CHAPTER 15

Efficient Markets

Introduction

One of the most influential theories to emerge out of the finance literature over the last 50 years is the efficient market hypothesis (EMH). Introduced by Burton Malkiel in the 1960s, the EMH precipitated a considerable amount of controversy between proponents of the EMH (primarily academicians) and practitioners who employed fundamental and technical analysis. EMH proponents argued that if the market consisted of a sufficient number of fundamentalists, then their actions would force the market price of a security to its equilibrium value. For example, if a security was underpriced, the fundamentalists would try to buy the security, pushing its market price toward its equilibrium value. In contrast, if a security was overpriced, the fundamentalists would short or sell it, pushing its market price down to its equilibrium value. Thus, according to the proponents of the EMH, with enough fundamentalists, the market price of a security is equal to its equilibrium price. Similarly, EMH proponents argued that if the market consisted of enough technicians, then their actions would eliminate the possibility of earning any abnormal return from identifying trends in security prices. As we noted in the last chapter, if a stock traded low on

Monday and high on Friday, then technicians would detect this trend and would buy on Monday and sell on Friday. These actions would augment the price of the stock on Monday and lower it on Friday, thereby eliminating the trend and the possibility of earning an excess profit. If the EMH holds, in the sense that the market consists of a sufficient number of fundamentalists and technicians, then investors would be unable to earn abnormal returns from either fundamental or technical strategies. Thus, the EMH questioned the usefulness of fundamental and technical analysis. In their defense, fundamentalists and technicians argued that the efficient market theory was an oversimplification of how the market functions and that EMH proponents were naive.

One of the benefits of this controversial theory was that it spurred a considerable amount of research; in fact, there has been more research devoted to the EMH than to any other subject in investments. Moreover, the research on the EMH has helped to allay the controversy. On the one hand, studies have provided support for the use of trading strategies based on some fundamental and technical principles (though not all), justifying the contributions of fundamentalists and technicians. On the other hand, the EMH has provided fundamental and technical analysts with some new methods for selecting securities, as well as introducing statistical tools for evaluating security price trends and determining the effect of events on security prices.

In this chapter, we examine the efficient market hypothesis and studies of its validity. We begin by taking a closer look at the theory and its implications.

Efficient Market Theory

Weak, Semi-Strong, and Strong-Form Tests of the EMH

The efficient market theory addresses the question of whether or not security prices reflect information. Information contained in a security price can include both fundamental information, such as the economic, industry, and firm conditions of a company, and technical information, such as historical trends in a security's price. The information can be publicly available, such as historical data or announcements made through the media, or it can be privately available, accessible only to insiders who work, manage, or direct the company or who have special dealings or relationships with the company (e.g., lawyers, outside advisors, media, regulators, etc.). In examining the extent to which information is contained in the price of a security, the EMH subdivides the information into three categories, each considering a different type of information. Originally described by Nobel Laureate Eugene Fama as tests of informational content, the categories include the weak-form test, the semi-strong-form test, and the strong-form test.

The *weak-form tests* of the EMH test whether information contained in historical prices is fully reflected in current prices. These tests involve determining if one can earn abnormal returns (i.e., returns above the equilibrium return) from technical strategies. For example, can one earn excessive profit from detecting a trend such as a stock priced low on Monday and high on Friday, and then trading off that historical information? If there are a sufficient number of technicians in the market, they will identify such trends and by their actions eliminate the trend, or at least the ability to earn abnormal returns by employing strategies based on the trend.

Tests of the EMH are often stated in terms of a null hypothesis (H_0), which subsequent statistical tests will either reject or accept (or not reject). In the case of the weak-form test, the null hypothesis, H^{wf}_0, to be tested is:

- H^{wf}_0: Investors cannot earn abnormal returns from strategies based on historical trends or return predictability patterns.

Semi-strong-form tests of the EMH test whether publicly available information is fully reflected in current prices. Two kinds of tests examine both market characteristics and the market's reaction to events or announcements. The first tests, sometimes called *cross-sectional tests*, look at whether or not abnormal returns can be realized from trading stocks with certain characteristics, such as their size or their price-to-earnings ratio. The second types of test are *event studies* or studies of announcements. Events include many factors, such as merger announcements, earnings reports, stock repurchases, new stock sales, stock splits, changes in the direction of monetary policy, or a depreciation of the dollar. Researchers usually limit their studies to events or announcements in which the information is not already reflected in the security's price; that is, the unexpected or the surprises.

When an event or announcement occurs, fundamentalists in the market reassess the equilibrium price (or value) of the security and by their subsequent trading cause the price of the security to change. For example, an unexpected good earnings announcement by a company would lead buyers and sellers of the security to value the company's stock higher, leading to a higher equilibrium price. Usually it takes some time before the market fully assesses the information and determines the new equilibrium price. For example, investors/fundamentalists may be too bullish about an unexpected good earnings announcement, causing the market price to overshoot its equilibrium value. Upon further assessment, the market may correct by slowing purchases or selling, causing the price to move down. During this reassessment period, the volatility of the stock price may increase. Semi-strong-form tests of the EMH do not rule out the possibility that during the assessment period some investors may pay less than the new equilibrium price and thus earn abnormal returns, whereas others may pay more than the equilibrium price and therefore earn returns less than the equilibrium return. Instead, the semi-strong-form tests try to determine if there are enough fundamentalists to ensure that investors, on average, do not earn abnormal returns from trading from events and announcements. As a result, the null hypothesis for the semi-strong-form tests, H^{ss}_0, is:

- H^{ss}_0: Investors, on average, cannot earn abnormal returns from trading strategies based on publicly available information.

Strong-form tests of the EMH are tests of whether all information—public and private—is fully reflected in the security's price. These tests usually take two forms. One form tries to determine whether or not insiders can earn abnormal returns from their private information. That is, do the officers, managers, engineers, scientists, accountants, and others in the company, as well as those who by the nature of their business are close to the company, have private information that would allow them to earn abnormal returns? In the United States and many other countries, there are security laws that require that insiders list their trades with the SEC. The intent of the laws is to make publicly available trades that are based on privileged information. If these and other laws aimed at inside trading are effective, then a priori we would expect security prices to reflect inside information. The null hypothesis to test for this form of the EMH, $H^s_0(1)$ is:

- $H^s_0(1)$: Insiders cannot earn abnormal returns from trading from private information.

The other strong-form test of the EMH tries to determine whether some non-insider groups are able to earn abnormal returns from their abilities to evaluate securities and events better than the average investor. In this strong-form test, researchers try to determine whether groups such as security analysts and portfolio managers of mutual funds and investment companies are able to earn abnormal return from being better able to value information than the average investor. The null hypothesis to test for this form of the EMH, $H^s_0(2)$, is:

- $H^s_0(2)$: Investment groups cannot earn abnormal returns from their investment strategies.

The weak-, semi-strong-, and strong-form tests of the EMH address different degrees of market efficiency. A perfectly efficient market is one in which all four hypotheses hold. In practice, a perfectly efficient market does not exist. As we will see later, evidence in support of each hypothesis is mixed.

Example

To see how information can be reflected in a security's price, consider again the case of an oil company who just finds its oil reserves are three times greater than originally estimated. Suppose that this company's accountants project that the firm's earnings will be three times greater than the current level as a result of the discovery and that the projected earnings increase is expected to be permanent. When the company announces the reserve increase, the market will push up the company's stock price. The efficient market theory, however, is less concerned with the subsequent price increase and more interested in determining whether the market is one in which investors can earn abnormal returns by using this information. The answer depends on how quickly the information is reflected in the stock's price. To see this, consider the following five scenarios.

Scenario 1

Suppose that after the announcement is made it takes two weeks for the stock price to increase from its current level of $50 to its new equilibrium level of $75. This gradual increase in share price might be due to the presence of a learning lag or the presence of a conservative bias in which some investors respond immediately to the auspicious earnings information, and others take more time to react. Since it takes some time before the impact of the information is fully reflected in the stock's price, a trend will emerge in which the stock begins to trade away from its historical level, increasing until it hits its new equilibrium, and then stabilizes. In this scenario, technicians studying such trends would be able to earn abnormal returns by buying the stock a day or two after it begins to trade away from its historical level ($50), then selling it when it stabilizes two weeks later around its new equilibrium ($75). Excess profit in this case is realized by technicians who profit from discerning learning lag trends in the market and not necessarily from the fundamental changes that are driving the price up. In this scenario, the efficient market hypothesis would not hold in the weak form (H^w_0).

Scenario 2

Suppose the market consists of fundamentalists who immediately buy the stock after the announcement and cause its price to increase sufficiently fast that technicians trading off price patterns are unable to earn excess profit. In this case, the fundamentalists' quick response to the earnings announcement eliminates the learning lag that characterized the last scenario, and the new price prevailing shortly after the announcement reflects fundamental information about the company's improved prospects. However, suppose in this case that while the stock price responds in kind to the announcement, it takes several days before the market fully assesses the impact. During this time, suppose there are overconfident investors who push the price to $80 two days after the news, then after reassessing, push the price down to $73, followed by another increase and then decrease, before settling in at the new equilibrium price of $75. Some investors buying the stock during this period will pay a price below the equilibrium of $75 and therefore realize an abnormal return; others will pay more than the equilibrium and earn less than the new equilibrium return associated with the $75 price. However, suppose that on average investors pay $75, and therefore on average realize the new equilibrium return. In this scenario, the efficient market hypothesis would hold in the weak and semi-strong forms (H^w_0 and H^{ss}_0).

Scenario 3

Suppose again that the market consists of a sufficient number of fundamentalists and technicians that the price increases quickly. This time suppose an investment group specializing in energy stocks is more adept at analyzing the news than the average investor and determines that the equilibrium price is $75. With this ability, the group is able to identify its trading strategy of buying below $75. With the stock fluctuating for several days after the announcement, suppose the investment firm buys at $72, thus earning a return above the new equilibrium level. In this scenario, the efficient market hypothesis would hold in the weak and semi-strong forms ($H^w{}_0$ and $H^{ss}{}_0$), but not the strong form: $H^s{}_0(2)$ does not hold.

Scenario 4

Suppose this time the market is characterized by fundamentalists who are all equally adept at analyzing fundamental information. Like scenario 2, the fundamentalists again would be able to quickly push the price to its equilibrium level at $75, with a smaller accompanying variability. Unlike scenario 3, however, no investment group on average would be able to earn abnormal returns. Suppose in this case that the company's geologist, knowledgeable regarding the new reserve estimates, buys the stock several days before the announcement at $50 and then sells it sometime later at $75 when the information is fully reflected in the price. We have an insider who is able to earn abnormal return while fundamentalists and technicians are not. The efficient market hypothesis would hold in the weak and semi-strong forms ($H^w{}_0$ and $H^{ss}{}_0$), but only part of the strong form: $H^s{}_0(1)$, does not hold.

Scenario 5

Finally, suppose the market has the same adept fundamentalists and technicians as in the preceding cases, as well as insiders, but that the insiders, in compliance with security laws, report their stock purchases to the Securities and Exchange Commission (SEC). If insiders' trades are announced prior to the company's earnings announcement, then adept fundamentalists would push the stock price up shortly after the insider announcement and before the company's earnings announcement. If the law required that insiders report their trade intentions before they executed them (if that were possible), then with a market consisting of adept fundamentalists, the insiders would not be able to earn abnormal returns. In this case, the efficient market hypothesis would hold in the weak and semi-strong forms, $H^w{}_0$ and $H^{ss}{}_0$, as well as both strong forms, $H^s{}_0(2)$ and $H^s{}_0(1)$.

Implications

The EMH has at least three implications for investments. First, if empirical tests support the weak-form null hypothesis, then technical trading strategies based on trends would be suspect. Paradoxically, the market would have to consist of a sufficient number of technicians for a condition to exist in which there were no abnormal return opportunities from strategies based on technical trends. Similarly, if empirical tests support the semi-strong null hypothesis, then fundamental strategies based on publicly available information would also be suspect. Again, however, the market would have to consist of a sufficient number of fundamentalists for a condition to exist in which there was no opportunity to earn, on average, abnormal returns from using publicly available information. Finally, if empirical evidence supports the two forms of the strong-form hypothesis, then the use of any fundamental strategy would be suspect. Once again, however, the market would have to have a sufficient number of adept fundamentalists and insiders, as well as the appropriate security laws, for a condition to exist in which no abnormal returns could be realized from strategies based on publicly and privately available information.

