CHAPTER 8
Semi-Strong Form And Strong Form Market Efficiency

A. Semi-Strong Form Efficiency

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

Cowles [1933] performed the first test of 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.

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.

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: $R_{i,t} = a + b_iR_{m,t} + e_{i,t}$ 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: $\Pi(1 + e_t)$. Presumably, this product is the compounded return over this period.

<u>Corporate Merger Announcements and Annual Reports</u>

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.

<u>Information Contained in Publications and Analyst Reports</u>

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 days 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 tat 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 1991was 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.

DCF Analysis and Price Multiples

In their study of 51 highly leveraged transactions (management buyouts and leveraged recapitalizations), Kaplan and Ruback [1995] found that DCF analysis provided better estimates of value than did price-based multiples. The free cash flow estimates used by Kaplan and Ruback were provided by management to the public as required by SEC regulation in going private transactions. Discount rates were estimated with CAPM (Other methods were used as well). Kaplan and Ruback found that between 95% and 97% of firm value was explained by (as indicated by r-square) DCF and slightly less was explained by price-based multiples. The price-based multiples did add useful information to the valuation process. In addition, analysts may be able to improve on DCF estimates by refining those provided by management. Regardless, the high r-squares do suggest that reasonably reliable information and analytical techniques are available in the marketplace fo analysts and investors to use in company valuations.

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.[1] The stock market reacted within minutes of the event, with investors dumping shares 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

[1] Thanks to George Shatz for his discussions on this.

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 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.

Political Intelligence Units

Investors with money at stake have obvious incentives to access and quickly exploit information. Many investors and institutions are able to access and exploit important information before it can be gathered and disseminated by the news agencies. Consider the case of USG Corporation, whose shares increased by 5.4% over two days prior to November 16, 2005 when Senate Republican Majority Leader Bill Frist announced that there would be a full Senate vote on a bill to create a $140 billion public trust for asbestos liability claims.[2] This fund would pay medical expenses and resolve lawsuits involving thousands of cancer victims who blamed USG, W.R.Grace and Crown for their illnesses. Share prices of all these firms increased over the two days prior to November 16. However, the price increases clearly preceded the trust fund announcement. Returns for these firms over the 2-day period exceeded those of the market. In addition, returns experienced by these particular firms far exceeded returns of their peer firms that were not involved in asbestos litigation. On the date that the actual announcement was finally made, these three firms showed no substantial reaction.

The S.E.C. initiated an informal investigation to determine whether and how information might have been leaked to investors prior to its announcement. While staff members for Senator Frist claim to have been careful not to leak information prior to the announcement, the bill's authors, Senators Spector and Leahy had held extensive discussions with lobbyists. Several law firms, including Sonnenschein Nath & Rosenthal, LLP and DLA Piper have operated "political intelligence" units enabling their clients to obtain public policy information from lobbyists operating in Washington. These firms and political intelligence units include hedge funds as clients. Several hedge funds holding substantial stakes in affected companies belonged to the Financial Institutions for Asbestos Reform, an industry advocacy group, giving them additional opportunities to access information provided by lobbyists. While it is not yet clear whether any laws have been broken, it does appear that hedge funds may have successfully gained an information edge in their trading.

Market Volatility

[2] See Mullins and Scannell [2006]

If security price changes are purely a function of information arrival, then security price volatility should be the same when markets are closed as when they are open. For example, stock return variances should be three times as high over a weekend as over a 24-hour period during weekdays. However, Fama [1965] and French [1980] found that return variances were only around 20% higher during weekends. On the other hand, one might argue that the arrival of new information over weekends is slower. But another study by French and Roll [1986] found that agricultural commodity futures prices (orange juice concentrate) were substantially more volatile during trading days than during weekends. Agricultural commodity futures prices are primarily a function of weather, news about which occurs over the weekend just as efficiently as during trading days. This suggests that volatility, to some extent, is caused by trading itself.

B. Back Testing Announcement Strategies: The Event Study

An event study is concerned with the impact of a given firm-specific corporate event on the prices of the company's securities. For example, an event study might be conducted for the purpose of determining the impact of corporate earnings announcements on the stock price of the company. Event studies are used to measure market efficiency and to determine the impact of a given event on security prices. More important, from a trading perspective, event studies are used to back-test price data to determine the usefulness and reliability of trading strategies.

A number of studies have suggested a relatively high degree of efficiency in capital markets. If this suggestion is true, then one would expect that security prices would continuously reflect all available information. If security prices are a function of all available information, and new information occurs randomly (otherwise, it would not be new information), then one would expect that security prices would fluctuate randomly as randomly generated news is impounded in security prices. Thus, the "purchase or sale of any security at the prevailing market price represents a zero NPV transaction."[3] In a perfectly efficient market, any piece of new relevant information would be immediately reflected in security prices. One should be able to determine the relevance of a given type of information by examining the effect of its occurrence on security prices. Thus, non-random performance of security prices immediately after a given event suggests that news of the event has a significant effect on security values. The degree of efficiency in a market to a given type of information may be reflected in the speed that the market reacts to the new information.

At any given point in time, security prices might be affected by a large number of randomly generated pieces of new information or events. An event study is concerned with the impact of a specific type of new information of a security's price. Given that more than one piece of news may be affecting the security's price at any given point in time, one will probably need to study more than one firm to determine how the given type of information will affect securities. Thus, a population or sampling of firms experiencing the given event will be gathered; the impact of the event on each of the firms' securities will be studied simultaneously. Thus, the first step in conducting an event study is to gather an appropriate sample of firms experiencing the event.

The impact of the event on security prices is typically measured as a function of the amount of time that elapses between event occurrence and stock price change. In a relatively efficient market, one might expect that the effect of the event on security prices will occur very quickly after the first investors learn of the event. Event studies are usually based on daily, hourly or even trade to trade stock price fluctuations. However, we frequently are forced to study only daily security price reactions since more frequent data is not readily available.

---

[3] Brown, Stephen J. and Jerold B. Warner, "Measuring Security Price Performance," Journal of Financial Economics 8, 1980. pp. 205-258.

Additionally, if markets are relatively efficient, one should obtain security price information as soon as possible after the event is known, although, determining when the information is known may be problematic. For example, analysts are often able to predict with a reasonably high degree of accuracy firm earnings and trade securities on the basis of their predictions. Thus the impact of corporate earnings changes may be realized in security prices long before earnings reports are officially released. Thus, one may need to study the impact of a given event, news item or announcement by considering security price reactions even before the event occurs. One should also take care in deciding on the precise nature of the event. For example, a dividend announcement may be of much greater interest than actual payment of the dividend.

Event studies typically standardize security price reactions by measuring the timing of security price reactions relative to the date of the event. For example, suppose that Company X announced its earnings on January 15 and Company Y announced its earnings on February 15. Let the base period time (t=0) for Company X be January 15 and the base period time (t=0) for Company Y be February 15. January 16 and February 16 (one day after the events) will be denoted as (t=1) for the respective companies. Thus, the timing of the corporate events are standardized and we are able to measure average security price reactions 1, 2, etc. days after (and before) the event occurs.

