How Do Stock Returns React to Special Events?

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Investors expect stock prices to react to some special events as a matter of course. They're rarely as certain, however, about the timing and magnitude of that reaction, and sometimes they aren't even sure of the direction.

This much, however, is known: unexpected events can change the stock prices of a firm by changing the profit potential or riskiness of that firm. And if the financial markets pick up information about an impending event, that event can change stock prices days or weeks before it actually occurs—and continue to influence stock prices for some time thereafter.

That stock markets quickly digest all new public information about firms and transmit it rapidly into changes in stock prices underlies a methodology now being used frequently in financial analysis. To provide some insights into how the equities market reacts to new information, financial economists have conducted "event studies," statistical techniques for analyzing the pattern of stock prices and returns when a special event occurs.

Event studies offer insight into such issues as the extent to which shareholders of acquired firms gain abnormal returns during mergers, and the extent to which bad news affects banks'

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stock returns. Some of these studies have implications for how forthcoming regulatory and market changes will affect banking firms.

The methodology of event studies may appear complicated, but the basic idea is quite simple. Many such studies have been conducted to analyze specific events in both the corporate finance and banking fields. A review of some of these studies shows how much stock returns can change in response to new information about a group of firms or a particular industry.

THE METHODOLOGY OF EVENT STUDIES

Event studies examine the stock returns for some specific firms (or for an industry) before and after the announcement of a special event—a merger, say. The returns for a certain holding period are calculated by adding the stock's dividend for the period to the change in the stock's price (a capital gain or loss) and dividing by the initial stock price. The capital gain (or loss) is included, since the investor could realize this gain (or loss) by selling the stock. Changes in the stock's price, then, have a major effect on the stock's returns.

News of a significant event could alter the pattern of stock returns for a firm (or industry). Suppose an event is taken as good news—that is, investors believe the event portends a bright future for the firm. The firm's stock price will increase as a result. This price increase represents a capital gain, which raises the return on the firm's stock.

But the stock returns might have changed for other reasons. The stock's price, and hence the returns, could have changed just from the overall movement in the stock market itself. The magnitude of this change will depend on the degree to which the firm's stock moves with the overall market. Stock analysts report that some stocks move almost in a one-to-one relationship with the stock market, while others do not move with the market at all. The difficult part of event studies is to make adjustments for overall movements of the stock market, as well as for other events unrelated to the specific announcement under study. To do so, event studies follow four basic steps.

Identification of the Event. The first step is to identify the event and the date on which it occurred. Usually, the event of interest is a single, one-time occurrence—a merger of two firms, for example. Other event studies investigate the impact on a group of firms (or on a specific industry) of a frequently occurring event, such as earnings announcements. Compared to studies of one-time events, this second type usually provides more reliable results because it covers a group of companies over different periods. If the results are the same for different firms at different points in time, we can be more confident of the event's impact.

Estimation of Abnormal Returns. The event-study methodology calls for examining the returns on a firm's stock around the date selected and separating out the portion of the total returns that is a reaction to the event. Part of the returns on a firm's stock reflects ups or downs in the overall stock market. The remainder reflects the unexpected event.

To separate the general movement of stock returns from an individual stock's return, economists calculate what are called "abnormal returns." Abnormal returns, also called "excess returns," represent the firm's return after subtracting out returns attributable to overall movements of the stock market.

Statistical models of the firm's stock returns are used to determine "normal returns"—an estimate of the firm's returns in the absence of the event. The estimated normal returns are subtracted from the actual returns, with the difference being the abnormal returns. (For details on the approaches to estimating normal returns, see *Estimating Returns*, p. 25.) The pattern of the abnormal returns should show the event's impact, if there is one.

Grouping of the Abnormal Returns. Once obtained, the abnormal returns for the firms under study are grouped for analysis. The usual approach is to calculate the cross-section average and cumulative abnormal returns for the firms. The cross-section average abnormal returns are calculated by summing the abnormal returns and dividing by the number of firms in the study; the averages take into account the possibility that the event may have different impacts on the firms in the sample. (Using data for many firms provides evidence as to whether the impact of the event is more than just a one-time occurrence for a single firm.) Cumulative abnormal returns, representing the sum of the average abnormal returns to a point in time, show the impact of the event over time. If the equities market does not anticipate an event, the cumulative average abnormal returns up to the event date should be approximately zero.

