capital Market

Thomas S. Zorn*
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AN INFORMATION EXPLANATION OF THE SURVIVAL OF TECHNICAL ANALYSIS IN CAPITAL MARKET

Abstract

In an efficient market, technical analysis cannot earn abnormal returns. Technical strategies are inferior to a buy and hold strategy since they typically churn investor accounts. Nonetheless, technical analysis appears to thrive. The purpose of this paper is to explain why technical analysis survives even though it is inferior to a buy-and-hold strategy. A model is developed that compares four investor groups -- informed insiders, buy-and-hold investors, technical traders, and uninformed naive fundamental traders -- and are compared in the model. Surprisingly, it demonstrates the superiority of technical analysis relative to fundamental analysis. The equilibrium requires that different classes of investors earn different rates of return. Informed traders can only earn sufficient returns to cover their costs if there exist traders who, in some sense, are trading on bad information or "noise" in the Fisher Black sense. The ultimate explanation for the survival of naive investment strategies is that informed traders must have someone with whom to trade. If all uninformed traders are driven out of the market there is no benefit to being informed.

I. Introduction

Technical analysis is a dominated strategy compared to a buy-and-hold strategy. According to efficient market hypothesis, technical analysis makes money only for brokers or newsletter publishers. Empirical evidence supports the view that investors can not earn abnormal profits using securities price and volume information. Nonetheless, technical analysis survives.

The objective of this paper is to explain why technical analysis survives, even though it is inferior to a buy-and-hold strategy. This paper is concerned with naive technical analyses such as the Dow theory, bar charts and point and figure charts.

There are few sophisticated technical rules that may explain why technical analysis works. For example, Treynor and Ferguson (JF, 2985) demonstrate the usefulness of past price information in making an abnormal profit. They develop a Bayesian probability estimate using past price data to assess whether the market incorporates some firm-specific information, that is made available to investors. If the market does not have such information, and this is confirmed with past price data, the investor with this private information can make a trading profit. Technical analysis in the Treynor-Ferguson sense is beyond the scope of this paper, however. This paper only explains the apparent paradox, that is, technical analysis does not work in an efficient capital market, yet it survives.

II. Alternative Explanations

(a) The technical traders earn a risk-adjusted rate of return for accounts, but they could expect to earn the same return selecting securities randomly. Technical analysis is not worthwhile to perform in an efficient capital market; technical analysis will lose money over time by churning accounts. One possible

explanation why technical analysis survives is that losers quit, but they are replaced by other naive investors. The new naive investors entering the market, who play this technical analysis game, do not know anything about the naive investors exiting the market. It is sufficient for technical analysis to survive if the number of new naive investors equals the number of losers who exit the market.

(b) Technical analysis may be superior to naive fundamental analysis if naive investors buy and sell securities on the basis of published public information (for example, accounting reports, earnings multipliers, etc.). These naive investors are likely to lose against well-informed insiders (and other experts) who obtain information more quickly or interpret such information more rapidly. The naive investors will be the last to buy when informed investors are selling and to sell when informed investors are buying. In this scenario, a wealth transfer from naive investors to informed investors occurs. Informed investors cannot profit from investors who employ a buy-and-hold strategy. They can only profit over naive investors who trade on inferior information.

(c) Trading based on technical analysis is the same as trading based on a random strategy. Security prices change randomly. Any trading rule based on random changes is random, unless many technical traders follow the same rule. Technical traders follow numerous techniques. Therefore, it is reasonable to assume that buy and sell orders occur randomly and approximate white noises. Random trading averages out the time one buys with the informed insiders with the time one sells when the informed traders buy. Naive fundamental traders consistently lose money because they tend to buy and sell at the wrong time. A

random strategy based on technical analysis is, therefore, superior to a naive fundamental analysis.