Second, the EMH can be alternatively stated in terms of three conditions and their implications (see Exhibit 15.1). First, if there are enough technicians, fundamentalists, adept fundamentalists, and insiders, then the market price of the security would be equal to its equilibrium price or value (V): $P^M = V$. Second, if information is disseminated efficiently (no learning lags and no group with better information or with a comparative advantage over other investors in valuing information), then the market price will tend to equal the equilibrium price at all times, and any equilibrium price adjustments to new information will occur rapidly. Third, any new information hitting the market by definition would be random; that is, information already reflected in the price of securities includes expectation (e.g., expected earnings), thus new information would be unexpected (e.g., an unexpected good earnings announcement). Since the new information will also be reflected in the price, and since it is unexpected, it will cause the prices of securities to fluctuate randomly—a random walk.

Conditions		***Implications***
➢ The market consists of fundamentalists and technicians.	$\Longrightarrow$	➢ Stock's market price (P) is equal to the intrinsic value of the stock (V): $P = V$.
➢ Information is disseminated efficiently.	$\Longrightarrow$	➢ $P = V$ at all times.
➢ News is random.	$\Longrightarrow$	➢ $P = V$ fluctuates randomly.

EXHIBIT 15.1 EMH: Conditions and Implications

A third implication of the EMH is that the market provides a fair game. In a fair game, the market cannot use the information available at time *t* to earn an abnormal return. If there is information that an individual (or group) has that enables him to earn abnormal returns, then the market is inefficient and the game is not fair. If the EMH holds, the security market can be deemed a fair game. Also, it should be noted that the EMH does not mean that returns are uncorrelated or independent, but rather that one cannot look at the correlations in past returns to earn excess returns. A firm, for example, could have made a series of risky investments that over several years were successful, resulting in higher realized earnings and returns. Analysts, looking at this company, would therefore see a positive correlation in return. This does not mean excess returns are increasing; rather, since risk is increasing, the company's equilibrium return is also increasing.

Studies of the Weak-Form Hypothesis

As noted earlier, since its introduction the EMH has spurred an extensive amount of empirical research. The research can be divided along the lines of the weak-form, semi-strong-form, and strong-form tests. The weak-form tests of the EMH try to examine whether information contained in historical prices is reflected in current prices. The null hypothesis to be tested is that in a weakly efficient market one cannot earn abnormal returns from trading strategies based on past price information. The empirical research on weakly efficient markets can be divided into two areas: studies of time patterns in security return (also referred to as calendar events) and studies of historical return predictability patterns.

Time Patterns

Studies of time patterns examine whether or not returns are systematically higher or lower during certain periods of time, such as a day of the week, a week of a month, or a month of a year. Surprisingly, a number of early studies discovered certain time patterns in security returns. The two most notable are the abnormally positive return pattern in the month of January, referred to as the *January effect*, and the abnormally low return pattern on Monday, referred to as the *Monday effect*.

Monday Effect

In a 1981 study, Gibbons and Hess reported that over a 17-year period from 1962 to 1978 the average annualized return on Monday was –33 percent. They also found large negative Monday returns for subperiods from 1962 to 1970 and 1970 to 1978. This Monday effect was also reported in a 1986 study by Harris. In addition to finding large negative Monday returns, Harris also found that much of the observed Monday decline occurred between the close of trading on Friday and the first hours of trading on Monday: a time trend referred to as the *weekend effect*. The Monday effect certainly questions whether markets are weakly efficient, suggesting that speculators could earn abnormal returns by shorting stocks on late Friday and covering their positions by purchasing their stocks early on Monday.

January Effect

A number of studies have found that the average returns on stocks in the month of January are significantly higher than the average returns in other months, with the stocks of smaller firms showing the largest returns. In a 1991 study, Eugene Fama found that for the period from 1941 to 1981, the average return in January for small stocks was 8.06 percent and for large stocks was 1.34 percent. In both groups, these average monthly returns were higher than the average returns in other months. Fama also found a similar January pattern from the more recent time period from 1982 to 1991, with small stocks averaging a return of 5.32 percent and large stocks a return of 3.2 percent in the month of January. Exhibit 15.2 shows monthly rates of return for the S&P 500 from 2003 to 2013, with the month in each year ranked from highest to lowest. As shown, in 8 of the last 10 years, the month of January had the highest rate of return.

Month	Rate	Month	Rate	Month	Rate	Month	Rate	Month	Rate
4/30/2003	0.1247	1/30/2004	0.3447	1/31/2005	0.0722	1/31/2006	0.1065	1/31/2007	0.13239
10/31/2003	0.1459	11/30/2004	0.0377	7/29/2005	0.0448	10/31/2006	0.0764	4/30/2007	0.03068
5/30/2003	−0.0829	12/31/2004	0.0325	11/30/2005	0.0124	9/29/2006	−0.0305	9/28/2007	0.02994
12/31/2003	0.1539	6/30/2004	−0.0587	5/31/2005	−0.0464	8/31/2006	−0.0240	5/31/2007	0.00253
1/31/2003	−0.2304	10/29/2004	−0.0093	2/28/2005	0.0102	11/30/2006	0.0743	10/31/2007	0.01226
8/29/2003	0.1780	2/27/2004	0.0130	9/30/2005	0.0209	12/29/2006	0.0126	8/31/2007	−0.04866
7/31/2003	−0.0176	5/31/2004	−0.0212	6/30/2005	−0.0305	4/28/2006	−0.0759	3/30/2007	−0.03605
6/30/2003	−0.0160	9/30/2004	−0.0054	12/30/2005	0.0478	3/31/2006	−0.0120	12/31/2007	0.03343
3/31/2003	−0.1296	8/31/2004	−0.0093	8/31/2005	−0.0224	7/31/2006	−0.0140	6/29/2007	0.02383
11/28/2003	0.2476	3/31/2004	0.0199	10/31/2005	−0.0109	2/28/2006	0.0031	2/28/2007	−0.06421
9/30/2003	−0.0588	4/30/2004	−0.0168	3/31/2005	−0.0219	6/30/2006	−0.0082	7/31/2007	0.03444
2/28/2003	−0.1554	7/30/2004	−0.0050	4/29/2005	−0.0201	5/31/2006	−0.0001	11/30/2007	0.01778
Average	0.0133	Average	0.0268	Average	0.0047	Average	0.0090	Average	0.01403
7/31/2009	0.1018	1/29/2010	0.1681	1/31/2011	0.1806	1/31/2012	0.1600	1/31/2013	0.14331
9/30/2009	0.0705	9/30/2010	0.0627	10/31/2011	−0.0255	2/29/2012	0.0406	7/31/2013	0.12524
10/30/2009	−0.0198	7/30/2010	−0.0347	2/28/2011	0.0590	6/29/2012	−0.0026	10/31/2013	0.04201
11/30/2009	0.0574	12/31/2010	0.1416	4/29/2011	0.0274	3/30/2012	0.0340	3/29/2013	−0.10666
12/31/2009	0.0178	3/31/2010	−0.0701	12/30/2011	−0.0777	9/28/2012	0.0229	9/30/2013	0.07160
8/31/2009	−0.0847	10/29/2010	0.0118	3/31/2011	0.0543	8/31/2012	−0.0237	5/31/2013	−0.03022
1/30/2009	−0.3562	2/26/2010	−0.0666	11/30/2011	−0.0595	7/31/2012	−0.0194	4/30/2013	−0.02034
3/31/2009	−0.0339	4/30/2010	0.0744	5/31/2011	0.0788	12/31/2012	0.0340	2/28/2013	−0.05189
4/30/2009	0.0568	11/30/2010	−0.0052	6/30/2011	−0.0183	11/30/2012	−0.0070	6/28/2013	0.06047
2/27/2009	−0.1578	8/31/2010	−0.1112	7/29/2011	−0.0215	4/30/2012	−0.0129	8/30/2013	0.01662
5/29/2009	0.2504	6/30/2010	−0.0177	8/31/2011	−0.0568	10/31/2012	0.0102		
6/30/2009	0.0002	5/31/2010	0.0570	9/30/2011	−0.0718	5/31/2012	−0.0721		
Average	−0.0081	Average	0.0175	Average	0.0057	Average	0.0137	Average	0.02501

EXHIBIT 15.2 Monthly Rates of Return for S&P 500, 2003–2013

Data Source: Bloomberg

The January effect is not unique to the United States. Gultekin and Gultekin in a 1983 study found average returns in January higher than in other months for the 16 countries that they studied. Brown, Keim, Kleidon, and Marsh (1983) also found a January effect extant in Australia; Berges, McConnell, and Schlarbaum (1984) documented one in Canada; and Kata and Shallheim (1985) found excess January returns for stocks traded on the Tokyo exchange, with the smaller stocks earning an average return of 8 percent.

Several theories have been advanced to explain this January anomaly. One popular explanation offered is a *tax-selling hypothesis*. According to this theory, many investors holding stocks with capital losses sell them at the end of the year to realize the tax deduction, and then buy comparable stocks at the beginning of the year. Their actions of selling at the end of the year and buying at the beginning of the year results in the price of many stocks being lower at the beginning of the month of January and higher later in the month. Studies by Reinganum (1983) and Branch (1977) have found that stocks that reached their low in December (stocks that would have yielded capital losses for investors who purchased them during the year) on average grew faster in the month of January than any other month. Moreover, Reiganum found that a high proportion of those stocks are those of small firms. One of the problems with accepting the tax-selling hypothesis as the sole explanation of the January effect is that the effect occurs in other countries that have a different tax year (e.g., Australia) or no capital gains tax (e.g., Japan and Belgium). Another possible explanation for the January effects is a *liquidity argument* in which investors have a greater liquidity need at the end of the year and as a result are selling stock at the end of year, leading to lower stock prices at the beginning of the year.

Both the tax-selling and liquidity arguments combined may explain the January effect. If markets are weakly efficient, however, we would expect investors trading on past security price patterns to purchase stocks at the end of December and sell in January to take advantage of the abnormal returns. These actions, in turn, would serve to increase the price of the stock at the end of the year and decrease it in

January, thereby eliminating the January effect. This anomaly certainly questions the weak form of the EMH.

Return Predictability Studies

In addition to time patterns, studies of weakly efficient markets also include return predictability patterns. These studies involve tests of whether or not prior returns can be used to predict future returns. The statistical tests used in many of these studies include serial correlation tests, run tests, and filter rule tests.

Serial Correlation Tests

Serial correlation (or autocorrelation) is a measure of the correlation between a series of numbers and a lagged series of numbers. In testing the weak-form hypothesis, researchers typically estimate the serial correlation between the rate of change in a security's price in one period (t) and the rate of change in the same security's price in an earlier period ($t-i$). To determine the degree of serial correlation, a security's return in one period is regressed against its return in a previous period; that is:

$$r_t = a + br_{t-i} + \varepsilon_t$$

where:

- i = number of periods from t (e.g., 1, 2, ...).

In determining whether or not serial correlation exists, researchers look at the slope coefficient (b) to see if it is significantly different from zero and at the coefficient of determination (R^2) to determine the proportion of variation in returns in period t that can be explained by the variation in returns in period $t - i$.

A number of serial correlation studies have been conducted. The studies vary in terms of the securities analyzed, the lags used, and the sample periods (day, week, year, etc.). They are all unable to detect any significant pattern in security returns, finding serial correlations close to zero.

