

Event Studies and Semi-Strong Form EMH Tests

Semi-strong form efficiency tests are concerned with whether security prices reflect all publicly available information. For example, how much time is required for a given type of information to be reflected in security prices? What types of publicly available information might an investor use to generate higher than normal returns? The vast majority of studies of semi-strong form market efficiency suggest that publicly available information and announcements cannot be used by the typical investor to secure significantly higher than normal returns. A few of the exceptions to this rule are included in the following paragraphs. In addition, investors able to react within a few minutes to event news may be able to secure higher than normal returns.

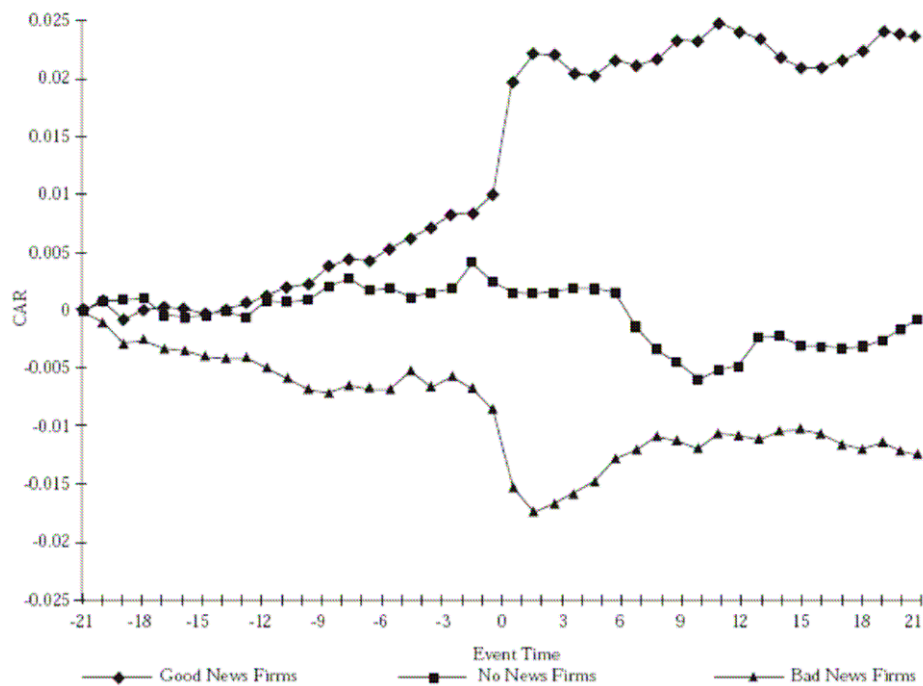
Early Tests

Garfield Cox [1930] found no evidence that professional forecasters could outperform the market. Similarly, and more rigorously, Cowles [1933] performed several tests of what was to be known as the efficient market hypothesis (EMH). He examined the forecasting abilities of forty-five professional securities analysis agencies (including fire insurance companies, financial services companies, and financial publications). He compared the returns that might have been generated by professionals' recommendations to returns on the market over the same period. He found that the average returns generated by professionals were less than those generated by the market over the same periods. He found that the best performing fund was not an outlier; that is, it did not exhibit unusually high performance. Cowles also tested whether analyst recommendations were correct an unusually high number of times; that is, he tested whether analyst picks were profitable relative to the market more frequently than might be expected with recommendations made randomly. Their picks were not.

Cowles also examined the abilities of analysts to predict the direction of the market as opposed to selecting individual stocks (this is the selectivity versus timing issue). He found that a buy and hold strategy was at least as profitable as following "average" advice of professionals as to when to be long or short in the market. He performed a simulation study using a deck of cards (since there were no computers capable of generating random numbers at the time). Based on reports of analyst recommendations, he computed the average number of times analysts change their recommendations over a year (33 times). He then randomly selected 33 dates, using cards numbered 1-229 (the number of weeks the study covered) to make simulated random recommendations. Draws were taken from a second set of randomly selected cards numbered 1 to 9, each with a certain recommendation (long, short, half stock and half cash, etc.) for a given date. Cowles then compared the results distribution of the 33 recommendations based on randomly generated advice to the advice provided by the actual advisors. He found that the professionals generated the same return

distributions as did the random recommendations. Thus, he concluded that the best-informed investors would perform no better than the uninformed investor. He also examined 255 editorials by William Peter Hamilton, the fourth editor of the *Wall Street Journal* who had gained a reputation for successful forecasting. Between 1902 until his death 1929, Hamilton forecast 90 changes in the market; 45 were correct and 45 were incorrect.

