The Economic Worth of Celebrity Endorsers: An Event Study Analysis

Celebrity endorsement has become a prevalent form of advertising in the United States. Despite extensive literature on the effects of celebrity endorsements on consumers' brand attitudes and purchase intentions, little is known about the economic value of these endorsements. Research on this topic has typically focused on theories explaining how celebrity endorsements influence consumers' attitudes and intentions. The authors assess the impact of celebrity endorsement contracts on the expected profitability of a firm by using event study methodology. Their approach assumes that the announcement of a celebrity endorsement contract, usually widely publicized in the business press, is used as information by market analysts to evaluate the potential profitability of endorsement expenditures, thereby affecting the firm's expected return. Announcements of 110 celebrity endorsement contracts were analyzed. Results indicate that, on average, the impact of these announcements on stock returns is positive and suggest that celebrity endorsement contracts are generally viewed as a worthwhile investment in advertising.

Celebrity endorsement has become a prevalent form of advertising in the United States. According to industry sources, approximately 20% of all television commercials feature a famous person, and approximately 10% of the dollars spent on television advertising are used in celebrity endorsement advertisements (Advertising Age 1987; Sherman 1985). The number and dollar value of celebrity endorsement contracts are increasing, and these contracts constitute a significant and growing portion of advertising budgets (McGill 1989).

Several studies have examined consumers' response to celebrity endorsements in advertising. Findings show that celebrities make advertisements believable (Kamins et al. 1989) and enhance message recall (Friedman and Friedman 1979). Furthermore, celebrities aid in the recognition of brand names (Pettty, Cacioppo, and Schumann 1983), create a positive attitude towards the brand (Kamins et al. 1989), and create a distinct personality for the endorsed brand (McCrenken 1989). Ultimately, celebrity endorsements are believed to generate a greater likelihood of customers' choosing the endorsed brand (Heath, McCarthy, and Mothersbaugh 1994; Kahle and Homer 1985; Kamins et al. 1989; Ohanian 1991). Thus, the use of celebrity endorsements is an advertising strategy that should enhance the marginal value of advertisement expenditures and create brand equity by means of the "secondary association" of a celebrity with a brand (Keller 1993).

Celebrity endorsements are expensive for the firm. Depending on the status of the celebrity, remuneration could run into millions of dollars for several years. A contract may also include a profit sharing plan. Firms often build special and costly advertising campaigns around celebrities. For example, Coca Cola reportedly spent $25 million in an advertising campaign with Bill Cosby as its spokesperson for Coke (Advertising Age 1986). Similarly, IBM spent $40 million in an advertising campaign involving MASH actors (Reuters 1987). Overall, the use of celebrities as spokespersons in advertisements constitutes a significant investment in intangible assets by the sponsoring firm—an investment that management hopes to offset with greater future sales revenues and profits.

The economic value of strategic marketing decisions is receiving growing interest in marketing literature. A number of studies have examined the effect of strategic marketing decisions such as product innovation, research and development expenditures, advertisement expenditures, product quality, and consumer satisfaction on firm profitability (Capon, Farley, and Hoenig 1990; Szymanski, Bharadwaj, and Varadarajan 1993). Because a growing number of firms are investing in celebrity endorsement to enhance the value of advertising dollars and build brand equity, a natural question is: What are the economic returns from the investment in this form of advertising?

Our purpose is to assess the profitability of the celebrity endorsement advertising strategy. Previous studies on the impact of celebrity endorsements have provided valuable insights into consumers' responses to advertisements that portray celebrities. Our premise is that it is important for a manager to know whether a celebrity endorsement strategy generates a favorable consumer response, as well as understand whether the economic returns justify the costs associated with such a strategy.

Measuring the overall effect of advertising expenditures on sales is problematic, and a direct assessment of the effectiveness of a celebrity endorsement on a firm's profitability may be impossible. In addition, because advertising ef-
fects accrue over time, current profits may not accurately reflect the true profitability of a given campaign. The difficulty associated with isolating and measuring the profit associated with a given celebrity endorsement campaign led us to use an alternative measure. This is the expected profit associated with a celebrity endorsement campaign as reflected in the abnormal returns of a firm. Abnormal returns are measured using event study methodology. Although a firm's profit is influenced by several factors, and isolating the contribution of any one variable is difficult, the event study methodology provides a means and unique opportunity to assess the impact of a particular strategy on a firm's expected future profits.