Run Tests

In a run test, a researcher looks at the number of times a security's price changes its sign; that is, goes from increasing to decreasing or decreasing to increasing. For example, from the seven closing prices shown below, there are three runs:

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Monday	Tuesday
Price	52	53	51	50	49	50	49
Sign		+	–	–	–	+	–
Run			1			2	3

In an early study, Fama (1965) compared the runs from 30 Dow Jones Average stocks to the runs obtained from random number tables and found no significant difference. However, as we noted in the last chapter, the Hurst exponent is a metric used to identify price patterns hidden within seemingly random stock price trends (Bloomberg's Hurst screen: GPO KAOS). If a price trend is random, then the Hurst coefficient would continuously have a value close to 0.5. If not, then there is pattern to the stock price movement. For the period 2000–2013, Bloomberg's Hurst exponent value for the S&P 500 averaged 0.735 (Exhibit 14.25). Using the Hurst screen for other stocks shows more often than not that the price patterns of many stocks have Hurst exponent values higher or lower than 0.5, suggesting patterns to their movements and providing an argument for the use of technical analysis.

Filter Rules

Filter rules are timing strategies aimed at defining when a security should be purchased and when it should be sold. The rules are constructed based on past price behavior. For example, as discussed in Chapter 14 many technicians believe that security prices tend to randomly fluctuate within bands, until they break through their barrier, such as, an increase past their resistance line followed by an increase to a new higher level, or a decrease past their support barrier followed by a decrease to a new lower level. An X percent filter rule would be:

> *If the price of the stock increases by at least X percent, buy and hold it until it reaches a peak and then drops at least X percent. When the stock drops from the peak by X percent, liquidate the position and sell short. Keep the short position until the price hits a new bottom and turns up. When the price increases by X percent from the new low, close the short position and take a new long position.*

Exhibit 15.3 shows a filter rule applied to the S&P 500. The filter is set at 7.5 percent (a large filter). A long position is taken after the market increases from a bottom by at least 7.5 percent, and short position is taken after the stock has decreased by at least 7.5 percent from a peak.

EXHIBIT 15.3 A 7.5 Percent Filter Applied to S&P 500 Bloomberg: GP Graph for S&P 500

Different filters can be applied by varying the X percent. In examining weakly efficient markets, researchers have tried to determine if filter rules based on historical patterns can earn returns significantly different from a naive buy-and-hold strategy in which one buys on the first day of the period and sells on the last day of that period. One of the first studies examining filter rules was done by Fama and Blume (1966). Using the 30 Dow Jones stocks, Fama and Blume varied their filters from X = 0.5 percent to X = 4 percent and then compared the returns obtained from each filter to the returns from a buy-and-hold strategy. They found that the only filter to outperform the buy-and-hold strategy was the one with X = 0.5 percent. They did find, however, that filters of 1 percent and 1.5 percent were more profitable on a before-commission cost basis than the buy-and-hold strategy when only the long positions were considered; these strategies, however, became unprofitable when transaction costs were included.

In a 1988 study, Sweeney showed that in the Fama and Blume study many of the filter rules that resulted in short positions led to trading losses, although many of the long positions were profitable. As a result, in his study of filter rules Sweeney evaluated returns using the following filter:

> *If the price of a stock increases by X percent from a previous low, buy and hold until it decreases by at least X percent from a subsequent high. Then liquidate the long position and invest in a risk-free security until the stock reaches its next trough and increases by X percent.*

Using this filter rule, Sweeney was able to find certain stocks that consistently yielded above average profits; unfortunately, these profits disappeared when commission costs were applied.

In a 1992 study, Brock, Lakonishok, and LeBaron tested several different breakout rules for Dow Jones stocks covering the period from 1897 through 1986. They, in turn, found the trading rules were profitable. In their 1992 study, they also reported that trading rules based on moving average were profitable. However, in a later study, Bessembinder and Chan (1998) found that over different sample periods such rules were less profitable.

A number of other studies have also been conducted to test filter rules and breakout rules. These studies vary in terms of the stocks analyzed, the filter rules tested, and the sample period examined. The conclusion reached by these studies is that, with the exception of small filters, filter rules do not outperform naive buy-and-hold strategies. Most of these studies also find that low filters (e.g., X = 0.5 percent) yield above average profits on a before-commission cost basis, but that the higher trading costs for implementing low filter rules negates the profits from these strategies.

Back Testing Breakout Rules, Bloomberg BTST Screen

Filter rule tests are designed to test technical rules of buying and selling when stocks break their support and resistance levels. Bloomberg's back testing screen (BTST) can be used to back test the profitability of various technical trading rules, including when stocks hit their resistance and support line. Exhibit 15.4

shows a back test of a moving average envelope (15-day moving average with a 3 percent band) for the S&P 500, in which a long position is taken when the closing price cuts its lower band and a short positive when it cuts its upper band. The back test covered the period from 11/8/2008 to 11/8/2013. The percentage return for the moving-average envelope strategy was 49 percent. However, the percentage return from a buy-and-hold strategy for the period was 93 percent. Most of the losses, however, were from the short positions, giving some credence to the aforementioned Sweeney study. The percentage gain from a back test of the same strategy applied to the Bollinger band, which has a wider band than the moving-average envelope, however, was 122 percent for the same period (see Exhibit 15.5).

EXHIBIT 15.4 Backtests of Moving-Average Envelope, S&P 500, 11/8/2008–11/8/2013, Bloomberg, BTTS Screen

EXHIBIT 15.5 Backtests of Bollinger Band, S&P 500, 11/8/2008–11/8/2013, Bloomberg, BTTS Screen

Conclusions on Weakly Efficient Markets

The tests of weakly efficient markets are mixed. On the one hand, the existence of January and Monday effects suggest abnormal returns are possible by implementing trading strategies around those periods. On the other hand, other studies suggest that the returns on securities are serially uncorrelated and that the runs observed on stocks are not significantly different from the runs obtained from a random number generator. Finally, some studies suggest that certain filter rules can yield above average profits before commission cost, but not after.

BLOOMBERG'S HURST SCREEN

Bloomberg's Hurst screen (GPO KAOS) is based on the work of Christopher May who applied the Hurst exponent to nonlinear price patterns. Bloomberg's Hurst exponent screen can be used to test for randomness. If a price trend is random, the Hurst coefficient would continuously have a value close to 0.5. If not, then there is pattern to the stock price movement. See Exhibit 14.25.

The Hurst coefficients for a number of stocks, such as those that make up an index, can be found using the RV screen for the index and then adding a column by typing in "Hurst." The coefficient for a number of stocks can also be found using the Bloomberg Excel Add-In.

BACK TESTING

Back testing, BTST: BTST <Enter>: The BTST screen back tests a number of different technical studies and compares them to a naive buy-and-hold strategy. On BTST, click the pencil icon to bring up a box for setting the conditions of the test. The back test for the moving average envelope and the Bollinger band shown in Exhibits 15.4 and 15.5, respectively, were set up using BTST.

ANNOTATIONS

Lines, regression lines, bands, and other drawings can be included on a graph by clicking the "Annotate" button on the gray toolbar at the top of the price chart. Clicking the button will bring up an annotations palette showing all of the tools for drawing on the chart, editing, and deleting. The percent change lines shown in Exhibit 15.3 to identify 7.5 percent filter points were drawn from the annotation palette.

BLOOMBERG EXCEL ADD-IN

The data in Exhibit 15.2 was imported into Excel using Bloomberg's Excel Add-In and the "Import Data" tab.

- On the Bloomberg Add-In in Excel, click “Historical End of the Day” from the “Import Data” and then follow the Wizard's steps.
- The monthly rates shown in Exhibit 15.2 were sorted in Excel (Sort function) from “highest to lowest.”

See Bloomberg Web Exhibit 15.1.

Studies of the Semi-Strong-Form Hypothesis

Semi-strong-form tests of the EMH were defined earlier as tests to determine whether or not publicly available information is reflected in current prices. According to the null hypothesis, in a semi-strong efficient market, investors, on average, cannot earn abnormal returns from trading strategies based on public information. Studies of semi-strong efficient markets can be divided into cross-sectional studies based on firm characteristics and studies of events and announcements.

Cross-Sectional Studies

Cross-sectional studies of the EMH examine whether stocks with common, observable features such as their size or price-to-earnings ratios earn abnormal returns. Three possible anomalies that have been identified by researchers examining firm characteristics are stocks with low price-to-earnings per share ratios, small-sized stocks, and stocks with high book-to-market values.

Low Price-to-EPS Ratios

A popular time-honored investment strategy among security analysts is to invest in stocks with relatively low price-to-EPS ratios (*P/e*). In a 1977 study, Basu empirically examined this investment strategy using a sample of 750 NYSE-listed stocks over a 14-year period from 1955 through 1971. Staring with the first year in his study, 1955, Basu calculated each stock's *P/e* ratio. He next ranked the 750 stocks in the order of their *P/e* ratios and formed five quintile portfolios.[1] Monthly rates of return were then calculated for the five *P/e* portfolios for the following year (1956), with each stock in the portfolio having an equal weight. Basu repeated the same calculations for the next year (1956), first arraying stocks in the order of their *P/e* ratios, next forming five *P/e* quintile portfolios, and lastly calculating the portfolio's monthly returns for the following year (1957). Basu repeated these calculations through 1971, yielding 168 monthly returns on five *P/e* portfolios. The portfolios Basu formed, in turn, could be viewed as mutual funds with a certain *P*/e size that were readjusted each year. Using the 168 monthly portfolio returns, Basu next regressed each portfolio's risk premium ($R_p - R_f$) against the market risk premium ($R_M - R_f$):

$$R_p - R_f = \alpha_p + \beta_p(R_M - R_f) + \varepsilon_p$$

He then evaluated each portfolio's performance in term of the Sharpe, Treynor, and Jensen performance measures:

$$\lambda_S = \frac{\bar{R}_p - R_f}{\sigma_p}$$
$$\lambda_T = \frac{\bar{R}_p - R_f}{\beta_p}$$
$$\lambda_J = \alpha_p$$

The three portfolio performance measures Basu calculated for the five quintile portfolios are shown in Exhibit 15.6. In examining the table, note that there is an inverse relation between the *P/e* ratio and the portfolio ranking, with the dominant portfolio (based on all three measures) being the low *P/e* portfolio. In fact, Basu also found that based on the Sharpe index, the low *P/e* portfolio was one of only two of the quintile portfolios with a higher risk premium per level of risk than the market. The Basu study thus provided empirical support for the time-honored investment strategy of investing in stocks with low *P/e* ratios. The study also suggests a market anomaly. However, Johnson, Fiore, and Zuber (1989) found using the Basu methodology for the period from 1985 to 1989 that low *P/e* portfolios underperformed the market, as well as other *P/e* portfolios. More recent studies of low *P/e* stock performances in the period of 1990s and 2000s, however, show such stocks are again earning abnormal returns.

P/e Portfolios	1	2	3	4	5
λ_S	0.2264	0.1886	0.1475	0.0967	0.0903
λ_T	0.1237	0.1047	0.0822	0.0537	0.0508
λ_J	0.0467	0.0228	0.0017	−0.0277	−0.033

1 = lowest *P/e* portfolio, … , 5 = highest *P/e* portfolio

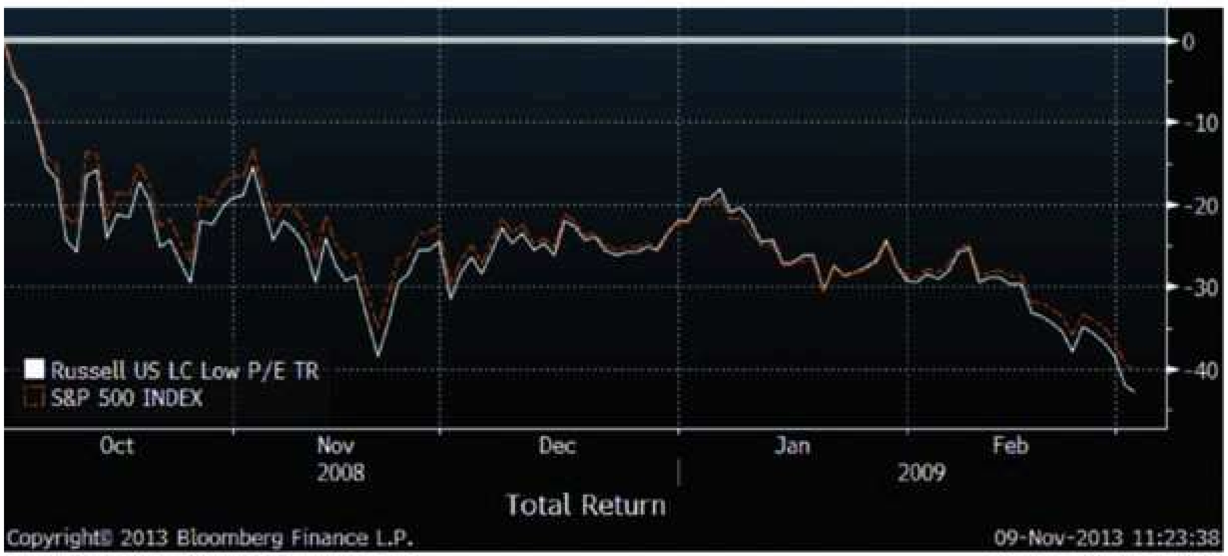
Source: Basu, S. 1977. Investment performance of common stocks in relations to their price-earnings ratios: A test of the efficient market hypothesis. *Journal of Finance* 32 (June): 663-682.