In Figure 1, Panel A shows what the cumulative abnormal returns would look like for an event that has a one-time positive impact on stock returns. The cumulative abnormal returns are zero until the event date, plotted as Day 0; on the event date, the abnormal returns jump. Panel B, on the other hand, shows the event having a one-time negative impact. In both panels, however, the event has a lasting effect in that the cumulative abnormal returns do not return to zero. If the event is anticipated, the pattern of cumulative abnormal returns would look like Panel C; here, the returns start to move up several days before the event date, then jump on the event date.

Analysis of the Data. The final step in the event-study process is to interpret the abnormal returns data. The examples plotted in Figure 1 are not taken from actual data. But the data plotted in Figures 2 and 3 (pp. 20 and 21) are from actual, and fairly typical, event studies. In Figure 2, we see the impact of a decision in a major lawsuit on two firms' abnormal returns. In Panel B, the cumulative abnormal

FIGURE 1

Plots of Cumulative Average Abnormal Returns (CAARs)

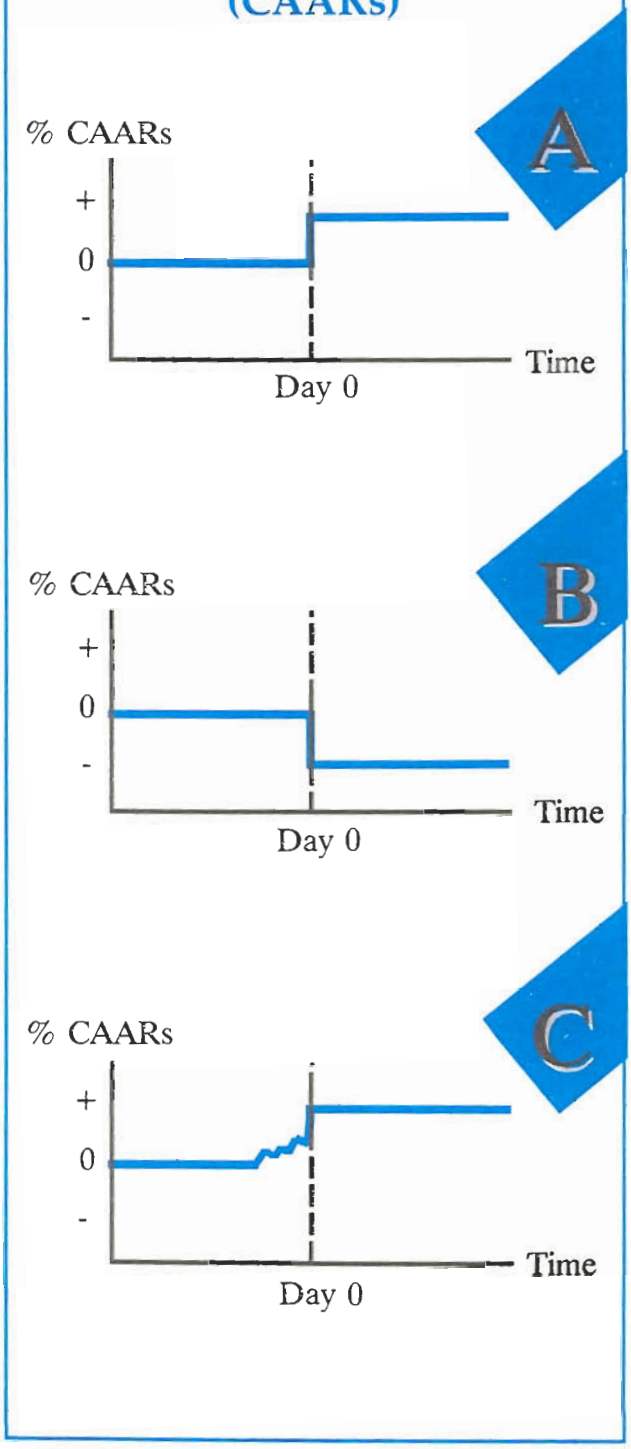
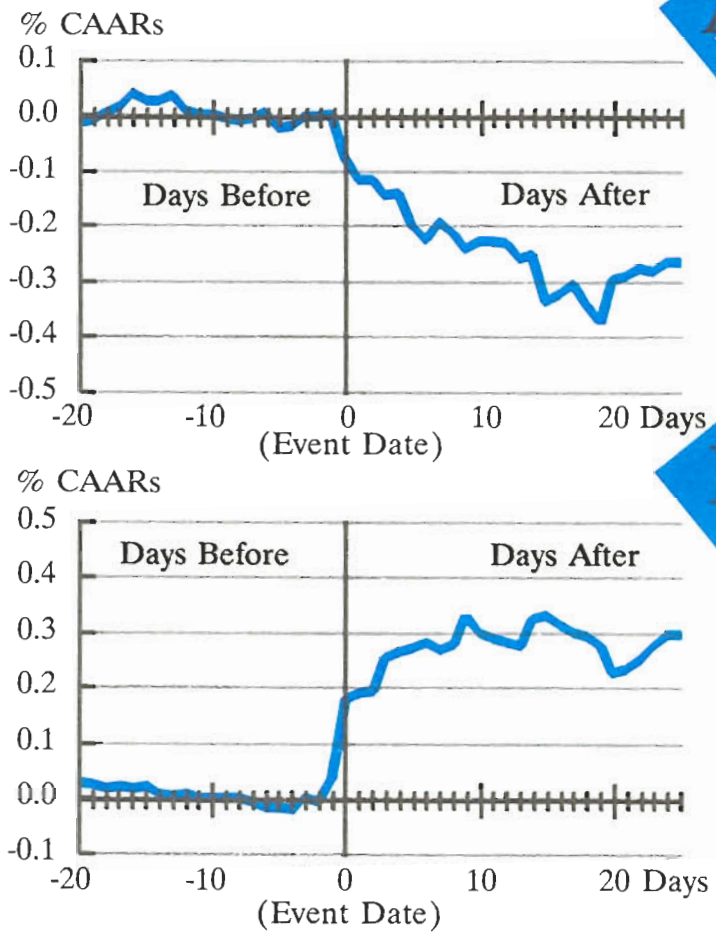