The rates of returns earned by different investor groups can be ranked as: (1) Informed insiders; (2) Buy-and-hold investors; (3) Technical traders; (4) Naive fundamental investors. Buy-and-hold investors earn a risk-adjusted rate of return warranted by an efficient capital market. The informed investors earn a rate of return above risk-adjusted rate of return while the naive fundamental investors earn a rate of return below risk-adjusted rate of return. Since the uninformed naive investors are consistently wrong, they earn a lower rate of return than that of technical traders who trade randomly. For an example, assume that the risk-adjusted rate of return is 8% if everyone is an informed insider. The informed insider is able to earn a 10% risk-adjusted rate of return if the uninformed naive investor trades at the wrong time. The difference, 2%, is a pure wealth transfer from uninformed naive investors to informed insiders. The informed insiders can gain a higher return only at the expense of uninformed investors; they cannot gain from buy-and-hold investors.

(d) Technical analysis provides liquidity service to the stock market. Otherwise, all trading activities would be among informed traders. Informed traders would eaarn only a risk-adjusted rate of return which would not be sufficient to pay the informed traders to collect information. In this scenario, the informed traders would stop trading and the stock market would lose liquidity. Technical analysts induce naive investors to enter the stock market. The informed traders then trade with poorly informed naive fundamental traders.

In addition, technical analysis provides service to traders engaged in transactions or portfolio revision. A portfolio revision trade occurs when an

investor sells securities to raise cash for a loan payment due immediately, for example, or a sudden death requires a portfolio rebalancing between cash and securities. This kind of trade is strictly transaction-specific. Technical traders do not trade on information at all. However, this kind of transaction-specific trade may not provide enough liquidity to the stock market and may not make information gathering a worthwhile activity. The naive fundamentalists add to stock market liquidity. Technical analysis is essentially a random strategy that provides a liquidity service to the stock market while earning a normal rate of return for such service.

III. Model

A. Assumptions

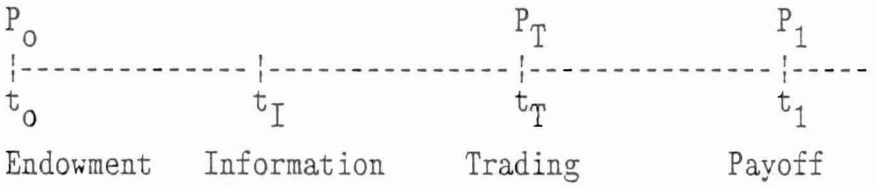
(1) Investors are risk-neutral expected end-of-period wealth maximizers.

(2) Investors have limited wealth, and they cannot borrow.

(3) Risk-free security is used as a numeraire.

(4) One period model is considered.

The sequence of events in the model can be represented by the following diagram:



Let a trader start with N risky stocks whose price is denoted by a risk-free numeraire good F. The trader receives information at current time and either makes a trade or does not make a trade. The expected payoff occurs at the end of the current period.

B. Notations

P_0 = current price of security at time t_0.

t_I = time information is received.

P_T = trading price of stock at time t_T.

P_1 = end-of-period price of stock at time t_1.

N = number of stocks.

F = unit of risk-free security.

R_f = risk-free rate.

P_F = expected price by a naive fundamentalist.

$\bar{P}_F$ = current price of a naive fundamentalist.

$\bar{P}_I$ = current price of an informed trader.

C(I)= cost of information.

C. Basic Model

The basic model can be represented by two simple equations:

(1) $$P_0 = \frac{E(P_1)}{1+R_f}$$ Buy-and-hold trade.

(2) $$P_T = \frac{E[P_1 \mid \phi]}{1+R_f}$$ Information trade.

The profit from trade can be written as:

(3) $$NPV = N \left[\frac{E(P_1)}{1+R_f} - P_0 \right]$$ Buy-and-hold trade.

(4) $$NPV = N \left[\frac{E(P_1 \mid \phi)}{1+R_f} - P_T \right]$$ Information trade.