EXHIBIT 15.6 Basu Study, Performance Measures on *P/e* Portfolios

Exhibit 15.7 (top panel) shows the total returns based on daily percentage changes in price for the Russell U.S. Large Cap Low *P/e* index (RU1LPETR) and the S&P 500 from 11/7/2008 to 11/30/2012 when there was a bullish market trend. For that period, the low *P/e* index outperformed the S&P 500 with a total return of 70.64 percent (annualized return of 14.04 percent) compared to a 52.12 percent return (10.87 percent annualized return) for the S&P 500. However, when the market was declining from 10/1/2008 to 3/3/2009, the total return of the low *P/e* Index was −42.94 percent compared to −40.03 percent for the S&P 500 (middle panel). The lower panel of Exhibit 15.7 shows the regression line of the low *P/e* index against the S&P 500 (for the period from 10/1/2008 to 11/30/2012). The low *P/e* index has an alpha that is very close to zero and beta of 1.113. Theses regression results suggest that for at least this period, the low *P/e* index is a higher beta portfolio with no abnormal returns.


Russell US LC Low P/E TR
S&P 500 INDEX
80
60
40
20
0
-20
08
2009
2010
2011
2012
Total Return
Copyright© 2013 Bloomberg Finance L.P.
09-Nov-2013 11:12:28

(a)


0
-10
-20
-30
-40
Russell US LC Low P/E TR
S&P 500 INDEX
Oct
Nov
2008
Dec
Jan
2009
Feb
Total Return
Copyright© 2013 Bloomberg Finance L.P.
09-Nov-2013 11:23:38

(b)


<HELP> for explanation.
Dep RU1LPETR Index
Indep SPX Index
98) Actions
97) Edit
Regression Analysis
Data Last Price
Data Last Price
Daily
Linear
Beta +/-
Non-Param
Reg On
Percent
10/01/08
11/30/12
11/09/10
11/09/12
Stacked
Lag
Winsorize
Std Dev
Local CCY
Legend
Zoom
Track
Copy
Statistics
Transformations
Y = 1.113 X + 0.008
RU1LPETR Index-Percent
SPX Index-Percent
Y = Russell US LC Low P/E TR
X = S&P 500 INDEX
Linear Beta Range 1
Raw BETA 1.113
Adjusted BETA 1.075
ALPHA (Intercept) 0.008
R^2 (Correlation^2) 0.981
R (Correlation) 0.990
Std Dev of Error 0.257
Std Error of ALPHA 0.008
Std Error of BETA 0.005
t-Test 231.968
Significance 0.000
Last T-Value -0.051
Last P-Value 0.480
Number of Points 1049
Last Spread 52.94
Last Ratio 0.963
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2013 Bloomberg Finance L.P.
SN 107545 EST GMT-5:00 G564-1650-0 09-Nov-2013 11:54:44

(c)

EXHIBIT 15.7 Total Return Graph Russell U.S. Large Cap Low *P/e* Index (RU1LPETR) and S&P 500 (SPX) 11/7/2008 to 11/30/2012 and 10/1/2008 to 3/3/2009

Exhibit 15.7a: 11/7/2008–11/30/2012

Total Return:

- Low *P/e* Index = 70.64 percent (Annualized Return = 14.05 percent)
- S&P = 52.12 percent (Annualized Return = 10.87 percent)

Note: Returns are percentage price change; dividends are not included. Exhibit 15.7b: 10/1/2008–3/3/2009

Total Return:

- Low *P/e* index = −42.94 percent (Annualized Return = −73.78 percent)
- S&P 500 = −40.03 percent (Annualized Return = −70.47 percent)

Size Effect

Another firm characteristic that has received a considerable amount of attention among researchers is firm size. In an early anomaly study, Banz (1981) formed 10 equally weighted decile portfolios based on size from the NYSE-listed stocks, and regressed each portfolio's return premium against the market premium. Using the intercept term from these regressions as an estimate of abnormal return, Banz found excess returns from the portfolio consisting of the smallest-size stocks. Banz concluded that over an extended period of time, small firms earned significantly larger risk-adjusted returns than larger firms.

Similar conclusions on size and performance were also reached in another early anomaly study on the size effect for both NYSE and AMEX stocks by Reinganum (1983). For the period from 1963 to 1980, Reinganum found that a portfolio of small firms grew from $1 in 1963 to $46 in 1980 with annual rebalancing, while a portfolio of large firms grew from $1 to only $4 during that same period with annual rebalancing. Both the Banz and Reinganum studies suggest an anomaly existed over a long time period.[2] Exhibit 15.8 shows the total returns for the S&P Small Cap Core Index (DEFISCCI) and Large Cap Core Index (DEFILCCI) for the five-year period from 11/28/2008 to 10/31/2013 when there was a bullish trend. For that period, the small cap index outperformed the large cap with a total return of 183.45 percent (annualized return of 23.55 percent) compared to a 136 percent return (19.07 percent annualized return) for the large cap index. However, when the market was declining from 10/2/2008 to 3/3/2009, the total return of the small cap index was −48.41 percent compared to −42.43 percent for the large cap index (lower panel of Exhibit 15.8).


DEFINED SML CAP CORE IDX
DEFINED LRG CAP CORE IDX
200
150
100
50
0
2009
2010
2011
2012
2013
Total Return
Copyright© 2013 Bloomberg Finance L.P.
09-Nov-2013 10:04:38

(a)


0
-10
-20
-30
-40
-50
DEFINED SML CAP CORE IDX
DEFINED LRG CAP CORE IDX
Oct
Nov
2008
Dec
Jan
Feb
2009
Total Return
Copyright© 2013 Bloomberg Finance L.P.
09-Nov-2013 10:17:40

(b)

EXHIBIT 15.8 Total Return Graph S&P Small Cap Core Index (DEFISCCI) and Large Cap Core Index (DEFILCCI) 11/28/2008 to 10/31/2013 and 10/1/2008 to 3/3/2009

Exhibit 15.8a: 11/28/2008–10/31/2013

Total Return:

- Small Cap index = 183.45 percent (Annualized Return = 23.55 percent)
- Large Cap index = 136 percent (Annualized Return = 19.07 percent)

Exhibit 15.8b: 10/1/2008–3/3/2009

Total Return:

- Small Cap index = −48.41 percent (Annualized Return = −79.38 percent)
- Large Cap index = −42.43 percent (Annualized Return = −73.21 percent)

A number of studies have tried to explain the size effect. James and Edmister (1983), for example, posit that there is a lower trading volume on small-size firms that causes them to trade with a liquidity premium over larger, more marketable stocks. Barry and Brown (1984) argue that there is less information about small firms that causes investors to require a higher return or an *information premium* over larger, more well-known stocks. This information premium is also supported by a study by Arbel and Strebel (1983) on neglected firms. Grouping stocks into three categories (highly followed, moderately followed, and neglected), they found that not only did a small-size effect exist, but also that there were abnormal returns for the neglected stock group.

Book-to-Market Value

In a 1994 study, Lakonishok, Shleifer, and Vishny examined the performance of stock portfolios grouped in terms of the stock's book-to-market value. To eliminate the size effect, they first formed five quintile portfolios based on size. From each of these portfolios, they formed 10 decile portfolios based on the stock's book-to-market value. Among the five quintile portfolios, Lakonishok, Shleifer, and Vishny found an average difference of approximately 8 percent between the high book-to-market value portfolios and the low book-to-market value ones.

Fama and French (1992) also found a significant positive relationship between the book-to-market value ratios and average returns. Running a number of cross-sectional regressions, they found that leverage and *P/e* ratios were significant explanatory variables of a stock's return when they were the only variables in the regression, but were insignificant when size and book-to-market values were included as explanatory variables in the regression. In contrast, they found size and book-to-market value significant when included together, as well as significant and dominant when other variables were included.

Other Anomalies

The studies by Basu, Banz, Lakonishok, Shleifer, and Vishny, and Fama and French suggest that abnormal returns may be possible from buying stocks with either low *P/e* ratios, relatively small sizes, or large book-to-market value ratios. Combined, these studies question whether publicly available information is reflected in security prices and therefore whether the market is semi-strongly efficient.

In addition to these studies, a number of other cross-sectional studies have also identified return irregularities. Notable anomalies were found with stocks characterized with positive skewness and stocks that had previously been poor performers. Specifically, studies by Friend and Lang (1988), Westerfield (1977), and Barone-Adesi (1985) show that there are possible gains in portfolio returns by allocating more investment funds to stocks that are characterized by positive skewness. A study by DeBondt and Thaler (1985) found abnormal returns by going long in stocks that in the previous year were the biggest losers and by going short in stocks that in the previous year were the biggest winners. In their study, they constructed portfolios each December of the 50 stocks that did the best and the 50 that did the poorest. Measuring the performance of those portfolios over the next three years, they found positive abnormal returns for the portfolio consisting of the 50 poorest stocks and negative abnormal returns for the portfolio consisting of the 50 best.

The existence of all of these anomalies certainly leads one to question the semi-strong-form of the EMH. In fact, many investors over the years have jumped on the anomaly bandwagon looking for abnormal returns. Before rejecting the semi-strong-form hypothesis, however, it is important to recognize that the anomalies reported in many of these studies are based on a CAPM framework. It could very well be that the reported irregularities are simply the result of omissions of important variables that are needed to explain equilibrium returns. This is the conclusion reached by Chan and Chen in a study of the size effect (1991). Using both CAPM and a multi-index/APT model to explain the equilibrium returns on the portfolios constructed based on size, they found that the difference in returns between the small size portfolios and the large size ones was only 1.5 percent using their multifactor model, compared to an 11 percent difference using the single-factor CAPM. Furthermore, they found that the size effect disappears when a multi-index/APT model is used and that the abnormal return observed using a CAPM framework could be explained by the risk premium term in an APT model. In addition to limitations of CAPM, another factor to consider in examining anomalies is that some may simply be proxies for others. For example, a small firm portfolio may simply be a proxy for a low *P/e* portfolio. This was the conclusion that Basu reached in a 1983 article in which he reported that the highest risk-adjusted returns were in portfolios with small firms and low *P/e* ratios. Recall, however, that Fama and French also found that *P/e* ratios were significant by themselves, but that they became insignificant when both size and book-to-market values were considered.

Event Studies

When an event such as an unexpected good earnings announcement or a merger occurs, investors re-assess the value of the security and by their subsequent trading cause the price of the security to change. In addition to cross-sectional studies, empirical studies of the semi-strong-form tests of the EMH also try to determine if there are enough fundamentalists to ensure that investors, on average, do not earn abnormal returns from trading on events and announcements. Empirical studies examining this form of the semi-strong EMH are called *event studies*. These studies try to ascertain how long it takes for new information to be reflected in the price.