Although stock return generating processes may be modeled as a random walk if capital markets are efficient, one might expect a general drift in returns; that is, one might expect that investors will earn a "normal" return on their securities. Thus, excess or abnormal return randomness is observed when markets are efficient, except for a very short period after relevant new information is available. The abnormal return in a given period for security i, $\varepsilon_{i,t}$, for a security is the difference between its total, actual or ex-post return $R_{i,t}$ and its expected, normal or ex-ante return $E[R_{i,t}]$: $\varepsilon_{i,t} = R_{i,t} - E[R_{i,t}]$. To measure the impact of an event on security returns, one must have a consistent means of measuring normal returns. Brown and Warner [1980], in their classic study of event study methodologies, suggest three models of normal returns:

1. Mean Adjusted Returns: The normal return for a security equals a constant K_i. Typically, the mean return for the security over a sampling of time periods outside of the testing period serves as the constant K_i. The expected return for the security is assumed to be constant over time, though ex-ante returns will vary among securities. Thus, the abnormal return for the security is found: $\varepsilon_{i,t} = R_{i,t} - K_i$.
2. Market Adjusted Returns: The normal return for a security at a given point in time equals the market return for that period. The expected returns for all securities are assumed to be the same during a given period, though they vary over time. Abnormal returns are found: $\varepsilon_{i,t} = R_{i,t} - R_{m,t}$.
3. Market and Risk Adjusted Returns: Here, normal returns are assumed to be generated by a single index model. Typically, security returns are linearly related to market returns through stock betas. These risk-adjusted returns vary across securities and over time. Abnormal returns may be determined: $\varepsilon_{i,t} = R_{i,t} - \beta_i(R_{m,t} - r_{f,t})$.

One may test the significance of an event by averaging the abnormal performance for the sampling of securities around the event dates. If abnormal returns are not statistically significantly different from zero during the relevant testing period, one may conclude that the test did not provide evidence indicating the significance of the event. If either no abnormal performance is detected around the event date or abnormal performance rapidly disappears, we have evidence of market efficiency with respect to that type of information.

Event Studies and Takeovers

Numerous firms have been targets of takeover attempts in recent years. As we will discuss in the next chapter, short-term price reactions following takeover announcements suggest that targets of takeover attempts experience significant positive abnormal returns. This suggests that target firm shareholders benefit from takeover announcements. Suppose we wish to perform our own event study to test the following hypotheses:

1. Takeover targets experience positive stock price reactions to takeover announcements.
2. Markets react efficiently to takeover announcements.

Our first step in this event study is to locate an appropriate sampling of companies to study. Suppose, we wish to base our study on the following three targets of takeover attempts:

Target Firm[4]	**Symbol**	**Announcement Date**
Fleet Boston	FBF	10/27/2003
Disney	DIS	2/11/2004
AT&T Wireless	AWE	1/18/2004

Obviously, an actual statistical study would almost certainly require a much larger sampling of firms, but for sake of computational ease, we will focus on only three firms here. Suppose we establish a 21-day testing period for returns around the event dates, the event date plus 10 days before and 10 days after (30 days before and after the event is more typical). Table 1 provides our three target firm stock prices during 21-day periods around merger announcement dates. We standardize event dates (merger announcements occur on the seventh date, standardized at day 0) and compute returns for each stock during each of the days in the testing period as in Table 2. The return for a particular day is simply the closing price for that day divided by the closing price for the prior day minus one: $(P_t / P_{t-1}) - 1$.

[4] The successful takeover of Fleet Boston by Bank of America was consummated in 2004. Comcast's bid for Disney failed. AT&T Wireless, the target of competing offers from Vodafone and Cingular was acquired by Cingular in 2004.

Table 1
Target Company Stock Prices

Day	Calendar Date	FBF Price	Calendar Date	DIS Price	Calendar Date	AWE Price
10	10-Nov-03	39.69	26-Feb-04	26.73	3-Feb-04	11.08
9	7-Nov-03	39.84	25-Feb-04	26.3	2-Feb-04	11.16
8	6-Nov-03	40.26	24-Feb-04	25.96	30-Jan-04	11.05
7	5-Nov-03	39.89	23-Feb-04	26.75	29-Jan-04	11.03
6	4-Nov-03	39.6	20-Feb-04	26.55	28-Jan-04	11.02
5	3-Nov-03	39.86	19-Feb-04	27	27-Jan-04	11.17
4	31-Oct-03	39.73	18-Feb-04	26.71	26-Jan-04	10.93
3	30-Oct-03	39.45	17-Feb-04	26.9	23-Jan-04	10.61
2	29-Oct-03	38.9	13-Feb-04	26.92	22-Jan-04	10.56
1	28-Oct-03	38.17	12-Feb-04	28	21-Jan-04	10.99
0	27-Oct-03	38.56	11-Feb-04	27.6	20-Jan-04	10.39
-1	24-Oct-03	31.28	10-Feb-04	24.08	16-Jan-04	9.99
-2	23-Oct-03	31.54	9-Feb-04	23.77	15-Jan-04	9.81
-3	22-Oct-03	31.47	6-Feb-04	23.35	14-Jan-04	9.99
-4	21-Oct-03	31.88	5-Feb-04	23.2	13-Jan-04	8.55
-5	20-Oct-03	32.17	4-Feb-04	23.19	12-Jan-04	8.13
-6	17-Oct-03	32.08	3-Feb-04	23.26	9-Jan-04	8.15
-7	16-Oct-03	32.31	2-Feb-04	23.8	8-Jan-04	8.24
-8	15-Oct-03	31.99	30-Jan-04	24	7-Jan-04	8.21
-9	14-Oct-03	32.1	29-Jan-04	24.45	6-Jan-04	8.29
-10	13-Oct-03	31.87	28-Jan-04	23.67	5-Jan-04	8.03

Table 2
Target Company Stock Returns[5]

	PRICES			RETURNS		
Date	FBF	DIS	AWE	FBF	DIS	AWE
10	39.69	26.73	11.08	-0.004	0.016	-0.01
9	39.84	26.3	11.16	-0.01	0.013	0.01
8	40.26	25.96	11.05	0.009	-0.03	0.002
7	39.89	26.75	11.03	0.007	0.008	0
6	39.6	26.55	11.02	-0.007	-0.02	-0.01
5	39.86	27	11.17	0.003	0.011	0.022
4	39.73	26.71	10.93	0.007	-0.01	0.03
3	39.45	26.9	10.61	0.014	-0	0.005
2	38.9	26.92	10.56	0.019	-0.04	-0.04
1	38.17	28	10.99	-0.01	0.014	0.058
0	38.56	27.6	10.39	0.233	0.146	0.04
-1	31.28	24.08	9.99	-0.008	0.013	0.018
-2	31.54	23.77	9.81	0.002	0.018	-0.02
-3	31.47	23.35	9.99	-0.013	0.006	0.168
-4	31.88	23.2	8.55	-0.009	0	0.052
-5	32.17	23.19	8.13	0.003	0	0

[5] Table calculations will reflect rounding errors.

-6	32.08	23.26	8.15	-0.007	-0.02	-0.01
-7	32.31	23.8	8.24	0.01	-0.01	0.004
-8	31.99	24	8.21	-0.003	-0.02	-0.01
-9	32.1	24.45	8.29	0.007	0.033	0.032
-10	31.87	23.67	8.03	N/A	N/A	N/A

The next step in this study is to determine normal or expected returns for each of the securities for each date. We could use any of the three adjustment methods discussed above (with more information). Suppose that we have decided to use the Market Adjusted Return method. In this case, we compute daily returns for the market index for each day in our 21-day testing period for each stock. Table 3 lists adjusted S&P index values for each of the 21 dates affecting each of the three stocks along with returns for the index for each of those dates.