**Event Study Methodology**

Event study methodology measures the magnitude of the effect that an unanticipated event has on the expected profitability and risk of a portfolio of firms associated with that event. The theory underlying event study methodology is the efficient market hypothesis (Fama et al. 1969). According to this theory, the price of a security is the present value of future cash flows expected from a firm's assets and, at any given time, reflects all the available information about the firm's current and future profit potential. If any new information resulting from an unexpected event is believed to affect a firm's current and future earnings, the security price changes as soon as the market learns of the event. Therefore, stock prices are viewed as reliable indicators of a firm's value. The amount of change in the price of a security after an event, relative to its pre-event price, would reflect the market's unbiased estimate of the economic value of that event (Brown and Warner 1985). To examine whether an event had any impact on the firm's value, abnormal return, which is the change in stock price after it has been adjusted for changes resulting from general market movements, is measured.

This methodology is well accepted and has been widely used in a variety of disciplines, such as finance, accounting, law, organizational behavior, and business strategy. More recently, the methodology has also been applied to assess the impact of some marketing-related events on a firm's profitability; such events include, for example, a change in a company's name (Horsky and Swyngedouw 1987), new product introduction (Chaney, Devinney, and Winer 1991), brand leveraging (Lance and Jacobson 1995), product recalls (Jarrell and Peltzman 1985), and regulations and rulings on false advertising (Peltzman 1981). Details of event study methodology are widely available in the literature (Horsky and Swyngedouw 1987; Schwert 1981). We also present a summary of this methodology in the Appendix.

Our rationale for applying event study methodology to celebrity endorsements is: Although it may be impossible to measure the direct impact of a celebrity endorsement on a firm's future profits, we can investigate whether the decision to incur this advertising expenditure is viewed as wise by investors. Because of the substantial costs usually associated with celebrity endorsements, we argue that a firm's contractual agreement with a celebrity is a major event with potential financial implications. Such contracts are formally announced by firms and usually receive wide coverage in the media. Therefore, when an announcement is made about a celebrity endorsement contract, investors make independent judgments on the future profit impact of the contract. These judgments are then immediately reflected in the firm's stock returns. Therefore, measuring the abnormal returns of firms announcing endorsement contracts enables us to examine the market's valuation of the net economic worth of celebrity endorsements.

**Results**

**Data**

We define the event day as the date when the announcement of a contract or a forthcoming contract between a firm and a celebrity first appeared in the print media. We consulted major newspapers for announcements of contracts between January 1980 and December 1992. We also conducted a thorough search of other newspaper and newswire services in Lexis/Nexis data files to search for any leakage of forthcoming contracts, and other firm-specific events from five days before to one day after the announcements of the contracts. Our search led to the identification of 207 cases of endorsements for which announcement dates were available. Ninety-seven cases were excluded from the analysis because they involved privately held companies or foreign firms for which stock data were unavailable. Hence, our final sample size was 110 observations. For most of the cases (83%), the event day is the date when the news about an actual contract appeared in the print media. We found no other prior news of a forthcoming contract for these cases. For the remaining cases, there was prior information from the print media of forthcoming contracts; and for these, the event day is the first day when the news of the forthcoming contract became public through print media. The sample of 110 cases represents announcements of celebrity endorsement by 35 firms involving 87 celebrities. Each announcement contained primarily information regarding the names of celebrities and the sponsoring firm. Only a fraction of the announcements (31%) also contained information on the contract value, and eight cases were associated with the endorsement of new brands. Data on stock returns were collected from the files of the Center for Research in Security Prices at the University of Chicago.

**Abnormal Returns Due to Announcement of Celebrity Contracts**

Following Brown and Warner's (1985) study, we estimated the parameters of the market model (Equation 3 in the Appendix) for each firm by regressing its actual returns on the returns of a weighted portfolio of securities using an estimation period of 239 days (t = 244 to t = 6 days relative to the event day, t = 0). The estimated market model parameters (α and β) were then used in Equation 4 to estimate abnormal returns to the portfolio of 35 firms for 110 announcements on and around the event day. Figures 1 and 2

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1 All equations mentioned subsequently can be found in the Appendix.
present the distribution of abnormal returns (Equation 4) and standardized abnormal returns (Equation 5), respectively on the event day for all 110 events.