Methodology of Event Studies

A common methodology used in many event studies is to estimate the *cumulative abnormal returns* (*CAR*) before and after the event. A *CAR* test consists of the following steps:

1. **Step 1:** Collect a sample of companies that have experienced the event being studied.
2. **Step 2:** Determine the time of the event and the period before and after. If the period around the event is 60 days, for example, then each day prior to the event could be designated as −30, −29, −28, ... , −1, the day of the event as 0, and each of the days after the event as +1, +2, +3, ... , +30. In many studies the time periods prior to and after the event are usually equal and many use daily data.
3. **Step 3:** Determine the abnormal returns for each stock in the sample for each day, ϵ_i. A stock's abnormal return on a given day is equal to its actual return minus its equilibrium return, with the equilibrium return being determined by using a single or multi-index model.
4. **Step 4:** Compute the average abnormal return for each day from the abnormal returns of the stocks in the sample.

5. **Step 5:** Compute the cumulative average residual (CAR_t) for each period (t = 29, 28, … , 30) by summing the average residuals from the beginning of the sample period (t = −30) to that period.
6. **Step 6:** Interpret the results.

Using the *CAR* methodology, the effect of an event is examined in terms of how the *CAR* values move before and after the event. For example, if the *CAR* values prior to the event are relatively constant, then increase at or near the event, and then become stationary again after the event, it could be inferred that the market did not anticipate the event; but when it did occur, it reacted positively and efficiently. This pattern, in turn, would be consistent with a semi-strong efficient market. On the other hand, if the *CAR* values prior to the event were stationary and then increased near the time of the event, as well as after the event, then abnormal returns could be earned after the event; this trend would be inconsistent with the semi-strong efficient market. Finally, if the *CAR* values increase prior to the event and then become stationary, then it could be inferred that the market anticipated the event. In such cases, it may be that there is prior information (either public or private) that is signaling the event or it may be that the event in question is preceded by other related events or information. In either case, the presence of abnormal returns suggests market inefficiencies.

One of the early event studies using a *CAR* methodology was conducted by Fama, Fisher, Jensen, and Roll (FFJR) (1969). Their study examined the impact of stock splits and stock dividends on security returns. Taking 940 stock splits on NYSE-listed stocks over a sample period from 1927 through 1959, they first estimated each stock's characteristic line using a 60-month period around the split (30 months before and 30 months after):

$$r_i = \alpha + \beta R_M + \varepsilon_i$$

They next calculated the residual errors, ϵ_{it}, around the time of the split or stock dividend for each month (−30, −29, … , 0, +1, + 2, … +30):

$$\varepsilon_{i,t} = r_{i,t}^{Obs} - [\alpha + \beta R_{M,t}^{Obs}]$$

where:

- $r^{Obs}_{i,t}$, $R_{M,t}{}^{Obs}$ = observed returns at time t.

Note that if the residual error at the time of a stock split were positive, then the stock's return would be above the characteristic line, implying abnormal returns. To minimize the effect of factors other than the stock split or dividends on returns, FFJR next calculated the average residual error for the 940 stock splits and dividends analyzed for each of the 60 months:

$$\bar{\varepsilon}_t = \frac{1}{940} \sum_{i=1}^{940} \varepsilon_{i,t}$$

This yielded 60 average residuals: $\bar{\varepsilon}_{-30}, \bar{\varepsilon}_{-29}, \ldots, \bar{\varepsilon}_{30}$.

Finally, they computed the cumulative average residual for each period by summing the average residuals from the beginning of the sample period (t = −30) to that period (T):

$$CAR_T = \sum_{t=-30}^{T} \bar{\varepsilon}_t$$

Exhibit 15.9 shows a representation of the *CAR*s that FFJR found in each of the months before and after a stock split and stock dividend. As can be seen, the *CAR*s were increasing in the months preceding the split or stock dividend and then became constant after the stock split or dividend.

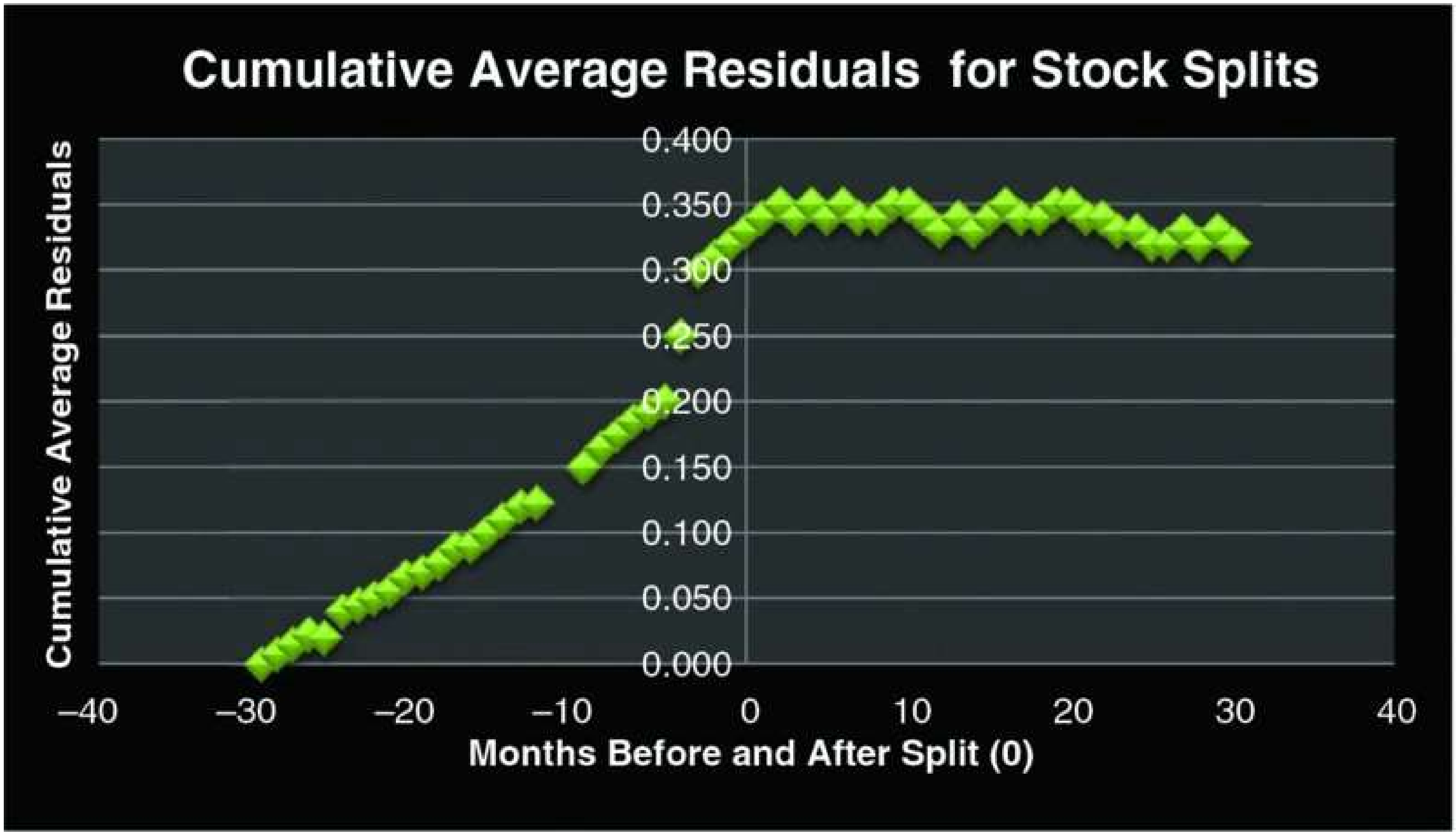


EXHIBIT 15.9 Cumulative Average Residuals Error, 30 Months Before and After a Stock Split

Graphical Representation of the Fama, Fisher, Jensen, and Roll Study (1969)

In trying to interpret FFJR's results, most analysts would not conclude that the market sees a stock split or dividend as having a positive impact on the company's earnings and that it anticipates the event; stock splits and dividends are simply paper shuffling. Rather, most analysts would argue that stock splits and stock dividends are often accompanied by increases in earnings and cash dividends that, in turn, are the major factors leading to an increase in the stock's fundamental value. Thus, in the FFJR study the increase in *CAR* values prior to the splits could be interpreted as a case in which the market is already expecting higher earnings, with these expectations being reached prior to the split.

A number of event studies have been conducted using a CAR methodology similar to FFJR's. Among the events examined are unexpected earning announcements, initial public offerings, new exchange listings, corporate events, macroeconomic events, and world events. Collectively, the findings from these studies lead to mixed conclusions about the efficiency of the market.

Unexpected Earnings Announcements

A number of early studies using a CAR methodology have found that security prices tend to react quickly to anticipated earnings announcements. A more engaging question with respect to earnings, however, is how quickly the market reacts to unexpected earnings announcements.

In an early event study, Joy, Litzenberger, and McEnally (1977) used a *CAR* methodology to test the impact of unexpected earnings announcements on stock prices. They grouped the stocks in their sample into the following categories based on the differences in their actual and expected quarterly earnings: (1) plus and minus deviations of 20 percent, and (2) plus and minus deviations of 40 percent. Examining the *CAR*s for a period of 13 weeks prior to the quarterly announcement and 26 weeks following it, they found that stock prices tended to adjust quickly to the unfavorable earnings announcements, but slowly to the favorable earnings announcements, finding a 4 percent gain in the 20 percent above-expectation group and a 6 percent gain in the 40 percent above-expectation group. The Joy, Litzenberger, and McEnally study suggests that, while unfavorable earnings information is quickly reflected in a stock price, favorable information about a company's earnings takes some time before it is fully reflected, allowing investors to earn abnormal returns. Thus, their study questions the semi-strong EMH.

In a 1982 study, Rendleman, Jones, and Latane also applied a *CAR* methodology to test how the market responded to unexpected good and unexpected bad earnings announcements. To measure the unexpected earnings of a company, they calculated the company's *standardized unexpected earnings* (*SUE*) for each quarter *t*:

$$SUE_{i,t} = \frac{EPS_{i,t} - E(EPS_i)}{\sigma(\varepsilon_i)}$$

where:

- $EPS_{i,t}$ = stock *i*'s announced EPS for quarter *t*
- $E(EPS_i)$ = expected EPS estimated by extrapolating EPS from an estimated trend regression
- $\sigma(\epsilon_i)$ = standard deviation of the forecast error (error term from the trend regression)

A *SUE* measures the forecast error per average deviation in error. Thus, a predictable company with an average standard deviation of errors of $0.25 and a forecast error for the quarter of $1.00 (*SUE* = 4) would be considered to be a bigger earnings surprise than a less predictable company with an average standard deviation of forecast errors of $1.00 but with a forecast error of $1.00 for the quarter (*SUE* = 1).

In their study, Rendleman, Jones, and Latane obtained the quarterly earnings announcements of approximately 1,000 companies for the period from 1972 through 1980. They then calculated the *SUE* values for each company for each quarter, ranked the companies in the order of their *SUE* values, and formed 10 decile *SUE* portfolios. Rendleman, Jones, and Latane then calculated the *CAR*s for each group beginning with 20 days before the earnings announcement and 90 days after the announcement. They applied this *SUE*/*CAR* methodology to every quarter in the sample. The average *CAR*s for each of the 10 *SUE* groups are shown in Exhibit 15.10.