Table 3
Returns on the S&P 500

Calendar Date	Adj. Close	Return	DIS	AWE	Calendar Date	Adj. Close	Return	FBF	AWE	Calendar Date	Adj. Close	Return	FBF
26-Feb-04	1,144.91	0.00108	10		27-Jan-04	1,144.05	-0.0098		5	3-Nov-03	1,059.02	0.00791	5
25-Feb-04	1,143.67	0.00402	9		26-Jan-04	1,155.37	0.01211		4	31-Oct-03	1,050.71	0.0036	4
24-Feb-04	1,139.09	-0.0017	8		23-Jan-04	1,141.55	-0.0021		3	30-Oct-03	1,046.94	-0.0011	3
23-Feb-04	1,140.99	-0.0027	7		22-Jan-04	1,143.94	-0.0032		2	29-Oct-03	1,048.11	0.00126	2
20-Feb-04	1,144.11	-0.0026	6		21-Jan-04	1,147.62	0.00777		1	28-Oct-03	1,046.79	0.01519	1
19-Feb-04	1,147.06	-0.0041	5		20-Jan-04	1,138.77	-0.0009		0	27-Oct-03	1,031.13	0.00216	0
18-Feb-04	1,151.82	-0.0045	4		16-Jan-04	1,139.83	0.00687		-1	24-Oct-03	1,028.91	-0.0047	-1
17-Feb-04	1,156.99	0.00976	3		15-Jan-04	1,132.05	0.00135		-2	23-Oct-03	1,033.77	0.00331	-2
13-Feb-04	1,145.81	-0.0055	2		14-Jan-04	1,130.52	0.00829		-3	22-Oct-03	1,030.36	-0.015	-3
12-Feb-04	1,152.11	-0.0049	1		13-Jan-04	1,121.22	-0.0053		-4	21-Oct-03	1,046.03	0.00129	-4
11-Feb-04	1,157.76	0.01067	0		12-Jan-04	1,127.23	0.00479		-5	20-Oct-03	1,044.68	0.00516	-5
10-Feb-04	1,145.54	0.00503	-1		9-Jan-04	1,121.86	-0.0089		-6	17-Oct-03	1,039.32	-0.0102	-6
9-Feb-04	1,139.81	-0.0026	-2		8-Jan-04	1,131.92	0.00496		-7	16-Oct-03	1,050.07	0.00316	-7
6-Feb-04	1,142.76	0.01256	-3		7-Jan-04	1,126.33	0.00237		-8	15-Oct-03	1,046.76	-0.0026	-8
5-Feb-04	1,128.59	0.00184	-4		6-Jan-04	1,123.67	0.00129		-9	14-Oct-03	1,049.48	0.00395	-9
4-Feb-04	1,126.52	-0.0084	-5		5-Jan-04	1,122.22	0.0124		-10	13-Oct-03	1,045.35	N/A	-10
3-Feb-04	1,136.03	0.00068	-6	10	10-Nov-03	1,047.11	-0.0058	10					
2-Feb-04	1,135.26	0.00365	-7	9	7-Nov-03	1,053.21	-0.0046	9					
30-Jan-04	1,131.13	-0.0026	-8	8	6-Nov-03	1,058.05	0.00593	8					
29-Jan-04	1,134.11	0.00499	-9	7	5-Nov-03	1,051.81	-0.0014	7					
28-Jan-04	1,128.48	-0.0136	-10	6	4-Nov-03	1,053.25	-0.0054	6					

Next, based on actual returns computed in Table 2 and normal returns from the S&P 500 Index from Table 3, we compute periodic residuals $\varepsilon_{i,t}$ (abnormal returns) for each stock during each date in the testing period along with the average residual over the sample for each date as in Table 4.

Table 4
Target Firm Stock Residuals

	Abnormal Returns			Average
Date	**FBF**	**DIS**	**AWE**	**Residuals (ARs)**
10	0.002	0.0153	-0.0078	0.003149
9	-0.006	0.0091	0.0063	0.003174
8	0.0033	-0.028	0.00444	-0.006695
7	0.0087	0.0103	-0.0041	0.004956
6	-0.001	-0.014	0.00018	-0.004996
5	-0.005	0.015	0.03176	0.014036
4	0.0035	-0.003	0.01805	0.006319
3	0.0153	-0.011	0.00682	0.00386
2	0.0179	-0.033	-0.0359	-0.017053
1	-0.025	0.0194	0.04998	0.014683
0	0.2306	0.1355	0.04097	0.135687
-1	-0.004	0.008	0.01148	0.005316
-2	-0.001	0.0206	-0.0194	0
-3	0.0021	-0.006	0.16013	0.052052
-4	-0.01	-0.001	0.05699	0.015093
-5	-0.002	0.0054	-0.0072	-0.00141
-6	0.0031	-0.023	-0.002	-0.007428
-7	0.0068	-0.012	-0.0013	-0.002151
-8	0	-0.016	-0.012	-0.009543
-9	0.0033	0.028	0.03109	0.020772
-10	N/A	N/A	N/A	N/A

One of our objectives is to determine whether any daily residual is statistically significantly different from zero. Following standard hypotheses testing techniques reviewed in the appendix to this chapter, standard deviations for each of the average daily residuals are computed along with normal deviates ($[\varepsilon_t - 0] \div \sigma_{\varepsilon i}$) as in Table 5.

Table 5
Target Firm Average Residuals and Standard Deviations

Day	Average Residuals (ARs)	Residuals	Normal Deviate
10	0.003149	0.0116	0.2715
9	0.003174	0.00794	0.39957
8	-0.006695	0.01834	-0.3649
7	0.004956	0.00787	0.63007
6	-0.004996	0.0079	-0.6321
5	0.014036	0.01821	0.77059
4	0.006319	0.01061	0.59555
3	0.00386	0.01313	0.29393
2	-0.017053	0.03027	-0.5633
1	0.014683	0.03786	0.38784
0	0.135687	0.0948	1.43123
-1	0.005316	0.00786	0.67597
-2	0	0.01999	0.00187
-3	0.052052	0.09369	0.55561

-4	0.015093	0.03656	0.41285
-5	-0.00141	0.00635	-0.2219
-6	-0.007428	0.01404	-0.5289
-7	-0.002151	0.00944	-0.2278
-8	-0.009543	0.00777	-1.2279
-9	0.020772	0.01524	1.36292
-10	N/A	N/A	N/A

Our test for each daily average residual (AR_t) is structured more formally as follows:

$$H_0: AR_t \leq 0 \qquad H_A: AR_t > 0$$

We shall assume the residuals follow a t-distribution and we will perform a one-tailed test with a 95% level of significance. Given a sample size of three firms such that we work with 1 = 3 - 2 degrees of freedom, the critical value for each test will be 6.314. Based on our computations above, we find that none of the residual t-statistics (normal deviates) exceed 6.314. Thus, we may not conclude with a 95% level of confidence that any residual differs from zero. Based on the confines of the test that we established here, we may not conclude that markets appear inefficient with respect to merger announcements. Perhaps, in part due to our small sample with such a small number of degrees of freedom, we cannot conclude that merger announcements have any effect on security returns. Note that this example was structured so as to facilitate computations; it is unlikely that a realistic test would be structured with a sample set of only three firms.

The tests performed above were concerned with whether merger announcements significantly affected stock prices in any given date around the time of the announcement. We found no significant effect for any single day returns. In some other instances, we may find that while no effect is found on the residual for any particular date, the effect might be realized over a period of days. This might be expected if market reactions are slow, that is, if the market is somewhat inefficient. Perhaps, we may even wish to broaden our test to determine whether some of the effect might be realized over a period of time before the date of the announcement. We can compute cumulative average residuals to determine cumulative effects over time:

(1) $$CAR_t = \sum_i^t AR_i$$

Cumulative average residuals are computed in Table 6 from Average Residuals taken from Table 5. Cumulative average residuals may also be computed by summing individual firm residuals and dividing by the number of firms in the sample as in Table 7.