Table 1 presents the average abnormal returns for the 110 announcements on the event day, as well as for a window of ±10 days around the event day. Results show that, on average, announcements of celebrity endorsement contracts are associated with positive excess returns. The average abnormal return for the event day is .44%, which is statistically significant (t = 2.39, p < .05). This percentage represents the largest gain in excess returns over a period of

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2 We used the Center for Research in Security Prices market value weighted portfolio of all NYSE and AMEX stocks to serve as the proxy for the market portfolio when estimating each firm's market model. Similar results to those we report here were obtained when the equally weighted market portfolio was used. The results at the event day were: Average abnormal return = .53%; T-hash1 = 2.74; and T-test2 = 2.92.
TABLE 1
Excess Returns of 110 Announcements of Celebrity Endorsements

<table>
<thead>
<tr>
<th>Event Day</th>
<th>Average Abnormal Return (%)</th>
<th>T-Statistic1</th>
<th>T-Statistic2</th>
<th>Cumulative Average Abnormal Return (%)</th>
<th>% of + Abnormal Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10</td>
<td>.26</td>
<td>1.28</td>
<td>.93</td>
<td>.26</td>
<td>49.1</td>
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<td>.30</td>
<td>1.61</td>
<td>1.98*</td>
<td>.56</td>
<td>58.2</td>
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<td>-1.11</td>
<td>-1.01</td>
<td>.28</td>
<td>44.5</td>
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<td>-.11</td>
<td>-.36</td>
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<td>.17</td>
<td>38.2</td>
</tr>
<tr>
<td>-6</td>
<td>.02</td>
<td>.55</td>
<td>.11</td>
<td>.19</td>
<td>44.5</td>
</tr>
<tr>
<td>-5</td>
<td>-.21</td>
<td>-.84</td>
<td>-.32</td>
<td>-.02</td>
<td>47.3</td>
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<tr>
<td>-4</td>
<td>.15</td>
<td>1.32</td>
<td>.81</td>
<td>.13</td>
<td>54.5</td>
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<tr>
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<td>-.00</td>
<td>-.74</td>
<td>-1.07</td>
<td>.13</td>
<td>38.2</td>
</tr>
<tr>
<td>-2</td>
<td>-.05</td>
<td>-.23</td>
<td>-.31</td>
<td>.08</td>
<td>44.5</td>
</tr>
<tr>
<td>-1</td>
<td>.09</td>
<td>.54</td>
<td>1.42</td>
<td>.17</td>
<td>56.4</td>
</tr>
<tr>
<td>0</td>
<td>.44</td>
<td>2.39*</td>
<td>2.63**</td>
<td>.61</td>
<td>57.3*</td>
</tr>
<tr>
<td>+1</td>
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<td>-.96</td>
<td>-.55</td>
<td>.40</td>
<td>45.5</td>
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<tr>
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<td>-.26</td>
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<td>.30</td>
<td>.47</td>
<td>.12</td>
<td>50.0</td>
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<td>.04</td>
<td>.33</td>
<td>-.01</td>
<td>.16</td>
<td>45.5</td>
</tr>
<tr>
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<td>.04</td>
<td>.36</td>
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<tr>
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<td>55.5</td>
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<td>-.02</td>
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<td>-.09</td>
<td>.04</td>
<td>46.4</td>
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<tr>
<td>+10</td>
<td>.18</td>
<td>.74</td>
<td>-.12</td>
<td>.22</td>
<td>43.6</td>
</tr>
</tbody>
</table>

T-Statistic1 = Based on the parametric test in Equation 6.
T-Statistic2 = Based on Corrado’s (1989) nonparametric test.
*p < .01.
**p < .05.