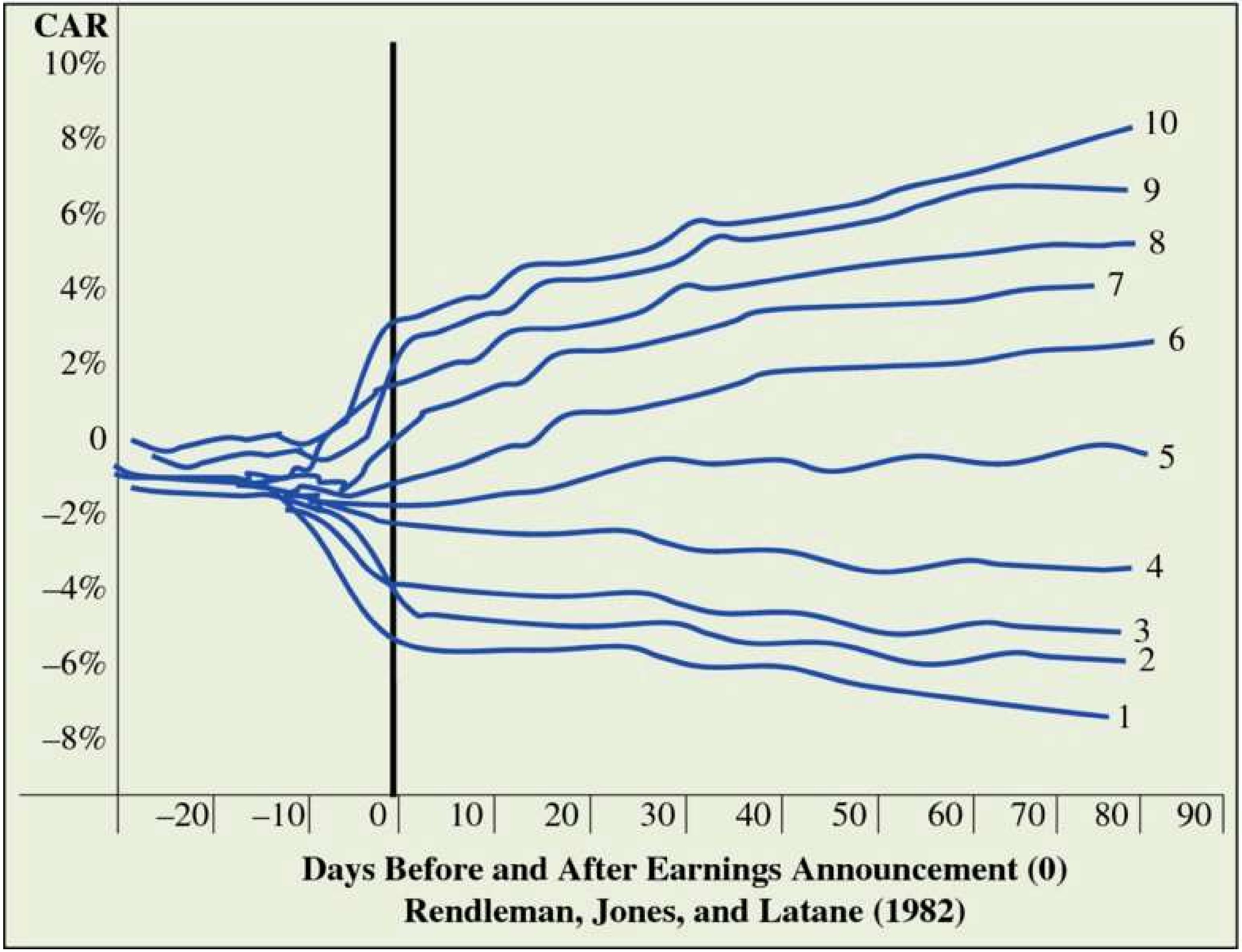


EXHIBIT 15.10 Cumulative Average Residuals Error, Earnings Announcements

In examining the Rendleman, Jones, and Latane's findings shown in Exhibit 15.10, three trends should be noted. First, there is a direct relationship between the size of the earnings announcements and the rates of returns: the greater the unexpected good earnings announcements, the greater the return; the greater the unexpected bad earnings announcements, the greater the negative returns. Second, the *CAR*s tend to move a few days prior to the announcement, suggesting a market anticipation based on other information. Finally, the *CAR*s continue to move up (for good earnings) and down (for poor earnings) after the announcement. Thus, like the Joy, Litzenberger, and McEnally study, the Rendleman, Jones, and Latane study also finds the market takes some time to react to good earnings announcements, and unlike the Joy, Litzenberger, and McEnally study, this study finds the market also takes some time to react to unexpected bad announcements as well. Both studies, however, suggest abnormal returns and therefore market inefficiencies.

Initial Public Offerings

When a closely held company goes public with an initial public offering (IPO) of its stock, the market determines the price of its stock. A commonly held view among many investors is that the underwriters of IPOs tend to underprice the new stock, making it possible for investors to earn abnormal returns. In an early *CAR* study, Ibbotson and Jaffe (1975) examined the return patterns of new issues over their initial 60-month period. They found average abnormal returns of approximately 12 percent in the first month after the IPO and an adjustment period of approximately three months before the stock reached its equilibrium level. Although the study suggests market inefficiencies, one should keep in mind that they estimated the abnormal returns using a single-index/ CAPM model, which may be an inappropriate model to use for a company just going public. By compiling the results of more recent studies on IPOs, one obtains a different profile of the impact of an IPO on stock prices than those determined by Ibbotson and Jaffe.[3] Specifically, studies by Ritter (1991), Lougham and Ritter (1997), and Carter, Dark, and Singh (1998) suggest that underwriters, on average, underprice IPOs by approximately 15 percent, but that the price adjustment takes place within the first few days (not three months), with most of the gains going to institutional investors. These studies thus suggest that investors who acquire IPOs after the initial adjustment would not earn abnormal returns.

Exchange Listings

Another major event for a company occurs when it decides to become listed on a national organized exchange. A common view is that such listings make a company more prestigious, make its stock more marketable, and lead to an increase in the price of the company's stock. A study by McConnell and Sanger (1989), however, finds that the marketability effect of a new exchange listing is not a significant factor in increasing the stock's value over the long run. Studies do find that around the time of a new exchange listing, the company's stock price tends to increase before the listing and decrease after the listing. Specifically, McConnell and Sanger found that abnormal returns could be realized during the period between the listing announcement and the actual listing (a period of between four to six weeks), and abnormal returns could be realized from short positions taken just after the listing.

Other Event Studies

In addition to the above studies, event studies have also been extended to global, macroeconomic, and corporate events. Studies have found that the market tends to react within hours to announcements by the Federal Reserve, the Treasury, and government agencies regarding unexpected macroeconomic information. Considerable research has also been directed toward corporate finance events, such as mergers, new security offerings, and reorganizations. For example, a study by Clifford Smith (1986) on the impact of mergers found that the price of the firm being acquired tended to increase in the market by the amount of the premium being offered by the acquiring firm, and the price of the acquiring firm tended to decrease, reflecting the market's expectation that the company paid too much. In addition, Smith also found that most of the price adjustments related to mergers occur relatively quickly.

Conclusions on Semi-Strong Efficient Markets

Studies of the semi-strong EMH are mixed. On the one hand, event studies of stock splits, IPOs, and corporate events suggest that the market tends to react quickly and efficiently to such information. On the other hand, event studies of unexpected earnings announcements and new exchange listings and cross-sectional studies on selecting stocks based on size, *P/e* ratios, book-to-market values, and neglect suggest abnormal returns are possible.

BLOOMBERG EARNINGS SCREENS

- **EEB:** The Bloomberg EEB shows projections of earnings, sales, and other income statement items from a consensus of Bloomberg contributors. You can view how the consensus has changed over time and the estimates of individual contributors.
- **ERN**: Earnings History.
- **EE**: Earnings and Estimates.
- **EM**: Earnings Trends.
- **EE SURP**: Earnings Surprises.
- **EE Z**: Zach's Earnings Estimates.
  - **CACS:** The Bloomberg CACS screen is a good screen to use to identify a company's past and pending IPOs and new offering, stock splits, dividends, other corporate actions.
  - **CACT:** The Bloomberg CACT screen is a good screen for investment activities for cross-sectional listings (e.g., stocks composing an index, portfolio formed in PRTU, or a search saved in EQS).
  - **FSCO:** The FSCO screen scores and ranks funds belonging to the same peer group based on a combination of weighted indicators. Using FSCO, you can find funds that best meet your investment criteria (e.g., growth, large cap fund domiciled in the United States). You can customize your scoring templates and ratings (e.g., Sharpe, Treynor, and Jensen index). You can rank funds by setting the weights for each parameter.
  - **MRR:** The MRR screen shows the best and worst performers for an index or portfolio.
  - **GP Screen and Events:** On the price graphs (GPs), events such as earning announcements, stock splits, and acquisitions can be identified at the time of the announcement. The “News” box can also be brought up from the gray toolbar by clicking the News button.

See Bloomberg Web Exhibit 15.2.

Studies of the Strong-Form Hypothesis

A strongly efficient market is one in which all information—public and private—is fully reflected in security prices. As we noted earlier, tests of the strong-form EMH take two forms. The first form determines whether insiders have information that would allow them to earn abnormal returns; the second form ascertains whether certain non-insider investment groups such as security analysts or portfolio managers are able to earn abnormal returns by being able to value information better than the average investor. In testing both forms of the strong EMH, researchers have tended to focus on the performance of three identifiable investment groups: insiders, security analysts, and portfolio managers.

Insiders

Security law requires that all insiders (directors, officers, significant shareholders, and others with access to material nonpublic information) notify the Securities and Exchange Commission (SEC) within two days of all large trades they have made in their company's stock. The SEC subsequently publishes the inside trades in their publication, *Official Summary of Insider Trading*. In an early insider study, Jaffe (1974) examined the returns obtained from insider trading as reported by the SEC. He selected stocks each month from the *Official Summary* that had at least three more inside buyers than sellers (buyers' plurality) or at least three more inside sellers than buyers (sellers' plurality). Using a *CAR*-type methodology, Jaffe estimated the after-commission-cost abnormal returns for each stock meeting the plurality criterion by calculating its residual errors. He then calculated the average abnormal returns for months one, two, and eight after the trade was originated (not when it was publicly reported) and the cumulative average residual for those three months for stocks in the buyers' plurality and stocks in the sellers' plurality, as well as the average monthly and cumulative returns (in absolute value) for both plurality groups together. Jaffe found that one month after a plurality of insider trading (buying or selling), there was an average loss in value of 1 percent ($CAR = -0.0102$); after two months, a cumulative average return of approximately zero ($CAR = 0.0009$), suggesting insiders on average were breaking even; and after eight months, a cumulative average excessive return after commission cost of 3 percent ($CAR = 0.0307$). Jaffe concluded that modest abnormal returns were possible after several months as a result of trading from inside information. His study also suggested that outsiders who consistently traded with the insiders based on announced insider transactions also could have earned abnormal returns.

In a follow-up study, Seyhun (1986) examined insider trades using a larger sample than Jaffe. He also examined the profitability of trading strategies of outsiders who traded on inside information provided by investment service companies. Unlike Jaffe, he found that, on average, they were not able to profit from such trades. However, more recent studies by Chowdhury, Howe, and Lin (1993) and by Pettit and Venkatesh (1995) have looked at corporate insiders' trades to determine if insiders were long in their company's stocks before above-average uptrends and short in their stocks before above-average downtrends. They, in turn, found consistent above-average profits, especially on the purchases of their stocks. These studies suggest market inefficiencies.

Security Analysts

Several studies have investigated whether the security analysts who make buy and sell recommendations are able to earn abnormal returns for their clients. One of the early studies of buy and sell recommendations was done by Logue and Tuttle (1974). In their study, they simulated trades based on the buy and sell recommendations of six investment companies. They concluded that with the exception of Value Line, investment company recommendations would not yield returns different from a naive buy-and-hold strategy. The fact that Logue and Tuttle found Value Line to be the exception is noteworthy. Over the last twenty years, a number of studies have examined the stock recommendations of this well-respected investment advisory company.[4]

In a more recent study, Barber, Lehavy, McNichols, and Truemen (2001) found that analysts' recommendations continued to be highly skewed toward buy to strong buy. They further found that those stocks with the most-favorable recommendations tended to outperform those with the least-favorable recommendations. In a 2004 study, Jegadeesh, Kim, Krische, and Lee found positive price changes occurred when there was a change in the consensus recommendation. These more current studies suggest that analysts do provide valuable information to the market.