FIGURE 2

Cumulative Average Abnormal Returns (CAARs)



SOURCE: Fields, M. Andrew, "The Shareholder Wealth Effects of the Texaco-Penzoil Court Case," University of Delaware Working Paper (1988).

returns show that the decision has a positive impact on the one firm's stock. On the other hand, Panel A shows a negative impact on the stock of the other firm.

Figure 3 shows the impacts, on two different groups of banks, of a regulatory change—an anticipated event. The cumulative abnormal returns are plotted for 30 days before and after the event, itself shown as Day 0. The top panel of Figure 3 shows cumulative abnormal returns indicating that the event has a positive effect on stock returns for one group of banks. Focusing on the event date, Day 0, we see that the returns tend to increase about 27 days before the event and that the positive effect is still present 30 days after the event. That the pattern of returns increases before the event indicates that the market anticipated this event.

The bottom panel of Figure 3 shows the pattern of returns that might develop if the event had a negative impact on the stock of another group of banks. Note that the cumulative returns drop sharply before the event date. This pattern indicates that the market reacted negatively to the event even before it was announced.

After examining the plot of the abnormal returns, financial economists then ask whether the pattern of returns is statistically significant or whether it is attributable to chance. To arrive at this answer, economists perform statistical tests on the abnormal returns data, seeking evidence to support their financial theories about the event's economic significance.[1]

Shortcomings of the Event-Study Approach. The event-study approach is not without its