±10 days around the event day. The results indicate that, on average, firms announcing contracts with celebrities experienced a gain of .44% in excess returns. This estimate has the same order of magnitude as abnormal returns reported in other marketing-related event studies. For example, Horsky and Sweeney (1985) report .64% positive excess returns on average in response to the changes in a firm’s name; Chaney, DeVinney, and Winer (1991) report .25% abnormal return with the announcement of new products; and more recently, Lane and Jacobson (1995) report a .32% abnormal return due to the announcement of brand leveraging.

We performed an additional test to further examine the significance of our results. The distribution of excess returns on the event day, presented in Figures 1 and 2, depict a distribution that is skewed slightly to the right. This skewed distribution suggests that the assumption of a normal distribution implicit in the t-test in Equation 7 might be violated. To circumvent this problem, Corrado (1989) has suggested an alternative nonparametric rank test. This test uses only ordinal information about the returns on the event day, rather than information on the magnitude of returns (Corrado 1989). As a result, the test statistic is not influenced by the variance in the distribution of returns on the event day. As indicated in Column 4 of Table 1, the t-value of the event day estimates derived from this test is 2.63, which is statistically significant. This result further confirms the significance of excess returns on the event day. The last column presents the percentage of the 110 abnormal returns, which are strictly positive for each day, showing that 57.3% of all cases had a positive abnormal return on the event day. This proportion was significantly (at p < .05) larger than the average percentage of positive returns observed over the estimation period (47.0%).

Cumulative Abnormal Returns

It is standard practice in an event study to examine the cumulative excess returns for various windows surrounding the event day for two reasons. First, analyzing abnormal returns surrounding the event day allows for uncertainty regarding the actual date of the event. Second, it allows the researcher to capture the cumulative effect of an event, because the effect may be spread over several days surrounding the event day because of the gradual availability of information and interpretation of the event’s impact on future firm profitability.

Table 2 presents the cumulative average returns (CAR) for various windows surrounding the event day. Of all windows considered, only the one from -1 to 0 days showed a significant CAR, with a value of .54%. The significance of

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3For nine cases, there was leakage of news regarding "negotiations". Because such negotiations have failed in the past on some occasions (for example, Madonna for LA Gear and Meryl Streep for American Express), we ignored such rumors. However, considering the date of publication of rumors as the event day produced very similar results. Results for the event day were: Average abnormal return = .38, T-test1 = 2.33, and T-test2 = 2.42; and CAR (Cumulative Average Return) for -1 to 0 days was .41, T-test1 = 1.86.

4Figures 1 and 2 show some of the abnormal returns as potential outliers. We replicated our analyses after excluding outliers and arrived at essentially the same conclusions reported in the text.
TABLE 2
Cumulative Abnormal Returns for Windows Surrounding the Event Day

<table>
<thead>
<tr>
<th>Time Interval</th>
<th>Cumulative Average Abnormal Return (%)</th>
<th>T-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10; +10</td>
<td>.23</td>
<td>.61</td>
</tr>
<tr>
<td>-10; -2</td>
<td>.08</td>
<td>.49</td>
</tr>
<tr>
<td>-5; +5</td>
<td>.18</td>
<td>.44</td>
</tr>
<tr>
<td>-5; -2</td>
<td>-.11</td>
<td>-.24</td>
</tr>
<tr>
<td>-2; 0</td>
<td>-.48</td>
<td>1.54</td>
</tr>
<tr>
<td>+1; 0</td>
<td>.54</td>
<td>2.91**</td>
</tr>
<tr>
<td>0; +1</td>
<td>.24</td>
<td>.99</td>
</tr>
<tr>
<td>-1; +1</td>
<td>.33</td>
<td>1.12</td>
</tr>
<tr>
<td>+1; +5</td>
<td>-.24</td>
<td>-.42</td>
</tr>
<tr>
<td>+1; +10</td>
<td>-.39</td>
<td>-.50</td>
</tr>
<tr>
<td>-1; +10</td>
<td>-.15</td>
<td>.38</td>
</tr>
</tbody>
</table>

*Statistically significant at the .05 level. We computed the T-statistics using Brown and Warner's (1985) Equation A.6.