If trading in stocks is a fair game, tomorrow's price is expected to be the same as today's price; expected profit is zero. This scenario conforms to the efficient capital market hypothesis.

The model purports to show that the informed insider with superior information earns profit at the expense of naive fundamentalists with inferior informatioin. The buy-and-hold investors earn a risk-adjusted rate of return. The technical analysts follow a coin-flipping random strategy and earn a rate of return better than the naive fundamentalists. Within the context of the basic model, we will state and prove a number of hypotheses.

D. Hypotheses

(1) The value of information is zero if all traders have equal access to information or uninformed traders employ a buy-and-hold strategy.

Proof

We will prove this hypothesis under three assumptions regarding the cost of information.

1a. Information is costless and each trader has equal access to information.

The end-of-period wealth of a trader can be written as

(5) $[P_1 - P_T (1 + R_f)] N$ if it is an information trade.

(6) $[P_1 - P_0] N$ if it is a buy-and-hold trade.

Informed insiders have conclusive information about the end-of-period price P_1. If all traders are informed, the profit from information trade is zero because

(7) $$NPV = - P_T + \frac{P_1}{1+R_f} = - \frac{P_1}{1+R_f} + \frac{P_1}{1+R_f} = 0$$

Therefore, there is no gain from information trades and there is no incentive to collect information. If some traders are informed and some are uninformed, however, the informed traders cease to trade with each other and the uninformed traders simply follow a buy-and-hold strategy. This is paradoxical; no trade will occur because it does not pay to be informed.

1b. Information is costly, and each trader has equal access to information.

The profit from a trade is

$$(8) \qquad NPV = \frac{E[P_1 \mid \phi]}{1+R_f} - P_T - C(I)$$

Because information collection is a negative NPV undertaking, no trader collects information. If information is collected, however, profit can be earned. This result is also puzzling. The uninformed trader simply follows a buy-and-hold strategy as no profit can be earned by an information trade.

1c. Information costs are different for various groups of traders, and each trader has equal access to information.

If the cost of information is greater for uninformed traders, the uninformed traders simply buy-and-hold -- no trade occurs. Given rational expectations, the uninformed traders know ex-ante that they will lose in trade with informed insiders. Hence, they will cease to trade. As a result, obtaining costly information is a losing strategy for the informed insiders. Therefore, no trader gets information.

These three results based upon costless, identically costly, and differentially costly information are not in equilibrium. These paradoxes resemble the well-known Grossman-Stiglitz paradox about security prices in an efficient capital market.

(2) A random technical strategy dominates a naive fundamentalist strategy.

A random strategy is similar to flipping a fair coin. The technician makes a buy trade if a head appears and makes a sell trade if a tail appears. Hence, he loses half of the time and wins half of the time. Over a sequence of trade, he earns zero excess returns whether he trades with an insider or a naive

fundamentalist. A naive fundamentalist does not know P and acts on the basis of his poor information believing that it is good information whereas, in fact, it is poor information. The insider knows the true end-of-period price P_1.

A naive trader buys if

$$\bar{P}_F < \frac{P_F}{1+R_f} \tag{9}$$

and sells if

$$\bar{P}_F > \frac{P_F}{1+R_f} \tag{10}$$

And insider buys if

$$\bar{P}_I < \frac{P_1}{1+R_f} \tag{11}$$

and sells if

$$\bar{P}_I > \frac{P_1}{1+R_f} \tag{12}$$

P_F is a noisy signal of actual price P_1, i.e., $P_F = (P_1 + \epsilon)$ because a naive trader buys if $\bar{P}_F > \bar{P}_I$ and sells if $\bar{P}_F < \bar{P}_I$. Because $\bar{P}_I$ is the discounted price of the actual end-of-period price P_1, a naive trader loses money on either buy or sell trade consistently. Consequently, he earns a rate of return less than risk-free rate in a sequence of trade as he buys and sells at the wrong time. Therefore, a technical analyst earns a superior return to a naive fundamentalist.

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