Table 6
Target Firm Cumulative Average Residuals
Average

Day	Residuals (ARs)	CAR
10	0.003149	0.22986
9	0.003174	0.22671
8	-0.006695	0.22354
7	0.004956	0.23023
6	-0.004996	0.22527
5	0.014036	0.23027
4	0.006319	0.21623
3	0.00386	0.20991
2	-0.017053	0.20606
1	0.014683	0.22311
0	0.135687	0.20843
-1	0.005316	0.07274
-2	3.74E-05	0.06742
-3	0.052052	0.06739
-4	0.015093	0.01533
-5	-0.00141	0.00024
-6	-0.007428	0.00165
-7	-0.002151	0.00908
-8	-0.009543	0.01123
-9	0.020772	0.02077
-10	N/A	N/A

Table 7
Target Firm Cumulative Average Residuals

Day	CR FBF	CR DIS	CR AWE	CAR	CAR σ	Normal Deviate
10	0.241609	0.1196	0.328365	0.229858	0.104878	2.191678
9	0.239582	0.104334	0.336212	0.226709	0.116474	1.946444
8	0.24544	0.095258	0.329908	0.223535	0.118849	1.880836
7	0.242097	0.123125	0.325467	0.23023	0.101692	2.263999
6	0.233407	0.112865	0.329549	0.225274	0.108571	2.074906
5	0.234481	0.12696	0.329368	0.23027	0.10127	2.273827
4	0.239118	0.11197	0.297613	0.216234	0.094913	2.278221
3	0.235621	0.114565	0.279559	0.209915	0.085448	2.456643
2	0.220366	0.125065	0.272735	0.206055	0.074868	2.752261
1	0.202502	0.158168	0.308654	0.223108	0.07733	2.885135
0	0.227803	0.138796	0.258678	0.208426	0.062246	3.348411
-1	-0.00278	0.003284	0.217708	0.072739	0.125584	0.579205
-2	0.000767	-0.00473	0.206232	0.067423	0.120244	0.560715
-3	0.001852	-0.0253	0.225603	0.067385	0.137692	0.489392
-4	-0.00027	-0.01921	0.065477	0.015333	0.044446	0.34498
-5	0.010039	-0.0178	0.008485	0.00024	0.015645	0.01535
-6	0.012391	-0.02317	0.015725	0.00165	0.021555	0.076564

-7	0.009272	0.000202	0.01776	0.009078	0.008781	1.033889
-8	0.002431	0.012187	0.019069	0.011229	0.00836	1.343124
-9	0.003266	0.027964	0.031086	0.020772	0.015241	1.362916
-10	N/A	N/A	N/A	N/A	N/A	N/A

Do any of the CARs in Tables 6 or 7 exceed zero? A quick glance reveals that all do. Do any CARs exceed zero at a statistically significant level? We need a little more analysis to examine this second question. We begin to test for the statistical significance of cumulative average residuals by computing standard deviations of the cumulative residuals of the firms for each day and computing normal deviates. For example, the sample standard deviation of cumulative residuals for day -5 is computed based on the following:

$$\sigma = \sqrt{\frac{(.010039 - .00024)^2 + (-.0178 - .00024)^2 + (.008485 - .00024)^2}{3-1}} = .015645$$

These one-day standard deviations measure the spread or variability of residuals for that day. In Table 7, the normal deviate for a given date is simply the cumulative average residual for that date divided by the standard deviation applicable to that date. Daily standard deviations of cumulative residuals along with their normal deviates are given in Table 7. Larger normal deviates are consistent with larger positive and statistically significant stock price reactions.

The largest normal deviate is for day zero, the merger announcement date. In a realistic scenario, this would not be a surprise if prices rapidly adjusted to new information. However, we need a benchmark for statistical significance for these normal deviates. Because our sample set numbers only 3, we have 3-2=1 degrees of freedom. For a one-tail test with 95% certainty, we find from a t-table that our benchmark for statistical significance is 6.314. Note that none of our normal deviates exceed this critical value of 6.314. Thus, if our hypotheses concerning each date t in our testing period were given as follows:

$$H_0: CAR_t\ 0 \qquad H_A: CAR_t > 0\ ,$$

We would not be able to reject the null hypothesis that $CAR_t >$ with 95% confidence for any date.

C. <u>Insider Trading</u>

Should inside trading be illegal?

While regulation clearly prohibits trading on the basis of inside information, most investors readily admit to being willing to do so anyway if they were certain that they would not be caught. Apparently, investors do not consider inside trading a violation of their moral and ethical codes. If inside trading does not seem morally or ethically wrong, why should it be prohibited? Obviously, inside trading gives some investors an unfair advantage over other investors. But is this wrong? Perhaps, it is simply impractical to permit inside trading if it might reduce investment, liquidity and the value of investments. Since the U.S. economy is dependent on investment and investors' willingness to participate and bring capital to business, it is simply practical to prohibit inside trading. Perhaps, in addition, inside trading will make prices more volatile.

On the other hand, some other countries permit inside trading. First, some observers argue that it is simply immoral to prevent insiders to use information that they have legally obtained just as it is wrong to prevent them from using their intelligence, skills and physical assets to their gain. Furthermore, if inside information is deemed to belong to firms themselves or their investors, its use can be precluded by contract between insiders and firms. In addition, inside trading may well bring useful information to the market's price-setting process in a more timely and efficient manner, allowing market prices to more appropriately reflect the best information in the capital allocation process. This could reduce risk and perhaps even spur increased investment as prices better reflect conditions.

D. Strong Form Efficiency

Strong Form tests are concerned with whether any information, publicly available or private can be used to generate abnormal returns. We generally take it for granted that insiders are capable of generating higher than normal returns on their transactions. There have been many well-publicized cases of insiders generating abnormal returns - and being prosecuted for their trading. There is even some evidence that insiders are able to generate abnormal returns on apparently legal transactions that are duly registered with the S.E.C. (See Jaffee [1974]). Jaffee examined SEC insider transaction filings and determined that stock performance relative to the market after months when insider purchases exceed insider sales. When insiders sell, shares that they sold are outperformed by the market.

Why do insiders appear to outperform the market on their duly registered insider transactions? Are insiders trading on the basis of their private information or do they actually have superior trading ability? A study by Givoly and Palmon [1985] suggests that transactions generating these superior returns are not related to subsequent corporate events or announcements. Givoly and Palmon examined insider transactions and then searched for subsequent announcements in the business press for that might have explained the superior returns on their investments. They found that insider superior returns were not explained by the published announcements. This may suggest that these insiders may either simply have superior investing ability or may generate higher returns for themselves on the basis of information that is not later announced.

On the other hand, perhaps insiders are trading on the basis of insider information that is not subsequently released on a specific date. Furthermore, managers are not obliged to announce most types of inside information according to any particular schedule. In addition, many insiders participate in plans to regularly buy (without liability, as per S.E.C. Rule 10b5-1) or sell shares. Managers can obtain 10b5-1 protection for trades if they create the plan at a time when they don't have non-public information and they announce their transactions schedule in advance. For example, Kenneth Lay was said to have protected $100 million in his own wealth by selling shares of Enron stock through a 10b5-1 plan. In addition, insiders always have the right to abstain from trading on the basis of inside information. Thus, it is not illegal to *not buy* shares on the basis of inside information.[6] How would investigators determine whether one declined to trade solely on the basis of inside information? Regardless, Jagolinzer [2005] found that insider trading within the 10b5-1 plans outperforms the market by 5.6% over six-month periods.

[6] The decision to retain stock cannot be a violation of Rule 10b-5. See Condus v. Howard Savings Bank, 781 F. Supp. 1052 (D.N.J. 1992).

Exercises

1. Toy stores have very clear seasonal patterns in their revenue flows. Should toy store share prices exhibit similar seasonality?

2. An analyst has tested the effect of spin-off announcements on share prices using event study methodology. The analyst's procedure proceeded as follows:

1: 10 spin-offs were obtained from the most recent year.
2: Announcement dates were standardized with 30 days of prices collected from both before and announcement dates.
3: Returns were computed and averaged for each company in the spin-off sample. Standard deviations and normal deviates were computed for the sample for each date. Appropriate tests for statistical significance were conducted.
4. Cumulative average residuals were computed for each date and tested for statistical significance.