The event study methodology can be used to investigate the effects of many events such as an earning announcement. MacKinlay did this research in 1997.



The result of his study is shown above. MacKinlay categorized the companies based on whether the companies reported strong profits, normal earnings or a loss in the earnings announcements. The results of his event studies show that companies which reported good news showed higher cumulative abnormal returns, especially on the event day (Day 0).

Stock Splits

In another seminal test of semi-strong form market efficiency, Fama, Fisher, Jensen and Roll [1969] (FFJR) examined the effects of stock splits on stock prices. Because it seems logical that stock splits should be cosmetic in nature, and that FFJR generally reached this empirical conclusion, the results of this paper are somewhat less important than the methodology used in this paper. This paper was the first to use the now classic event study methodology. Although stock prices did change significantly

before announcements of stock splits (and afterwards as well), FFJR argued splits were related to more fundamental factors (such as dividends), and that it was actually these fundamental factors which affected stock prices. The splits themselves were unimportant with respect to stock prices.

FFJR identified the month in which a particular stock split occurred, calling that month time zero for that stock. Thus, each stock had associated with it a particular month zero ($t=0$), and months subsequent to the split were assigned positive values. They then estimated expected returns for each month t of the stocks in their sample with single index model: $R_{i,t} = a + b_i R_{m,t} + e_{i,t}$ where the expected residual ($e_{i,t}$) value was zero. FFJR tested 940 splits occurring between from 1956 to 1960, excluding from their beta computations returns data 15 months before and after splits. They then examined residuals ($e_{i,t}$) for each month for each security then averaged the residuals for each month across securities. They then cumulated average residuals (CAR) starting 30 months before splits ($t=-30$). Cumulative excess residuals increased dramatically starting 30 months before split. FFJR regarded it unlikely for this increase to occur because a split was anticipated. They found that after splits, residuals again average zero. Afterwards, FFJR split their sample of companies into those increasing dividends after a split versus companies not increasing dividends. Companies splitting stock then increasing dividends had continued increasing CAR's after the split announcement date; those splitting stock then decreasing dividends experienced decreasing CAR's. Thus, dividends might indicate fundamental strengths; splits do not appear to be relevant. On average, once the split is announced, positive residuals (CAR's) stop.

Subsequent tests on stock splits have not been entirely consistent with the results of FFJR. For example, it has been argued that splits increase the proportional trading costs of stocks. Investors should require higher returns to compensate for these higher trading costs. Later studies have documented positive residuals on split announcements.

Nonetheless, the FFJR study provided the framework for future event studies and semi-strong efficiency tests. Consider the following general notes regarding testing the semi-strong form efficiency hypothesis:

1. Use daily data since information is incorporated into prices within days (or much shorter periods).
2. Announcements are usually more important than events themselves
3. Base security performance on estimated expected return.
4. When using the market model (Standard Single Index Model), we estimate slopes from historical data. Normally, we find them biased forecasters for future values, so we may adjust them towards one.
5. One way to deal with slope measurement error is to use moving windows for the period whose excess return is being determined, estimate slope based on time periods preceding and following the testing period, excluding the testing period itself.

6. An alternative to adding to determine cumulative excess returns is adding them to 1, then multiplying them (API) as follows: $\prod(1 + e_i)$. Presumably, this product is the compounded return over this period.