CAR from -1 to 0 days is plausible because, for some events, there is a lag of at least one day between the announcement of a contract and availability of information through print media. As a result, the positive abnormal return on Day -1 may reflect the impact of those announcements that were made on Day -1, but were not printed by the media until Day 0. In summary, evidence of significant positive returns on the event day and the cumulative average return over two days (including the event day) suggest that, on average, the market quickly reacts positively to announcements of celebrity endorsement contracts in advertising. The absence of significant cumulative effects beyond the 2-day period around the event is consistent with the efficient market assumption implicit in event study methodology (Fama et al. 1969).

To test whether our results were caused by having a substantial subsample associated with soft drinks (37.3%) and athletic shoes (22.7%), and using a substantial proportion of sports celebrities (55.5%), we performed a regression analysis. We regressed the standardized abnormal returns on the event day on a set of dummy variables, identifying the announcements associated with soft drinks (Soft-dummy) or athletic shoes (Shoe-dummy), and sports celebrity endorsers (Sport-dummy). None of the variables had any significant impact on abnormal returns ($F_{3,105} = 1.57; p < .20$). Our results suggest that event study results are not influenced by the inclusion of a large portion of cases from the soft drink or athletic shoe industries. Nor was evidence found that the market assigns sports celebrities more or less value than it does non-sports celebrities.

Conclusions and Extensions

Our analyses indicate that the market reacted both positively and negatively to the announcement of different celebrity endorsement contracts, which is reflected in both positive and negative abnormal returns on the event day. However, on average, investors seem to value positively the use of celebrities in advertisements. A significant percentage of positive abnormal returns to the sponsoring firms was observed on the event day; on average, the sponsoring firms recorded a gain of .44% excess returns in their market value as a result of announcing contracts with celebrity endorsers. Looking at several “windows” around the event day, we found that the interval between one day before the event and the event day was the only period with significant cumulative abnormal returns. Overall, these results clearly indicate a positive impact of celebrity endorsements on expected future profits, which lends objective, market level support to the use of celebrity endorsers in advertising.

Recent reports in the business press suggest that there are decreasing returns associated with using celebrities in advertising. For example, the costs associated with celebrity endorsements are rising; some celebrities endorse several products, sometimes even switching their endorsements to rival brands; the negative publicity generated by some celebrities has added the potential risk of negative impact; and surveys of consumers' reactions to product endorsements reveal that only a fraction of consumers react positively to endorsements. However, the widespread and persistent use of celebrities in advertising suggests that marketing managers continue to believe that celebrity endorsements are a worthwhile component of the advertising strategy, despite the costs involved. Our results suggest that this belief is generally shared by investors as well. The positive average abnormal returns found in this study reflect the market's general belief that the expected incremental gain from celebrity endorsements exceeds the incremental costs of advertising due to such contracts.

Because stockholders are one of the major stakeholders in the firm, shareholder value analysis has been advocated and practiced (Arzac 1986; Day and Fahey 1990; Rappaport 1986) as a means of assessing the financial consequences of strategic decisions. Recent studies show a positive association between abnormal returns and investments in intangible assets, such as innovativeness (Chancy, Devlin, and Winer 1991) and brand quality (Aaker and Robertson 1994). Our results provide additional empirical evidence that investors not only pay close attention to marketing strategies but also react to them. Our results also provide further support for the need for shareholder value analysis in conjunction with analysis of marketing strategies.

Our results also may offer some insights to firms considering the use of celebrity endorsers. To date, managers considering the hiring of celebrity endorsers for advertising could only turn to results of consumer experiments and surveys for guidance. Our results, based on a large sample of celebrity endorsement contracts, provide new evidence that celebrity endorsements are generally viewed as a profitable advertising strategy. However, measurement of abnormal returns is only the first step in assessing the economic value of celebrity endorsement. A manager, when considering the use of celebrity endorsements, must identify the appropriate celebrities who will potentially enhance the value of investing in advertising. Previous studies on the effectiveness of celebrity endorsements provide valuable insights regarding the celebrity characteristics that consumers view positively. Further research could survey investors analysts regard-
ing the characteristics of celebrities and circumstances when celebrity endorsements are viewed either more positively or negatively. Results of such surveys may provide additional information for the selection of appropriate celebrities.