Test results suggested that spin-offs were associated with 30-day returns of 8%. Why might an investor be skeptical of this test? How can the test be improved?

3. Which is worth more:
   a. A market forecasting service that correctly predicts the direction of the market portfolio with 100% consistency every month for extended periods of time and can be expected to continue to do so in the future.
   b. A market forecasting service that incorrectly predicts the direction of the market portfolio with 100% consistency every month for extended periods of time and can be expected to continue to do so in the future.

4. Suppose that we wished to conduct an event study on whether acquiring firms experience share price reactions to takeover announcements. For our event study, we will use for our sample the following three acquiring firms:

Company X: Merger announcement date Jan. 15, 2006
Company Y: Merger announcement date Feb. 15, 2006
Company Z: Merger announcement date Apr. 10, 2006

Suppose we establish an 11-day testing period for returns around the event dates, the event date plus 5 days before and 5 days after. The following table provides our three acquiring firm stock prices during 12-day periods around merger announcement dates:

Company *X*		Company *Y*		Company *Z*	
Date	Price	Date	Price	Date	Price
1/09	50.125	2/09	20.000	4/04	60.375
1/10	50.125	2/10	20.000	4/05	60.500

1/11	50.250	2/11	20.125	4/06	60.250
1/12	50.250	2/12	20.250	4/07	60.125
1/13	50.375	2/13	20.375	4/08	60.000
1/14	50.250	2/14	20.375	4/09	60.125
1/15	52.250	2/15	21.375	4/10	60.625
1/16	52.375	2/16	21.250	4/11	60.750
1/17	52.250	2/17	21.375	4/12	60.750
1/18	52.375	2/18	21.500	4/13	60.875
1/19	52.500	2/19	21.375	4/14	60.875
1/20	52.375	2/20	21.500	4/15	60.875

a. Compute one-day returns for each of 11 days for each of the three stocks.

b. Suppose that we have decided to use the Mean Adjusted Return method to compute excess or abnormal stock returns. Here, we will compute mean daily returns for each security for a period outside of our 11-day testing period. Suppose we compute average daily returns and standard deviations for each of the stocks for 180-day periods prior to the testing periods (this raw returns data is not given here). Suppose that we have found normal or expected daily returns along with standard deviations as follows:

Stock	Normal Return	Standard Deviation
X	.000465	.00415
Y	.000520	.00637
Z	.000082	.00220

Compute excess returns for each stock for each of the 11 days.

c. For each of the 11 days in the analysis, compute average residuals for the three stocks. Then, for each day, compute a standard deviation of residuals for the three stocks. Finally, compute normal deviates for each of the 11 dates based on the averages and standard deviations for the three stocks.
d. Are average residuals for any of the dates statistically significant at the 95 percent level?
e. Compute cumulative average residuals for each of the 11 dates.
f. Compute standard deviations and normal deviates for each of the 11 dates.
g. Does there appear to be statistically significant evidence of abnormal acquiring firm returns around announcement dates?

Exercise Solutions

1. No: Seasonal cycles are anticipated by shareholders who anticipate and discount cash flows accordingly. However, unanticipated changes in sales revenue would affect share prices.

2. 10 spin-offs provides for a very small sample set. Did stock returns increase for the year? Since returns were collected for only one year, and that year may not have both longer periods of decline and longer periods of increase, the returns might simply have been normal market returns. This scenario is especially likely if stock returns have not been adjusted for normal market returns.

3. Either service can be used equally well to time market decisions.

4. a. Acquiring company daily stock returns, $(P_t / P_{t-1}) - 1$ are computed as follows:

Day	Company *X* Return	Company *Y* Return	Company *Z* Return
-6	NA	NA	NA
-5	0	0	.00207
-4	.00249	.00625	-.00413
-3	0	.00621	-.00207
-2	.00248	.00617	-.00207
-1	-.00248	0	.00208
0	.03980	.04907	.00831
1	.00239	-.00584	.00206
2	-.00238	.00588	0
3	.00239	.00584	.00205
4	.00238	-.00581	0
5	-.00238	.00584	0

b. Excess returns (residuals) are computed in the following table:

Day	Co. *X* Residual	Co. *Y* Residual	Co. *Z* Residual	Average Residual
-5	-.000465	-.000520	.001988	.000333
-4	.002028	.005729	-.004214	.001181
-3	-.000465	.005690	-.002156	.001022
-2	.002021	.005652	-.002161	.001837
-1	-.002947	-.000520	.002001	-.000488
0	.039335	.048559	.008233	.032042
1	.001926	-.006368	.001979	-.000820

2	-.002852	.005361	-.000082	.000809
3	.001926	.005327	.001975	.003076
4	.001920	-.006334	-.000082	-.001498
5	-.002846	.005327	-.000082	.000799

c. Average residuals for the stocks on each date along with standard deviations and normal deviates are computed as follows from Part b:

Day	Average Residual	Standard Deviation	Normal Deviate
-5	.000333	.001169	.28545
-4	.001181	.004103	.28780
-3	.001022	.003372	.30326
-2	.001837	.003192	.57561
-1	-.000488	.002020	-.24197
0	.032042	.017251	1.85739
1	-.000820	.003922	-.20921
2	.000809	.003412	.23711
3	.003076	.001591	1.93273
4	-.001498	.003515	-.42623
5	.000799	.003394	.23550

d. We shall assume the residuals follow a t-distribution and we will perform a one-tailed test with a 95 percent level of significance. Given 1 = 3 - 2 degrees of freedom, the critical value for each test will be 6.314. Based on our computations above, we find that none of the residual t-statistics (normal deviates) exceed 6.314. Thus, we may not conclude with a 95 percent level of confidence that any residual differs from zero.

e. Cumulative average residuals are based on the following formula:

$$CAR_t = \sum_i^t AR_i$$

Cumulative average residuals are computed in our example as in either of the two following tables:

Day	Average Residual	Cumulative Average Residual
-5	.000333	.000333
-4	.001181	.001514
-3	.001022	.002537
-2	.001837	.004375
-1	-.000488	.003886
0	.032042	.035929

1	-.000820	.035108
2	.000809	.035917
3	.003076	.038993
4	-.001498	.037495
5	.000799	.038294

Day	Cumulative Residual, *X*	Cumulative Residual, *Y*	Cumulative Residual, *Z*	Cumulative Average Residual
-6	NA	NA	NA	NA
-5	-.00046	-.00052	.00198	.000333
-4	.00156	.00520	-.00226	.001514
-3	.00109	.01089	-.00438	.002537
-2	.00311	.01655	-.00654	.004375
-1	.00017	.01603	-.00454	.003886
0	.03950	.06459	.00369	.035929
1	.04143	.05822	.00567	.035108
2	.03858	.06358	.00558	.035917
3	.04050	.06891	.00756	.038993
4	.04245	.06257	.00748	.037495
5	.03958	.06790	.00739	.038294

f. Standard deviations and normal deviates are computed in the following table:

Day	Standard Deviation	Normal Deviate
-5	.001432	.23307
-4	.003717	.40749
-3	.007742	.32775
-2	.011599	.37720
-1	.010778	.36056
0	.012468	3.77089
1	.021347	1.66432
2	.023212	1.56549
3	.024538	1.60622
4	.022204	1.70760
5	.024190	1.60047

g. Normal deviates do not exceed the critical value of 6.314. Thus, if our hypotheses concerning each date t in our testing period were given as follows:

$$H_0: CAR_t\ 0 \quad H_A: CAR_t > 0 ,$$

We would not be able to reject the null hypothesis that CAR_t > with 95 percent confidence for any date

REFERENCES

Abelson, Reed (1997) "Finding an Initial Public Offering in the Temperate Zone," *New York Times*, July 20, 1997, section 3, page 4.