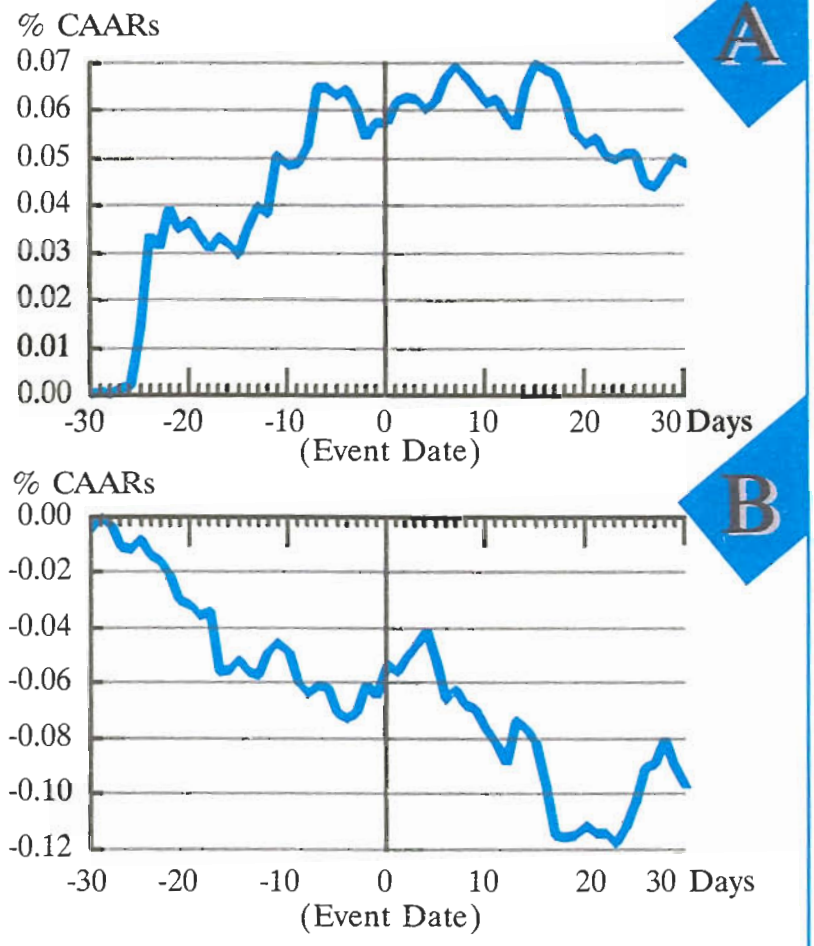
[1]The details of the statistical tests are presented in Brown and Warner (1980) and (1985).

critics. Financial economists cite several shortcomings. First, if researchers are unable to identify the exact event date, they could end up looking at the wrong pattern of abnormal returns and attribute, incorrectly, a stock's response to a specific event. Then again, they may not observe any trend in the pattern of returns at all.

In some event studies, establishing the exact date of the event can be very difficult. In studies of legislative events, for example, financial economists generally have trouble determining which date to focus on. New laws are often discussed before they are introduced, and there is usually a considerable period of debate. Moreover, the impact of the legislative change, because of its newsworthiness, will be recognized by investors and affect stock prices even before the bill actually becomes law. A way around this problem is to look at an event "window" framing the possible event date within a period of several days.

FIGURE 3

Cumulative Average Abnormal Returns (CAARs)



SOURCE: Black, Harold, M. Andrew Fields, and Robert Schweitzer, "Changes in Interstate Banking Laws: The Impact on Shareholder Wealth," Working Paper #88-16, Federal Reserve Bank of Philadelphia (November 1988).

A second shortcoming is data contamination by other events, which makes the results of event studies difficult to interpret. The confounding of several events often enters into event studies, particularly when the event date is difficult to determine. For example, we might study the effect on firms' stock prices of announcements of unexpected earnings changes. But if some of the firms were involved in mergers around the same time as the unexpected earnings announcements, it would be difficult to determine if the abnormal returns were attributable to the merger or to the unexpected earnings announcements.

The third shortcoming is the difficulty of estimating what the firm's normal returns would be in the absence of the event itself. The firm's stock price could have changed because of factors unrelated to the market's movement or

to the event itself. For example, banks' stock prices may change because of general interest-rate movements in ways different from those of nonbanking firms. Complex modeling of the normal returns can improve the accuracy of the estimates.[2]

WHAT CAN WE LEARN FROM EVENT STUDIES?