Corporate Merger Announcements, Annual Reports and Other Financial Statements

Thousands of other tests of semi-strong form efficiency have been reported in the academic literature, covering wide varieties of events. For example, Firth considered market efficiency when an announcement is made for purchase of more than 10% of a firm. Presumably, an announcement indicates a potential merger. Firth calculated CAR starting 30 days prior to announcements; the bulk of CAR is realized between last trade before and first trade after announcements, though it still increases slightly after an announcement. Thus, a large block purchaser can still make excess returns. An insider obviously can make excess returns; one without inside information cannot (except for the first trader after the announcement). Since returns change almost immediately, Firth suggested that there is semi-strong efficiency with respect to merger announcements.

Using the Abnormal Performance Index (API, a geometric mean residual), Ball and Brown [1968] study the usefulness of the information content of annual reports. With a primary focus on EPS, they find that security prices already reflect 85%-90% of information contained in annual reports; security prices show no consistent reactions to annual report releases. They conclude that analysts obtain more timely information from other sources.

Ou and Penman [1989] offer a summary factor Pr based on a logistic model and data (18 financial ratio predictors) from recent accounting statements intended to forecast subsequent year corporate earnings. Their study found that the relationship between Pr and subsequent year firm earnings was positive and highly significant and that there was even a direct relationship between Pr and CAPM-adjusted stock returns. Their results were consistent with those of Holthausen and Larcker [1992], who directly measured the relationship between their summary of financial ratios and stock returns. However, subsequent studies have suggested that the results of Ou and Penman are very sensitive to variations in testing procedures and are not stable across countries. Francis and Schipper [1996] have suggested that the explanatory power of accounting figures has decreased in US capital markets, though Collins, Maydew and Weiss [1997] have made contrary claims in the professional literature. Brown, Lo and Lys [1998] attribute this finding to upward bias in the R^2 metric generally used in accounting research as a measure of relationship strength.

Information Contained in Publications and Analyst Reports

Davies and Canes [1978] consider information analysts sell to clients then publish in the "Heard on the Street" column in *The Wall Street Journal*. They use the Market Model to measure the relationship between the market, risk and the security. Information in this column is frequently sold by investment firms to clients before publication in the journal. Prices seem to rise significantly after information is sold to clients, then even more when it is published in the *Wall Street Journal*. They then test to see whether these large residuals on the *Wall Street Journal* publication day are significant by standardizing each day's return and then checking to see how many standard deviations from zero the excess or abnormal return lies.

Other studies have been performed on the ability to use information provided by *Value Line Investment Surveys* to generate profits. Although they are not consistent, many studies, particularly those before 1990, seem to suggest that Value Line reports can be used to generate higher than normal returns. However, the excess returns based on *Value Line* analyses may not have been sufficient to cover trading costs and may have been due to systematic risk. A number of later studies have been unable to identify abnormal returns from following *Value Line* recommendations.

More general studies on the value of analyst reports are somewhat mixed. The earlier study by Cowles [1933] found no evidence of value in analyst reports. For example, Green [2005] found in his study of 7000 recommendation changes from 16 brokerage firms from 1999 to 2002 that, after controlling for transaction costs, purchasing (selling) quickly following upgrades (downgrades) resulted in average two-day returns of 1.02% (1.50%). He found that short-term profit opportunities persist for two hours following the pre-market release of new recommendations.

Another type of semi-strong form market efficiency test is concerned with whether security analysts provide useful information in the investment process. (However, if the information that they possess is regarded as non-public information, then such tests might be regarded as being strong form.) As discussed above, one of the earlier tests concerning this issue was that of Cowles who concluded that most analysts do not provide information capable of generating abnormal returns. However, a few more recent studies provide some evidence of incidence of forecasting abilities on the part of certain analysts. For example, one study found that analysts' mean post-event drift averages 2.4% on buy recommendations and is short lived. However, sell recommendations result in average losses of 9.1% that are longer lived. These price reactions seem more significant for small-capitalization firms than for larger capitalization firms. Also, consider that sell recommendations may be particularly costly to brokerage firms, potentially damaging investment banking relationships and curtailing access to information in the future. Clearly, buy recommendations far outnumber sell recommendations and an incorrect sell recommendation may be particularly damaging to an analyst's reputation.