Allen, F. and G. Faulhaber (1989), "Signalling by Underpricing in the IPO Market," *Journal of Financial Economics*, 23, 303-323.

Arrow, Kenneth J. (1982) "Risk Perception in Psychology and Economics," *Economic Inquiry* 20, 1-9.

Ball, Ray and P. Brown (1968), An Empirical Evaluation of Accounting Income Numbers, *Journal of Accounting Research*, 6, 159-178.

Ball, Ray, S. P. Kothari and Jay Shanken (1995): "Problems in Measuring Portfolio Performance: An Application to Contrarian Investment Strategies," *Journal of Financial Economics*, 38, 79-107.

Baron, D.P. (1982):"A Model of the Demand for Investment Banking Advising and Distribution Services for New Issues," *Journal of Finance* 37, pp. 955-976.

Barry, C. and S. Brown (1984), Differential Information and the Small Firm Effect, *Journal of Financial Economics*, 13, 283-294.

Banz, R. (1981), The Relationship between Return and Market Value of Common Stock, *Journal of Financial Economics*, 9, 3-18.

Barber, Brad M., Reuven Lehavy and Brett Trueman (2007): “Comparing the stock recommendation performance of investment banks and independent research firms,” *Journal of Financial Economics*.

Beatty R. and J. Ritter (1986), "Investment Banking, Reputation, and the Underpricing of Initial Public Offerings," *Journal of Financial Economics*, 15, 213-232.

Beaver, W.H. (1981), *Financial Reporting: An Accounting Revolution*. Englewood Cliffs, New Jersey: Prentice-Hall.

Benartzi, Schlomo and Richard Thaler (1995), *Quarterly Journal of Economics*, February.

Benveniste, L. and Spindt (1992), "How Investment Bankers Determine the Offer Price and Allocation of New Issues," *Journal of Financial Economics*, 24, 343-361.

Bhardwaj, Ravinder K. and Leroy D. Brooks (1992), The January Anomaly: Effects of Low Share Price, Transactions Costs, and Bid-Ask Bias, *Journal of Finance*, 47, 553-575.

Black, Fischer (1973) "Yes Virginia, There is Hope: Tests of the Value Line Ranking System," *Financial Analysts Journal*, Sep./Oct.

Black, Fischer (1986): "Noise," *Journal of Finance*, 41, pp. 529-544.

Block, S. and M. Stanley (1980), "The Financial Characteristics and Price Movement Patterns of Companies Approaching the Unseasoned Securities Market in the Late 1970s," *Financial Management*, Winter, 30-36.

Bjerring, James H., Josef Lakonishok and Theo Vermaelen (1983), "Stock Prices and Analysts' Recommendations," *Journal of Finance*, 38, 187-204.

Booth, J.R. and R.L. Smith II (1986), "Capital Raising, Underwriting and the Certification Hypothesis," *Journal of Financial Economics*, 15, 261-281.

Boudoukh, Jocob, Matthew Richardson and Robert Whitelaw [1994], "A Tale of Three Schools: Insights on Autocorrelations of Short- Horizon Stock Returns," *Review of Financial Studies* 7, 3, pp. 539-573.

Branch, Ben (1977) "A Tax Loss Selling Rule," *Journal of Business*, 50, 198-207.

Brennan, Michael J. and Thomas E. Copeland (1988), "Stock Splits, Stock Prices and Transactions Costs," *Journal of Financial Economics*, 22, 83-101.

Brown, L.D. and D.M. Chen (1990), Composite Analysts Earnings Forecasts: The Next Generation, *Journal of Business Forecasting*, 9, 11-15.

Brown, S. and J. Warner (1980), Measuring Security Price Performance, *Journal of Financial Economics*, 8, 205-258.

Brown, S. and J. Warner (1985), Using Daily Stock Returns: The Case of Event Studies, *Journal of Financial Economics*, 14, 3-31.

Brown, William O. and Raymond D. Sauer (1993), Fundamentals or Noise? Evidence from the Professional Basketball Betting Market," *Journal of Finance*, 48, 1193-1209.

Butler, K.C. and L.H. Lang (1991), The Forecast Accuracy of Individual Analysts: Evidence of Systematic Optimism and Pessimism, *Journal of Accounting Research*, 29, 150-156.

Carter, R.B. and S. Manaster (1990), "Initial Public Offerings and Underwriter Reputation," *Journal of Finance*.

Chan, K.C., N.F. Chen and D. Hsieh (1985), An Exploratory Investigation of the Firm Size Effect, *Journal of Financial Economics*, 14, 451-471.

Chang, E.C. and J.M. Pinegar (1986), Return Seasonality and Tax-loss Selling in the Market for Long Term Government and Corporate Bonds, *Journal of Financial Economics*, 17, 391-415.

Copeland, Thomas E. and David Mayers (1982) "The Value Line Enigma, 1965-1978: A Case Study of Performance Evaluation Issues," *Journal of Financial Economics*, 11, 3.

Cowles, Alfred, 3rd (1933): "Can Stock Market Forecasters Forecast?" *Econometrica*, vol. 1, pp. 309-324.

Cross, F. (1973): "Behavior of Stock Prices on Fridays and Mondays," *Financial Analysts Journal*, 29, 67-69.

Davies, Peter Lloyd and Michael Canes (1978), "Stock Prices and the Publication of Second Hand Information," *Journal of Business*, 51, 43-56.

DeBondt, Werner F.M. (1985), "Does the Market Overreact to New Information?" Unpublished Ph.D. dissertation, Cornell University.

DeBondt, Werner F.M. and Richard Thaler (1985), "Does the Market Overreact?" *Journal of Finance*, 40, 793-805.

Dichev, Ilia D. and Troy D. Janes (2001): "Lunar cycle effects in stock returns," Unpublished working paper, University of Michigan.

Dimson, Elroy (1979), Risk Measurement when Shares are Subject to Infrequent Trading, *Journal of Financial Economics*, 7, 197-226.

Dimson, Elroy and Paul Marsh (1984), "An Analysis of Brokers' and Analysts' Unpublished Forecasts of UK Stock Returns," *Journal of Finance*, 39, 1257-1292.

Drake, Philip D. and Michael R. Vetsuypens (1993), "IPO Underpricing and Insurance Against Legal Liability," *Financial Management* 22, No.1, pp. 64-73.

Dyl, Edward (1977), "Capital Gains Taxation and Year-End Stock Market Behavior," *Journal of Finance*, 32, 165-175.

Elton, E. and M. Gruber (1987), *Modern Portfolio Theory and Investment Analysis*, 3rd ed., New York: Wiley.

Fama, E. (1965): "The Behavior of Stock Market Prices," *Journal of Business*, 38, 34-105.

Fama, E. and M. Blume (1966), Filter Rules and Stock Market Trading Profits, *Journal of Business*, 39, 226-241.

Fama, E. et. al. (1969), The Adjustment of Stock Prices to New Information, *International Economic Review*, 10, 1-21.

Fama, E. and K. French (1988), Permanent and Temporary Components of Stock Prices, *Journal of Political Economy*, 96, 246-273.

Fama, E. and K. French (1992), The Cross-Section of Expected Stock Returns, *Journal of Finance*, 47, 427-465.

Fama, E. and J. MacBeth (1973), Risk, Return, and Equilibrium: Empirical Tests, *Journal of Political Economy*, 71, 607-636.

Foster, George (1986), *Financial Statement Analysis*, Englewood Cliffs, New Jersey: Prentice-Hall.

Fried, D. and D. Givoly (1982), Financial Analysts' Forecasts of Earnings: A Better Surrogate for Market Expectations, *Journal of Accounting and Economics*, 4, 85-107.

Friedman, Daniel (1998): “Monty Hall’s Three Doors: Construction and Deconstruction of a Choice Anomaly,” *American Economic Review* 88, pp. 933-946.