Event studies have been done for a wide range of issues, only some of which will be reviewed here. (See the Bibliography, pp. 27-29, for a detailed list of event studies, by topic.) Financial economists have studied the effects of single and multiple events, including mergers and acquisitions, regulatory changes, announcements of changes in capital structure, and announcements of bad news. The studies covered here, focusing on investigations in the fields of corporate finance and banking, help illustrate how much stock returns can be affected by announcements of new information.

Announcements of Capital Structure Changes. Financial economists have grappled for some time with the issue of optimal capital structure—that is, whether a firm's capital structure (its mix of equity and debt) affects its value. Recent financial research indicates there might be an optimal capital structure for the firm.[3] Thus, changes in capital structure, which represent changes in a company's leverage position, could be reflected in a firm's stock returns. Firms employ financial leverage when they use debt, which has a fixed interest cost, rather than equity (common stock) to finance their operations. A firm's announcement of its intentions to issue new debt or equity therefore signals information to the financial markets about that firm to which investors might react.

Several event studies examine the impact of firms' intentions to issue new securities.[4] These studies test the impact on stock returns of leverage-changing capital structure adjustments, and all conclude that the market sees the announcement to issue new equity as bad news. The research shows statistically significant negative abnormal returns (about 3 percentage points, on the announcement date) associated with the leverage-decreasing events of selling new equity or repurchasing debt. A 3-percentage-point change would mean, for example, a drop in returns from, say, 11 percent to 8 percent. The research on leverage-increasing events, such as the announcement to issue new debt, is inconclusive. Most of these studies report results that are not statistically significant, suggesting that the market does not respond to leverage-increasing events in the same way as it does to leverage-decreasing events.

The impact of capital structure changes on stock returns for bank holding companies has attracted recent attention because of the adoption of risk-based capital standards. These new capital standards will require bank holding companies (BHCs) to hold different amounts of capital based on the riskiness of their assets and off-balance-sheet activities.[5] To meet these new capital-to-asset ratio standards, some BHCs will be required to issue new equity.

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[2]Kane and Unal (1988) discuss the problems of estimating normal returns and offer solutions involving more advanced techniques.

[3]For more details on the optimal capital structure literature, see Thomas Copeland and Fred Weston, *Financial Theory and Corporate Policy*, 3rd edition, chapters 13 and 14 (Reading, MA: Addison-Wesley Publishing Co., 1988).

[4]See Kolodny and Suhler (1985), Masulis and Korwar (1985), Asquith and Mullins (1986), and Mikkelson and Partch (1986).

[5]The details of the new risk-based capital standards are presented in Robert Avery and Allen Berger, "Risk-Based Capital and Off-Balance-Sheet Activities," Finance and Economics Discussion Series (FEDS) #35, Board of Governors of the Federal Reserve (1988); and Jeffrey Bardos, "The Risk-Based Capital Agreement: A Further Step Towards Policy Convergence," Federal Reserve Bank of New York *Quarterly Review* (Winter 1987-88) pp. 26-34.

Applying the event-study approach to returns for 36 major bank holding companies, James Wansley and Upinder Dhillon (forthcoming) tested the impact of announcements by major bank holding companies about adjustments in their capital structure. Their results showed that banks' stock returns display the same negative reaction to new equity issues that was found for industrial firms. However, the negative reaction reported for banks was only around 1.5 percentage points, compared to 3 percentage points for industrial firms. The size of the negative reaction for banks, though, is closer to the negative reaction of almost 1 percentage point that Paul Asquith and David Mullins (1986) reported for utility firms.

Mergers and Acquisitions. Event studies have also been used to analyze the impact of mergers on firms' returns. Research by Michael Jensen and Richard Ruback (1983) shows that the shareholders of targeted firms gain substantial, and statistically significant, positive abnormal returns of almost 30 percentage points. In the case of unsuccessful merger attempts, shareholders of targeted firms gained some positive returns when the merger was initially announced, but lost these gains when it became clear that the merger would not go through. As for the bidding or acquiring firms, studies yield no evidence that mergers increase their returns.