One survey after-market returns of approximately 400 firms going public in 1990 and

1991 was concerned with whether analysts working for firms underwriting the IPOs provided buy recommendations that were superior to those of investment institutions not participating in the underwriting efforts. Results suggest that if the analyst worked for an institution that did not participate in the underwriting, they were more likely to recommend a stock that had performed well in the recent past and would continue its strong performance. However, if the analyst worked for a firm that participated in bringing the IPO to the market, it was more likely to have recorded poor performance both before and after the analyst's recommendation. This evidence suggests that analysts working for investment banks are likely to attempt to prop up the prices of their underwritten securities with their recommendations.

In response to these apparently biased and unethical analyst recommendations, Securities and Exchange Commission (SEC) announced in 2003 the *Global Research Analyst Settlement* with 10 of the industry's largest investment banks. This settlement resulted from investigations by Congress, the Office of New York Attorney General Elliot Spitzer, the SEC, and other regulators into apparent conflicts of interest among security analysts working for investment banks. The settlement required the ten investment banks to pay \$875 million in penalties and profit disgorgement, \$80 million for investor education and \$432.5 million to fund independent research. In addition to these payments, the investment banks were required to separate their investment banking and research departments and add certain disclosures to their research reports. Nevertheless, Barber, Lehavy and Trueman [2007] find that between February 1996 and June 2003, buy recommendations of independent research firms outperform those of investment banks by an average of 3.1 basis points per day. Investment bank hold/sell recommendations, in contrast, outperform those of the independent research firms by an average of 1.8 basis points daily.

The Challenger Space Shuttle Disaster

On January 28, 1986, at 11:38 AM Eastern Standard Time, the space shuttle *Challenger* was launched in Florida and exploded 74 seconds later ten miles above ground on national television. The stock market reacted within minutes of the event, with investors dumping shares of the four major contractors contributing to building and launching the *Challenger*. The four primary contractors, Rockwell International, builder of the shuttle and its main engines, Lockheed, managing the ground support, Martin Marietta, manufacturer of the vessel's external fuel tank and Morton Thiokol, builder of the solid-fuel booster rocket. Less than a half-hour after the disaster, Rockwell's stock price had declined 6%, Lockheed 5%, Martin Marietta 3%, and Morton Thiokol had stopped trading because of the flood of sell orders. By the end of trading for the day, the first three companies' share prices closed down 3% from their open prices, representing a slight recovery from their initial reactions. However, Morton Thiokol stock resumed trading and continued to decline, finishing the day almost 12% down from its open price. These reactions suggested that the market believed that Morton Thiokol would suffer the greatest losses from the disaster,

despite the fact that no reports surfaced in the public media identifying Morton Thiokol as the cause of the disaster. Even news reports of rumors in the media failed to single out the firm as the cause of the disaster.

However, many months after the disaster, Richard Feynman, the charismatic and brilliant physicist, in dramatic testimony to a congressional hearing on the explosion, dropped O-rings into ice water, demonstrating that they were the cause of the explosion. Morton had used the O-rings in its construction of the booster rockets, which failed and leaked explosive fumes when the launch temperatures were less than could be tolerated by the O-rings. Yet, there were no announcements of such failures on the dates of the disaster or even within weeks of the explosion. Nonetheless, the market had reacted within minutes of the disaster as though Morton Thiokol would be held responsible.

In their study of this event, Maloney and Mulherin, (1992) found no evidence that Morton Thiokol corporate officers and other insiders sold shares on the date of the disaster. How is it that no individual seemed to know that Morton Thiokol would ultimately be held responsible for the disaster, yet the market would react as though everyone knew? It may be useful to note that Morton Thiokol engineers were aware of the potential for failure of the O-rings in cold weather, but were overruled by company managers concerning their use. This scenario suggests that the information marketplace does quickly sift through and identify relevant information used for the valuation of company shares.

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