Portfolio Managers

Some of the earlier studies of mutual funds by Sharpe and Treynor indicated that the performance of the portfolio fund managers could not consistently outperform a naive buy-and-hold strategy on a risk-adjusted basis. These and other similar studies, however, were based on performance relative to a common benchmark and also on a CAPM or single-factor model. In a study by Grinblatt and Titmann (1992), the authors found significantly high risk-adjusted returns for growth funds. In a 1993 study, Elton, Gruber, Das, and Hlavka used a multifactor model with fund returns regressed against the excess returns of three benchmark portfolios; they, in turn, found the average alphas to be negative, implying no abnormal returns. However, in a 2005 study, Bollen and Busse ranked funds by their alpha using a multifactor model. They found a wide disparity in performance, but also found that over a short period of time, the performance differential disappears. The findings of Bollen and Busse probably also hold for some of the more well-known fund investment names such as Warren Buffett, Peter Lynch, and George Soros, who have consistently generated high returns, as well as some hedge funds.

Conclusions on the Strong-Form Efficient Markets

Conclusions regarding the strong-form of the EMH are mixed. On the one hand, there is some empirical evidence that supports the strong form of the EMH with respect to security analysts, portfolio managers, and public trading off insider trade information. On the other hand, there is evidence that indicates that some insiders are able to earn abnormal returns with private information, and some portfolio and investment managers do appear to be able to choose stocks and portfolios better than the average investor does.

BLOOMBERG INSIDER TRADING SCREENS

- INSD: Insiders Trading Monitor.
- Insider's Sentiment ETF: NFO <Equity>.
- GPTR Screen shows insider trades for a loaded stock.

ANALYST RECOMMENDATIONS

- ANRP: Analysts Rankings.
- ANRD: Historical Consensus.
- ANR: Analyst Recommendation (for loaded stock).

See Bloomberg Web Exhibit 15.3.

Portfolios Revisited: Equity Style Portfolios

The EMH provides a methodology for not only testing for abnormal return, but also for constructing investment funds and portfolios. The weak-, semi-strong-, and strong-form tests all start with a proposed null hypothesis to test (no abnormal returns can be earned from investing in stocks with low *P/e* ratios or investors cannot earn abnormal returns by investing in Berkshire Hathaway, etc.). The hypothesis is then tested statistically. This methodology, in turn, provides an approach for creating new funds and investment strategies. For example, a fund manager interested in setting up low *P/e* portfolios could do so by following the Basu methodology by ranking the 5,000 stocks that make up the S&P in terms of their *P/*e and then select the lowest quintile for the low *P/e* fund to offer investors.

As we first discussed in Chapter 5, a number of investment funds are formed based on size and style. The origin of many of these funds, in turn, is rooted in the efficient market analysis. We conclude this chapter by revisiting portfolio analysis, examining portfolios based on style.

Value-Style and Growth-Style Portfolios

In the 1970s, *cluster analysis* was a popular approach for constructing portfolios. A cluster is a portfolio of stocks that are highly correlated with each other, but uncorrelated with other clusters or groups. Cluster portfolio included those formed with cyclical stocks, stable stocks, growth stocks, or energy stocks. Today, cluster analysis is referred to as *equity-style management*. Clusters or styles are typically broken into either value stock or growth stock categories. Sub-categories are often formed within these two groups, such as small-cap, mid-cap, and large-cap. *Value stocks* are those with low *P/e* ratios or price-to-book values (*P/B*). *Growth stocks* are those with high *P/e* or *P/B* ratios.

A common methodology used to construct value and growth funds is to rank a large sample of stocks in in terms of their *P/e* or *P/B* ratios and then select value stocks as all stocks that encompass the first half or first quarter (or some defined proportion) and growth stocks as all those encompassing the other half or last quarter (or some defined percentage).[5] For an example, see the following:

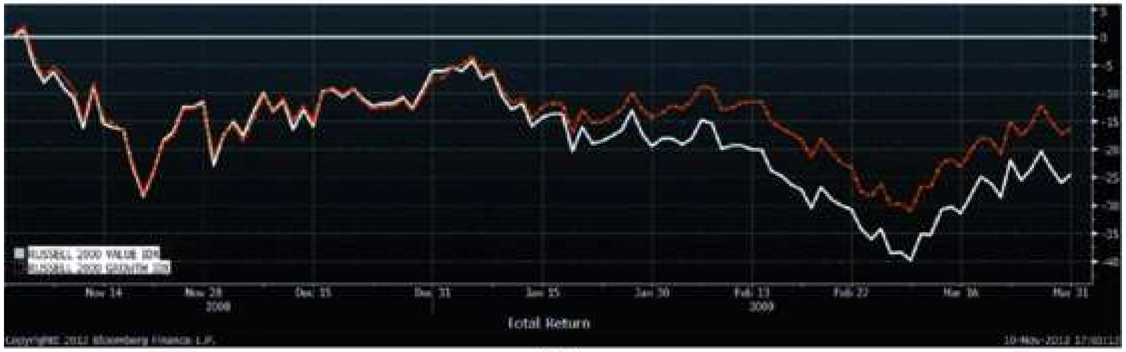
1. Select a large sample of stocks (1,000).
2. Determine the sample's total market value.
3. Compute each stock's *P/e* ratio.
4. Rank the stocks from low to high by *P/e*.
5. Define value stocks as all those stocks that encompass the first half of the market value or number (or some defined percentage).
6. Define growth stocks as all those stocks that encompass the second half of the market value (or some defined percentage).

Within a style, other groupings or substyles can be created. As noted, this could be based on market cap. Other substyles are growth and volatility. For example, within growth, funds could be set to have sub-styles of high growth, low growth, above-average growth.

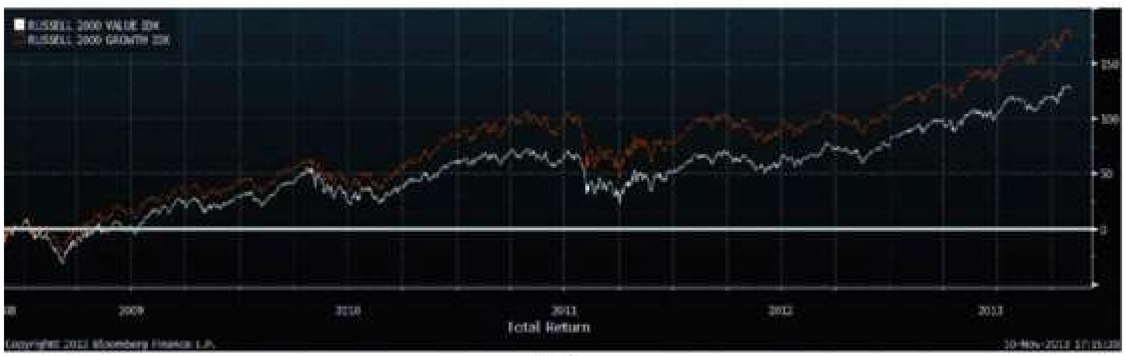
In a 1997 study, Leinweber, Arnolt, and Luck looked at the performance of value and growth style investments. They defined value and growth by ranking stocks in terms of their *P/B* ratios. Examining monthly returns, they found that from 1975 to 1995 $1 invested in a value-grouped portfolio would have grown to $23, whereas $1 invested in a growth-grouped portfolio would have grown to $14. They also found that in 45 percent of the months in the sample, growth stocks outperformed value. Exhibit 15.11 shows Bloomberg's total return graph for the Russell 2000 Value Index (RUJ) and the Russell 2000 Growth Index (RUO). For the period from 1/31/1995 to 10/31/2013 (top panel), the value index had an annualized total return of 13.56 percent compared to an 11.63 percent return for the growth index. However, during the bear market period from 10/1/2008 to 3/3/2009, the annualized loss on the growth index was 49.49 percent, whereas the loss on the value index was 35.09 percent (middle panel). Also, for the period from 11/28/2008 to 10/31/13, when the market rebounded, the growth index outperformed the value index with an annualized return of 22.74 percent compared to 17.97 percent for the value index (lower panel).


RUSSELL 2000 VALUE IDX
RUSSELL 2000 GROWTH IDX
1000
800
600
400
200
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Total Return
Copyright© 2013 Bloomberg Finance L.P.

(a)


5
0
-5
-10
-15
-20
-25
-30
-35
-40
RUSSELL 2000 VALUE IDX
RUSSELL 2000 GROWTH IDX
Nov 14
Nov 28
2008
Dec 15
Dec 31
Jan 15
Jan 30
Feb 13
2009
Feb 27
Mar 16
Mar 31
Total Return
Copyright© 2013 Bloomberg Finance L.P.

(b)


RUSSELL 2000 VALUE IDX
RUSSELL 2000 GROWTH IDX
150
100
50
0
2009
2010
2011
2012
2013
Total Return
Copyright© 2013 Bloomberg Finance L.P.

(c)

EXHIBIT 15.11 Total Return Growth and Value Index Russell 2000 Value Index and Russell 2000 Growth Index, 1995–2013, 10/01/2008–3/3/2009, and 11/28/2008–10/31/2013

Exhibit 15.11a: Annualized Total Return

- Value Index = 13.56 percent
- Growth Index = 11.63 percent

Exhibit 15.11b: Annualized Total Return

- Value Index = −35.09 percent
- Growth Index = −49.49 percent

Exhibit 15.11c: Annualized Total Return

- Value Index = 17.97 percent
- Growth Index = 22.74 percent

Other Equity Styles

In addition to value and growth, portfolio style can be based simply on size, such as S&P Mid-Caps or S&P Small Caps, or just growth rates. Fund styles can be defined by a number of characteristics: for example, a fund consisting of stocks with the potential for consistent earnings and dividend growth without high volatility, or funds consisting of stocks with posted positive earnings surprises in their last outings, or those with consensus broker ratings that have also recently been upgraded. Exhibit 15.12 shows several different detailed styles and the criterion for selecting them. Note how some of these are based on some of the efficient market studies we examined in this chapter.

1. **Funds with firms with the potential for consistent earnings and dividend growth without high volatility:**
   1. Market cap greater than or equal to $2.0B
   2. *P/e* less than or equal to 20
   3. 5-year average book value greater than 5%
   4. *EPS* growth rate greater than or equal to 10%
   5. Projected 5-year *EPS* growth greater than or equal to 10%
   6. *ROE* greater than or equal to 20%
   7. Beta less than or equal to 1.25
   8. Dividend growth greater than or equal to 5%
2. **Funds with large cap companies that still have the potential for rapid earnings growth:**
   1. Market cap greater than or Equal to $15.0B
   2. Projected *EPS* growth greater than 20%
   3. Consensus recommendation of buy or better
3. **Funds with companies with high *ROE* and good investment opportunities:**
   1. Projected 1-year *EPS* growth rate greater than or equal to 15%
   2. Projected 5-year *EPS* growth greater than 15%
   3. *ROE* greater than 25%
4. **Funds with neglected or under-followed stocks with attractive investment opportunities:**
   1. *P/e* less than 15
   2. *EPS* growth rate greater than 10%
   3. Projected 5-year *EPS* greater than 15%
   4. Estimated analysis coverage less than 5%

5. **Funds consisting of strong companies that are trading at discounts to their growth rates. Stocks with lower PEG ratios (*P/E* divided by growth). This ratio shows how much an investor is paying for each unit of potential earnings growth:**
    1. Projected 5-year *EPS* growth rate greater than 20%
    2. Projected 1-year *EPS* greater than or equal to 20%
    3. Daily volume greater than or 50,000
    4. Zacks buy recommendation
    5. PEG (*P/E* divided by growth) with lowest 20% for industry
6. **Funds consisting of companies with the potential for consistent earnings and dividend growth without high volatility:**
    1. Market cap greater than $2.0B
    2. *P/e* less than 20
    3. 5-years average book value growth greater than 5%
    4. Projected *EPS* growth rate greater than 10%
    5. *ROE* greater than 20%
    6. Beta less than 1.25
    7. 5-year average dividend growth rate greater than 5%

EXHIBIT 15.12 Investment Styles

BLOOMBERG CASE: CREATING AN EQUITY STYLE PORTFOLIO

- Search for portfolio with specific style characteristics in EQS.

- Import the EQS search to PRTU and evaluate it in PORT.