The effect of interstate bank mergers on banks' stock returns was investigated by Jack Trifts and Kevin Scanlon (1987), who report significant positive abnormal returns for the acquired or target banks. The share prices of acquired banks, in fact, were found to increase around 20 percent. For the acquiring banks, however, the research failed to show significant abnormal returns, as was the case for industrial firms.

In a study that used a sample larger than that of Trifts and Scanlon, Marcia Cornett and Sankar De (1988) studied 153 bank merger bids and reported significant positive abnormal returns both for the target bank and for the bidding bank. They reported a gain of 9 percent for shareholders of the acquired banks—not nearly as large as the 20 percent increase in share price reported by Trifts and Scanlon. Nonetheless, the evidence is strong and very convincing that shareholders of acquired banks do gain in interstate bank mergers.

Bank Regulatory Changes. Because changes in laws and regulations can influence the way firms operate and thus affect firms' earnings, they could alter firms' abnormal returns. Larry Dann and Christopher James (1982) investigated the removal of deposit interest rate ceilings on the stock prices of stock-owned S&Ls. They detected a negative cumulative abnormal return of 8 percentage points 15 days after the change in interest rate ceilings. This is not surprising, since thrift institutions received net benefits from regulated deposit rates in the form of a lower cost of funds. As a result, the benefits of these reduced-cost deposits should have been capitalized in thrifts' share prices; thus, when deposit rate ceilings were removed, thrifts' share prices fell.

In another study focusing on the banking industry, Michael Smirlock (1984) examined the removal of the ceilings on deposit interest rates in the 1970-78 period to see if bank stock returns reacted to this deregulatory event. Using a data set of 17 large banks listed on the major stock exchanges, Smirlock found that bank stock returns were unaffected by the removal of interest rate ceilings. This finding is in contrast to the Dann and James results for S&Ls; however, we must remember that this study focused on larger banks, which were not as dependent on rate-ceiling-protected deposits for funding.

Bad-News Announcements in Banking. When a firm faces some bad news that substantially alters the prospects for its earnings or its riskiness, investors typically react quickly by bidding down the price of its stock. But not all bad news affects firms' stock prices to the same

degree. Analysts have begun to use event studies to determine the extent of stock returns' reactions to announcements of bad news. Many examples of bad-news events can be found in the banking literature. Looking at three different bank failures—U.S. National Bank of San Diego in 1973, Franklin National Bank of New York in 1974, and Hamilton National Bank of Tennessee in 1976—Joseph Aharony and Itzhak Swary (1983) assessed the reaction of bank stock returns using a data sample of other banks' stock returns. The sample included 73 commercial banks: the 12 money-center banks, 31 medium-sized banks (with total deposits of around $5 billion), and 30 smaller banks (total deposits around $1 billion). The stock prices of these banks showed little response to the announcement of the three bank failures.

Later, Robert Lamy and G. Rodney Thompson (1986) studied the announcement effects associated with the 1982 failure of Penn Square Bank of Oklahoma. They reported a significant negative abnormal return of about 1 percentage point, on the day Penn Square was closed, for a sample of 54 major banks all traded on the New York or American stock exchanges—a result that could be linked to the market's perception that Penn Square, at the time of its failure, had complex lending relationships with many money-center banks. Thus, the failure of Penn Square, though only a medium-sized bank, had adverse implications simply because of its relationships with other, much larger banks.

In another study, Swary (1986) investigated the market's reaction to the bad-news announcement in 1984 that Continental Illinois National Bank was in financial distress. This event study, conducted on a portfolio of large banks, found significant negative abnormal returns (approximately 3 percentage points) following the news of Continental's problems. These returns could be explained by investors' downward valuation of other banks' stock. This revaluation might have occurred because investors believed that depositors, especially uninsured depositors, would have less confidence in major banks, and this loss of confidence would increase the cost of funds for these banks. An increase in their cost of funds would put downward pressure on banks' earnings.