French, K. (1980): "Stock Returns and the Weekend Effect," *Journal of Financial Economics*, 8, 55-69.

French, K. and Richard Roll (1986): "The Arrival of Information and the Reaction of Traders," *Journal of Financial Economics*, 13, 547-559.

Gandar, John, Richard Zuber, Thomas O'Brien and Ben Russo (1988) "Testing Rationality in the Point Spread Betting Market," *Journal of Finance*, 43, 995-1008.

Givoly, Dan and Arie Ovadia (1983) Year-End Induced Sales and Stock Market Seasonality, *Journal of Finance*, 38, 171-185.

Givoly, D. and O. Palmon (1985) Insider Trading and the Exploitation of Inside Information: Some Empirical Evidence, *Journal of Business*, January 1985.

Goetzmann, W. N. and N. Zhu, (2005): “Rain or shine: Where is the weather effect?” *European Financial Management* 11, 559-578.

Golec, Joseph and Maurry Tamarkin (1991) "The Degree of Inefficiency in the Football Betting Markets," *Journal of Financial Economics* 30, 311-323.

Graham, Benjamin and David Dodd (1934) *Security Analysis*.
Graham, Benjamin (1976) "A Conversation with Benjamin Graham," *Financial Analysts Journal*, 32, 20-23.

Granger, C.W. (1968) Some Aspects of the Random Walk Model of Stock Prices, *International Economic Review*, 9, 253-257.

Gray, Philip and Stephen F. Gray (1997) "Testing Market Inefficiency: Evidence from the NFL Sports Betting Market," *Journal of Finance* 52, 1725-1737.

Griffin, Dale and Amos Tversky (1992): "The Weighing of Evidence and the Determinants of Confidence," *Cognitive Psychology* 24, pp. 411-435.

Griffiths, Mark and Robert White (1993) "Tax-Induced Trading and the Turn of the Year Anomaly: An Intraday Study," *Journal of Finance*, 48, 575-598.

Grinblatt, M. and C.Y. Hwang (1988), "Signalling and the Pricing of New Issues," *Journal of Finance*, 44, 393-420.

Grossman, S.J.(1976): "On the Efficiency of Competitive Stock Markets where Trades have Diverse Information," *Journal of Finance* 31, pp. 573-585.

Grossman, Sanford and Joseph Stiglitz (1980): "On the Impossibility of Informationally Efficient Markets," *American Economic Review*, vol. 70, pp. 393-408.

Hanley, Kathleen, A. Arun Kumar and Paul Seguin (1993), "Price Stabilization in the Market for New Issues," *Journal of Financial Economics*, 34, 177-197.

Hirshleifer, D. and T. Shumway, (2003): Good day sunshine: Stock returns and the weather, *Journal of Finance* 58, 1009-1032.

Hirshleifer, Daniel K., and Teoh, S. H. 2002. “Investor psychology in capital markets: evidence and policy implications”. *Journal of Monetary Economics* 49, 139-209.

Hess, Alan and Peter A. Frost (1982), "Tests for Price Effects of New Issues of New Securities," *Journal of Finance*, 36, 11-25.

Holloway, Clark (1981) "A Note on Testing an Autoregressive Investment Strategy Using Value Line Ranks," *Journal of Finance*, 36, 711-719.

Huberman, Gur and Shmuel Kandel (1982) "Market Efficiency and Value Line Record," *Journal of Business*, 63, 187-216.

Ibbotson, R.G. (1975), "Price Performance of Common Stock New Issues," *Journal of Financial Economics*, 2, 235-272.

Ikenberry, David L., Graeme Rankine and Earl K. Stice (1996) "What do Stock Splits Really Signal?" *Journal of Financial and Quantitative Analysis*, 31, 3, 357-375.

Jaffee, Jeffrey (1974), "Special Information and Insider Trading," *Journal of Business*, 47, 410-428.

Jaffee, Jeffrey, Donald H. Keim and Randolph Westerfield (1989), "Earnings Yields, Market Values, and Stock Returns," *Journal of Finance*, 44, 135-148.

Jagolinzer, Alan D. (2005), "An analysis of insiders' information-based trade within the SEC Rule 10b5-1 safe harbor," Unpublished working paper, Stanford University.

Jegadeesh, Narasimhan (1991): "Seasonality in Stock Price Mean: Evidence from the U.S. and the U.K.," *Journal of Finance*, 46, 1427-1444.

Jegadeesh, Narasimhan and Sheridan Titman (1993): "The Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency," *Journal of Finance*, 48, 65-91.

Jennergren, Peter (1975), Filter Tests of Swedish Share Prices, in Elton and Gruber, *International Capital Markets*, Amsterdam: North-Holland.

Jennergren, Peter and Paul Korsvold (1975) "The Non-Random Character of Norweigian and Swedish Stock Market Prices," in Elton and Gruber, *International Capital Markets*, Amsterdam: North-Holland.

Johnson, J.M. and R.E. Miller (1988), "Investment Banker Prestige and the Underpricing of Initial Public Offerings," *Financial Management*, Summer 1988, 19-29.

Kaplan, Steven N. and Richard S. Ruback (1995). "The Valuation of Cash Flow Forecasts: An Empirical Analysis," *Journal of Finance* 50, no. 4 (September), pp. 1059-1093.

Keim, Donald B. (1983): "Size-Related Anomalies and Stock Return Seasonality: Further Empirical Evidence," *Journal of Financial Economics*, 12(1), pp. 13-32.

Keim, Donald B. (1989) "Trading Patterns, Bid-Ask Spreads, and Estimated Security Returns: The Case of Common Stock at Calendar Turning Points," *Journal of Financial Economics*, 25, pp. 75-97.

Keloharju, M. (1993): "The Winner's Curse, Legal Liability, and the Long-Run Price Performance of Initial Public Offerings in Finland," *Journal of Financial Economics* 34, 2, pp. 251-277.

Kendall, Maurice (1953): "The Analysis of Economic Time Series. Part I: Prices, " *Journal of the Royal Statistical Society*, vol. 96, pp. 11-25.

Kim, M., C.R. Nelson and R.Startz (1991) "Mean Reversion in Stock Prices? A Reappraisal of the Empirical Evidence," *Review of Economic Studies*, 58, 515-528.

Kluger, Brian D. and Steve B. Wyatt (2004): “Are Judgement Errors Reflected in Market Prices and Allocations? Experimental Evidence Based on the Monty Hall Problem,” *Journal of Finance*, 59,3, 969-997.

Knutson, Brian and Richard Peterson (2005). “Neurally reconstructing expected utility,” Games and Economic Behavior, 52, pp. 305-315.

Ko, Wang, Yuming Li and John Ericson (1997): "A New Look at the Monday Effect," *Journal of Finance* 52, #5, pp. 2171-2186.

Koh, F. and P. Walter (1989), "A Direct Test of Rock's Model of the Pricing of Unseasoned Issues," *Journal of Financial Economics*, 23, 251-272.

Krigman, Laurie, Wayne H. Shaw and Kent L. Womack (1997), "The Persistence of IPO Mis-pricing and the Predictive Power of Flipping," unpublished working paper, Dartmouth College.

Kross, William (1985) "The Size Effect is Primarily a Price Effect," *Journal of Financial Research*, 8, 169-179.

Kuhnen, Camelia and Brian Knutson. “The Neural Basis of Financial Risk Taking,” *Neuron* 47, September 1, (2005), pp. 763-770.

Kyle, Albert S. and F. Albert Wang (1997): "Speculation Duopoly with Agreement to Disagree: Can Overconfidence Survive the Market Test?" *Journal of Finance*, 52, #5, 2073-2089.

Lakonishok, Josef and M. Levi (1982): "Week-end Effects on Stock Returns: A Note," *Journal of Finance*, 37, 883-889.