Example: Stocks with the potential for consistent earnings and dividend growth without high volatility:

- Market cap greater than or equal to $2.0B.
- *P/e* less than or equal to 20.
- Book value growth greater than or equal to 5 percent.
- 5-year *EPS* growth rate greater than or equal to 10 percent.
- *ROE* greater than or equal to 20 percent.
- Beta less than or equal to 1.25.
- Five-year average dividend growth rate greater than or equal to 5 percent.

See Bloomberg Web Exhibit 15.4.

Conclusion

An efficient market is one in which all information is fully reflected in a security price. If such a market existed, then the price of the security would always be equal to its true value, and investors would not be able to earn abnormal returns from fundamental and technical strategies or from inside information. The empirical studies that have tested the weak-form, semi-strong-form, and strong-form tests of the EMH suggest that markets are not perfectly efficient. These studies have found the following:

1. Security returns are not serially correlated.

2. With the exception of small filters, strategies based on filter rules do not outperform a naive buy-and-hold strategy, and strategies using small filters do not outper- form the naive strategy on an after commission cost basis.
3. A number of anomalies may exist. The most notable are the January effects, Monday effects, small-size firms, low *P/e* stocks, and high book-to-market value stocks.
4. The market appears to react quickly and efficiently to events such as IPOs, new exchange listings, and expected earnings announcements, but appears to take some time to react to unexpected earnings announcements.
5. With some exceptions, security analysts and portfolio managers do not appear to be able to outperform the market on a risk-adjusted basis.
6. Insiders appear to have information that is not fully reflected in security prices.

Notes

1. Basu actually ranked the stocks by the inverse of their *P/e* ratio. By doing this, companies with negative earnings were placed in the high *P/e* group. To address possible biases of negative earnings companies, Basu then formed a sixth portfolio that included the high *P/e* stocks without negative earnings.

2. In a 1983 study, Brown, Kleidon, and Marsh found the performance of small-size firms relative to large firms varied from period to period. They concluded that the small firm effect is unstable.

3. For a review of studies on returns from IPOs, see Ibbotson, Sindelar, and Ritter (1994).

4. In forming their recommendations, Value Line publishes weekly information on thousands of stocks in their *Value Line Investment Survey*. In their survey, the company ranks stocks from 1 to 5, where 1 represents a strong buy recommendation and 5 a strong sell recommendation. Several older studies on Value Line's recommendations have found that the stocks in group 1 consistently outperformed the

market, as well as the other groups, and the stocks in group 5 significantly underperformed the market. In fact, Black and Kaplan, in a 1973 article entitled "Yes, Virginia, There is Hope: Tests of the Value Line Ranks," found that portfolios constructed with rank 1 stocks outperformed portfolios with rank 5 stocks by 20 percent on a risk-adjusted basis. Copeland and Mayers (1982) also found similar results. They also found performances that were consistent with the rankings; that is, group 1 stocks yield the highest return, followed by group 2, and so on. Finally, Stickel (1985) found that Value Line–recommended stocks that changed ranks also experienced price changes, with significant price changes occurring when a stock in group 2 moved to group 1. Unfortunately, the exceptional performance of Value Line at that time was not sustained. Over the decade of the 1990s, the Value Line Centurion Fund, which specializes in group 1 stocks, consistently underperformed the market.

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5. An alternative to ranking is to use a multiple-index measure that provides a score.

The index score is constructed so that the higher the score, the greater the growth stock. For example:

$$S_i = c_1\left(\frac{D}{P}\right)_i + c_2(ROE)_i + c_3(\text{Variation in Earnings})_i$$

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Bloomberg Exercises

1. Filter rule tests are designed to test technical rules of buying and selling when stocks break their support and resistance levels. Bloomberg's back-testing screen (BTST) can be used to back test the profitability of various technical trading rules, including when stocks hit their resistance and support line. Use the BTST screen to back test a moving average envelope for the S&P 500 or a stock or other index of interest. For your test, take a long position when the closing price cuts its lower band and a short positive when it cuts its upper band. Do a back test of just the long position.
    1. BTST <Enter>.
    2. On BTST screen, click the pencil icon next to “MA Envelope” to bring up a screen with several tabs.
    3. Click the “Strategy Definition” tab to bring up a screen for setting conditions. On the condition screen, you can edit the moving average and upper and lower bands by clicking the edit pencil icon.
    4. Click the “Simulation Control” tab to change the trade condition from Long & Short, Long Only, or Short Only.
    5. Click the “Strategy Analysis” tab to run the back test.
    6. On the main screen, compare the simulation result to a buy-and-hold strategy and other strategies.
2. Use the BTST screen to back test the Bollinger band for the S&P 500 or a stock or index of interest. On the BTST screen, click the pencil icon next to “Bollinger Band” to bring up a screen with several tabs for setting up your test (see Exercise 1).

3. Many of the early studies support a weakly efficient market. The Hurst exponent is a metric used to identify price patterns hidden within seemingly random stock price trends. If a price trend is random, the Hurst coefficient would continuously have a value close to 0.5. If not, then there is pattern to the stock price movement.
    1. Use Bloomberg's Hurst screen (GPO KAOS for a loaded stock or index) to see if an index or a number of stocks of interest have Hurst coefficients that are different from 0.5.
    2. Find the Hurst coefficients for stocks that make up an index (SPX or INDU) using the RV screen: INDU <Index>; RV; on the RV screen type in “Hurst” in the “Add Column” box.
4. In an early anomaly study, Banz found excess returns of portfolios consisting of the smallest size stocks. Evaluate the performance of portfolios based on size by comparing the performances over different time periods of the Russell Small Cap index (RTY <Index>) and the Russell Large Cap index (RIY <Index>) using the COMP and HS screens: RTY <Index>; COMP and HS. On the COMP and HS screens, enter the large cap index in the compare box (RIY <Index). Use the HRA or beta screen to see the regression relationship of the indexes with the market (S&P 500): RTY or RIY <Index>; HRA. Vary the time period for your regressions. Do either of the indexes have an abnormal return (positive alpha)?
5. The Basu study provided empirical support for the time-honored investment strategy of investing in stocks with low *P/e* ratios. Many value funds and indexes are constructed with stocks with relatively low *P/e* or *P/B* ratios and many growth funds and indexes are formed with stocks with relatively high *P/e* or *P/B* ratios. Evaluate the performance of portfolios based on *P/e* or *P/B* ratios by comparing the performances over different time period of the Russell 1000 Value index (RLV <Index>) and the Russell 1000 Growth index (RLG <Index>) using the COMP and HS screens: RLV <Index>; COMP and HS. On the COMP and HS screen enter the growth index in the compare box (RLG <Index). Use the HRA or beta screen to see the regression relation of the indexes with the market (S&P 500): RLV or RLG <Index>; HRA. Vary the time periods for your regression. Do either of the indexes have an abnormal return (positive alpha)?

6. Unexpected earnings event studies examine how the market reacts to good and bad earnings announcements. On 8/14/2013, Macy's had an unexpected bad earnings announcement of 7.46 percent below estimates and on 11/7/12 had a good earnings announcement of 22.03 percent above.
    1. Go to Macy's earnings surprise screen (EE SURP) and evaluate the impact of these announcements.
    2. Evaluate the impact of the announcements on Macy's stock price and volume around these announcement dates. On Macy's GP screen, click the “Events” tab and check “Earnings.” To determine the percentage change in price, use the percentage change drawing line by clicking the “Annotations Button” on the gray toolbar and then “% Change” from the annotations palette showing all of the tools for drawing on the chart. Move the “% Change” drawer to the announcement dates and click. The line will tell you the percentage change in price.
7. The performances of funds by type can be found on the Bloomberg Fund Heat Map Screen, FMAP.
    1. Use the screen to identify several value style funds and growth style funds:
        1. FMAP <Enter>, click “Objective” in “View By” dropdown and United States in “Region” dropdown, and then click “Equity” and select type (e.g., Value Broad Market and Growth Broad Market).
        2. Select one of the funds and study it (the fund's ticker can be found on the description page) using the functions on the fund's menu screen (Fund Ticker <Equity> <Enter>). Functions to include are DES, historical fund analysis (HFA), and price graph (GP).
    2. Evaluate the fund using the Holdings, Performance, and Characteristics tabs on the fund's PORT screen.
    3. Examine the fund's total returns for different periods and frequencies relative to the S&P 500, Russell 3000, or Dow using the COMP screen: Fund Ticker <Equity> <Enter> and then click COMP.
    4. Using the HRA or Beta screen, determine the fund's characteristic line with the S&P 500, its systematic risk (R^2), and unsystematic risk.
    5. Using your selected fund's RV screen, compare the fund with other similar funds in terms of Sharpe, Treynor, and Jensen ranking indexes. On the RV screen, click the custom tab and then type

in Sharpe, Treynor, and Jensen to find those indexes.

8. The FSCO screen scores and ranks funds belonging to the same peer group based on a combination of weighted indicators. Using FSCO, select the following types of funds by style and categories and then score them in terms of indexes (e.g., Sharpe, Treynor, and Jensen indexes; select Risk/Return in the Model dropdown):
   1. Value broad market base.
   2. Growth broad market.
   3. Value large cap.
   4. Growth large cap.
   5. Value small cap.
   6. Growth small cap.
9. Use the RV screen for the S&P 500 (SPX <Index>; RV) or Russell 3000 (RAY <Index>; RV) to find the range in size (market cap), *P/e*, and *P/B* values for stocks that make up S&P 500 or the Russell 3000. On the RV screen, click the column heading of the category (e.g., market cap or *P/e*) to sort the stocks in the index in increasing or decreasing order.
10. Construct one or more of the following portfolios based on style or characteristics and evaluate it using PORT:
    1. Low *P/e* Portfolio (e.g., *P/e* less than 15 or 10 or between 5 and 15 or a condition based on what you found from Exercise 9).
    2. Large *P/e* (e.g., *P/e* > 25 or a condition based on what you found from Exercise 9).
    3. Small Cap (e.g., market cap between $5 billion and $10 billion).
    4. Large Cap (e.g., market cap greater than $100 billion).
    5. Low *P/B* (e.g., price-to-book ratio less than 3).
    6. High *P/B* (e.g., price-to-book ratio greater than 7).

    Steps:

   1. Use EQS to search for stocks to form your portfolio from an index such as S&P 500 stocks or Russell 3000 stocks: EQS <Enter; select Standard and Poor's 500 or Russell 3000 from the Indexes tab; in the yellow ribbon box, type *P/e* or market cap and set your conditions; save your screen (Actions tab).
   2. Create a portfolio of the stocks from your search in PRTU: PRTU <Enter>; click red "Create;" from Settings Screen, click "Actions" tab and then import the stocks (on the settings screen, enable history; see Chapter 7, Bloomberg exhibit box: "Bloomberg Portfolio Screens for Evaluating Portfolios: PRTU and PORT, Steps for Creating Historical Data for Portfolios in PRTU."
   3. Evaluate your portfolio's past performance relative to an index (e.g., DJIA, INDU) using the PORT screen over different time periods: Performance tab, "Total Return," "Portfolio vs Index" (e.g., INDU), Time = MTD, YTD, and Custom (for Custom, the select time period must be within the period history of the portfolio created in PRTU).
   4. Evaluate the characteristics of your portfolio relative to an index using PORT: Characteristics tab, "Main View," "Portfolio vs Index (e.g., INDU), "by GIC Sectors" Characteristics tab, "Main View," "Portfolio vs Index" (e.g., INDU), "by GIC Sectors."

11. Several studies (Chowdhury, Howe, and Lin; Pettit and Venkatesh; and Jaffe) have found modest abnormal returns were possible for short periods from trading from inside information. The Sabrient Insider Sentiment Index (SBRIN <Index>) consists of publicly traded companies that reflect a positive sentiment by insiders closest to the company's financials. There is also an Insider's Sentiment ETF, NFO (NFO <Equity>) that is tied to the Sabrient index. Study the relative performance of the index or ETF to the S&P 500 over different time periods using the COMP screen.
12. Studies have found that analysts' recommendations are highly skewed toward buy to strong buy compared to sell. See whether or not you find this to be the case for several stocks of interest by examining Bloomberg's analyst recommendations screens ANRP and ANRD.