Another bad-news event that attracted considerable attention was Citicorp's announcement in 1987 that it had increased its loan-loss reserves to offset potential defaults on its Latin American loans. Theoharry Grammatikos and Anthony Saunders (1988) studied the impact of this event and the announcements made subsequently by other major American banks having large Latin American loan portfolios. Using a sample of 112 U.S. banks, the researchers found that the Citicorp announcement had only a weak negative effect on other banks' returns.[6]

Meanwhile, another study, conducted on the 12 major money-center banks by Jeff Madura and William McDaniel (forthcoming), showed that the market for bank stocks had anticipated the Citicorp announcement. In yet another study, by James Musumeci and Joseph Sinkey (1988), the effect of the announcement was found to be significantly positive for Citicorp and a sample of 25 large bank holding companies. All these studies show that Citicorp's announcement had effects on other major banks much like previous studies showing the news of bank failures in the 1980s having an effect on major banks.

SUMMARY

Event studies such as those just described provide investors, financial managers, and regulators with new data about how firms' stocks behave and about how quickly new

[6]The effect of subsequent announcements by other banks, however, was found to differ across banks in the sample; some experienced large negative abnormal returns while others had positive abnormal returns. The study therefore reports that no general conclusions can be drawn.

information affects firms' stock returns. Such studies have helped document the extent to which the shareholders of acquired firms or acquired banks gain abnormal returns in mergers. They also have helped identify and quantify cases in which bad news affecting one bank or group of banks has had so-called contagion effects on other banks.

Event-study research might prove useful as well in helping to assess the impact on bank holding companies' stock prices when some BHCs issue new capital to meet the new risk-based capital standards. All these examples of event studies suggest that the methodology will likely continue to have widespread uses in the fields of banking and finance.

Estimating Returns

To conduct an event study, the analyst must measure a security's performance against a benchmark. The benchmark is usually the return that the security would have achieved had the event not occurred. Thus, the key to this analysis is to determine a model of the return-generating process for the security in question.

Several methods have been used to model the return-generating process. The simplest way is by mean-adjusted returns. Under this approach the abnormal returns would be:

$$AR_{jt} = R_{jt} - \bar{R}_j \qquad (1)$$

where:

AR_{jt} is the abnormal return on the security of firm j in time period t,

R_{jt} is the observed return on the security of firm j in time period t, and

$\bar{R}_j$ is the mean return for the security of firm j over a given sample period.

This technique assumes that the expected returns for a firm's security are constant and equal to the historical average return and, thus, that any changes from the mean should be abnormal returns.

Another simple approach involves market-adjusted returns. Here it is assumed that the abnormal returns are those that are above the market return. Under this approach the abnormal returns would be:

$$AR_{jt} = R_{jt} - R_{mt} \qquad (2)$$

where R_{mt} is the return on the market portfolio in time period t. Financial economists usually use an index return, such as the Standard & Poor's 500-stock index, for the market return.

Most event studies employ a more complicated return-generating process called the market model. In this model the returns for a security are assumed to be linearly related to the returns on the market. The market model requires the analyst to estimate the parameters of the following equation using regression analysis:

$$R_{jt} = \alpha + \beta R_{mt} + \varepsilon_{jt} \qquad (3)$$

where α, β are regression parameters, and ε_{jt} is the error term for time period t. Once these regression parameters are estimated, the security's normal returns (called $\hat{R}_{jt}$) are then estimated using the estimated parameters ($\hat{\alpha}, \hat{\beta}$) and the return on the market by substituting into equation (3)

($R_{jt} = \hat{\alpha} + \hat{\beta} R_{mt}$). The abnormal returns are the difference between the estimated normal returns to the actual:

$$AR_{jt} = R_{jt} - \hat{R}_{jt} \qquad (4)$$

where $\hat{R}_{jt}$ is the estimated return for time period t from the regression equation.* This approach recognizes that few stocks move one-for-one with the overall market.

Once the abnormal returns have been estimated, the cross-section average abnormal returns are then calculated. They are:

$$AAR_t = \sum_{j=1}^{N} AR_{jt} / N \qquad (5)$$

where AAR_t is the average abnormal return for time period t, and N is the number of firms in the study. The average abnormal returns are then summed to find the cumulative average abnormal returns. They are:

$$CAAR_t = AAR_t + CAAR_{t-1} \qquad (6)$$

where $CAAR_t$ is the cumulative average abnormal return for time period t.

*For more details on these approaches, see Brown and Warner (1980) and (1985).

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