Lakonishok, Josef and Edwin Maberly (1990): "The Weekend Effect Trading Patterns of Individual and Institutional Investors," *Journal of Finance* 40, 231-243.

Lakonishok, Josef and Alan Shapiro (1986): "Systematic Risk, Total Risk and Size as Determinants of Stock Market Returns *Journal of Banking and Finance*, 10.

Lichtenstein, Sarah, Baruch Fischhoff and Lawrence D. Phillips (1982): "Calibration of Probabilities: The State of the Art to 1980," in Daniel Kahneman, Paul Slovic and Amos Tversky, Eds.: *Judgement Under Uncertainty: Heuristics and Biases*, Cambridge: Cambridge University Press.

Limpaphayom, Piman, Peter R. Locke and Pattarake Sarajoti (2005): “Gone with the Wind: Chicago’s Weather and Futures Trading,” Unpublished working paper, Chulalongkorn University.

Lo, A.W. and A.C. MacKinlay (1988): "Stock Market Prices do not Follow Random Walks: Evidence from a Simple Specification Test," *Review of Financial Studies*.

Lo, A.W. and A.C. MacKinlay (1990): "When Are Contrarian Profits Due to Stock Market Overreaction?" *Review of Financial Studies*, 3, pp. 175-205.

Lo, Andrew W. and Dmitry V. Repin. 2002. "The Psychophysiology of Real-Time Financial Risk Processing." *Journal of Cognitive Neuroscience*, 14(3): 323–39.

Logue, D.E. (1973), "On the Pricing of Unseasoned Equity Issues: 1965-1969," *Journal of Financial and Quantitative Analysis*, 8, 91-103.

McDonald, J. and A.K. Fisher (1972): "New Issue Stock Price Behavior," *Journal of Finance*, 27, 97-102.

McNichols, M. and A. Dravid (1990) "Stock Dividends, Stock Splits and Signalling," *Journal of Finance*, 45, 857-879.

McQueen, G. (1992) "Long-horizon Mean Reverting Stock Prices Revisited," *Journal of Financial and Quantitative Analysis*, 27, 1-18.

Maloney, Michael and J. Harold Mulherin (2003). "The complexity of price discovery in an efficient market: The stock market reaction to the Challenger crash," *Journal of Corporate Finance* 9, 453-79.

Michaely, Roni and Kent Womack (1996) "Conflict of Interest and the Credibility of Underwriter Recommendations," unpublished working paper, Cornell University.

Mullins, Brody and Kara Scannell (2006). "Hedge funds hire lobbyists to gather tips in Washington," Wall Street Journal, Friday, November 8: p. A1.

Muscarella, C.J. and M.R. Vetsuypens (1989), "A Simple Test of Baron's Model of IPO Underpricing," *Journal of Financial Economics*, 24, 125-135.

Muscarella, C.J. and M.R. Vetsuypens (1989b), "The Underpricing of `Second' Initial Public Offerings," *Journal of Financial Research*, 12, 183-192.

Myers, Stewart C. and Nicholas S. Majluf (1984): "Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have," *Journal of Financial Economics* 13, pp. 187-221.

Naqvi, Nasir, Baba Shiv and Antoine Bechara (2006): The Role of Emotion in Decision-Making: A Neuroscience Perspective, *Current Directions in Psychological Science 15,4*, pp. 260-264.

Neuberger, B.M. and C.T. Hammond (1974), "A Study of Underwriters' Experience with Unseasoned New Issues," *Journal of Financial and Quantitative Analysis*, March, 165-177.

Neuberger, B.M. and C.A. LaChapelle (1983), "Unseasoned New Issue Price Performance on Three Tiers: 1975-1980," *Financial Management*, Autumn, 23-28.

Osborne, M.F.M. (1962): "Periodic Structure in the Brownian Motion of Stock Prices," *Operations Research*, vol. 10, pp. 345-379.

Patell J.M. and M.A. Wolfson (1984): "The Intraday Speed of Adjustment of Stock Prices to Earnings and Dividend Announcements," *Journal of Financial Economics*, 13, 223-252.

Peavy, J.W. (1990), "Returns on Initial Public Offerings of Closed-End Funds," *Review of Financial Studies*, 3, 695-708.

Peterson, Richard (2005): "Affect and Financial Decision-Making: How Neuroscience Can Inform Market Participants," Unpublished working paper.

Rea, James (1977) "Remembering Benjamin Grahem - Teacher and Friend," *Journal of Portfolio Management*, 3, 66-72.

Reinganum, M. (1983), The Anomalous Stock Market Behavior of Small Firms in January: Empirical Tests for Tax-Loss Selling Effects, *Journal of Financial Economics*, 12, 89-104.

Richards, Anthony J. (1997): "Winner-Loser Reversals in National Stock Market Indices: Can They be Explained?" *Journal of Finance*, 52, #5, 2129-2144.

Richardson, Matthew and J.H. Stock (1988), "Inferences Drawn from Statistics Based on Multiyear Asset Returns," *Journal of Financial Economics*, 25, 323-348.

Ritter, Jay R. (1984): "The `Hot Issue' Market of 1980," *Journal of Business*, vol. 57, pp. 250-240.

Ritter, J. (1991), The Long-Run Performance of Initial Public Offerings, *Journal of Finance*, 46, 3-28.
Rock, K. (1986), "Why New Issues are Underpriced", *Journal of Financial Economics*, 15, 187-212.

Roll, Richard (1981): "A Possible Explanation of the Small Firm Effect," *Journal of Finance*, 36(4), pp. 879-888.

Roll, Richard (1988): "R^2," *Journal of Finance*, 43(3), pp. 541-566.

Ruud, Judith (1993) "Underwriter Support and the IPO Underpricing Puzzle," *Journal of Financial Economics*, 24, 135-151.

Samuelson, Paul (1965): "Proof that Properly Anticipated Prices Fluctuate Randomly," *Industrial Management Review*, vol. 6, pp. 41-49.

Sauer, Raymond D., Vic Brajer, Stephen P. Ferris and M. Wayne Marr (1988): Hold Your Bets: Another Look at the Efficiency of the Gambling Market for NFL Games," *Journal of Political Economy* 96, 206-213.

Schultz, Paul H. and Mir A. Zaman (1993), "Aftermarket Support and Underpricing of Initial Public Offerings," *Journal of Financial Economics*, 34, 199-219.

Shiller, Robert J. (1981), "Do Stock Prices Move too Much to be Justified by Subsequent Changes in Dividends?" *American Economic Review* 71, 421-436.

Sias, Richard and Laura T. Starks (1997): "Institutions and Individuals at the Turn-of-the-Year," *Journal of Finance* 52(4), 1543-1562.

Thaler, Richard H. and William T. Ziemba (1988) "Parimutuel Betting Markets: Racetracks and Lotteries," *Journal of Economic Perspectives* 2, 161-174.

Tinic, Seha, Giovanni Barone-Adesi and Richard West (1987) "Seasonality in Canadian Stock Prices: A Test of the "Tax-Loss-Selling Hypothesis", *Journal of Financial and Quantitative Analysis* 22, 51-64.

Weiss, K.A. (1989), "The Post-Offering Price Performance of Closed-End Funds," *Financial Management*, 18, 57-67.

Womack, Kent L. (1996): "Do Brokerage Analysts' Recommendations Have Investment Value?" *Journal of Finance*, 51, 137-167.

Woodland, Linda M. and Bill M. Woodland (1994) Market Efficiency and the Favorite-Longshot Bias: The Baseball Betting Market," *Journal of Finance* 49, 269-279.

Working, Holbrook (1934): A Random Difference Series for Use in the Analysis of Time Series," *Journal of the American Statistical Association*, vol. 29, pp. 11-24.