Celebrity endorsement contracts are not only on the rise but the average compensation paid to celebrities is also increasing. Reports from the annual surveys of Forbes (Lane 1994) magazine reveal that many celebrities earn far more money from their endorsement contracts than from their usual fields of endeavor. In addition, the abnormal returns reported here actually suggest that, on average, celebrities are worth more than the costs of hiring them. These results should be of interest to agencies that represent celebrities in contract negotiation.

The results of our study, as well as other recent marketing-related event studies, should provide impetus for applying this methodology to other areas. Managers often preannounce their marketing decisions through interviews or press releases. Their decisions may be associated with, for example, the introduction of new products, a change in advertising agencies, or the development of new segments or markets. Apart from competitors, consumers, and distributors, these announcements also provide information to investors regarding the firm’s commitment and intentions (Eisenberg and Robertson 1988; Horsky and Swyngedouw 1987). Investors’ reactions to such announcements, reflected in positive or negative abnormal returns, serve as feedback to managers regarding the investors’ assessments of their decisions (Rappaport 1987). On the basis of interviews with top executives, Webster (1981) identifies the lack of understanding about the financial implications of marketing decisions as one of the major issues facing marketing management. Our and other event studies show that event study methodology provides unique opportunities for marketing managers to assess the ramifications of their decision on the firm’s profitability.

Finally, a caveat must be placed on this and other studies that have employed event study methodology. We have attributed the excess return obtained at the end of the contract announcement to investors’ expectations regarding the future profitability of the celebrity’s endorsement. The implicit assumption here is that investors make inferences about the net present value of the firm’s investment in the celebrity contract and that the outcome of this inference by investors will be reflected in the firm’s stock price. In other words, we assume that the announcement of an endorsement contract is interpreted directly as information about the firm’s future use of the celebrity in advertising. This assumption is based on the findings of previous studies that demonstrate the potential effect of celebrity endorsement on consumer attitudes and intentions.

The announcement of such contracts could also send other signals to financial markets that might not be directly related to the usefulness of the celebrity in advertising (Klein and Leffler 1981; Nelson 1974). For example, the announcement of a contract could act as a signal to investors of the confidence a firm has in the superiority of its products or of its commitment to particular brands. In contrast, we assume that investors use these announcements as information: They consider the costs and potential benefits of the celebrity endorsement and react to the announcement accordingly. Obviously, as in any event study, verifying whether the observed abnormal returns attributed to each announcement are due to investors’ valuation of the celebrity endorsements or their response to some unrelated signal is virtually impossible, because it would require identification of all the hidden signals implied by each event. However, at the aggregate level, whether firms use announcements of celebrity endorsements to signal other intentions (e.g., entering a new market segment, increasing advertisement expenditures) or whether the market interprets those announcements as hidden signals can be assessed by surveys of managers and investment analysis. Thus, Eliashberg and Robertson’s (1988) study on informational and signalling values of new product preannouncements could provide a basis for further research in this area.

Appendix

A Summary of the Event Study Methodology

The price of a capital asset i at time t (Pit) is the present value of the future expected cash flows from the asset

\[ P_{it} = \sum_{k=1}^{\infty} d_{it+k} / (1 + r_{it+k})^k, \]

where \( d_{it+k} \) is the expected cash flow from asset i in period \( t+k \), and \( r_{it+k} \) is the discount rate of the cash flows accounting for its estimated riskiness.

The impact of an event on the firm’s potential profitability can be measured by comparing the stock return at the event day:

\[ R_{it} = (P_t + d_{it} - P_{i,t-1}) / P_{i,t-1}, \]

to the “normal return” that would be expected if the event did not take place. This “abnormal” return measures the change in the stock value due to an event.

Among various models, the one used most often for estimating expected or “normal” returns is the market model (Fama 1970). According to the market model, the normal return to asset i at time t can be expressed as a linear function of the returns from a portfolio of all market assets \( R_{mt} \):

\[ R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it}. \]

The abnormal return \( \epsilon_{it} \) for a security i at the date t of an event can, thus, be obtained as

\[ \epsilon_{it} = R_{it} - \alpha_i - \beta_i R_{mt}. \]

The commonly accepted hypothesis of efficient markets implies that the deviation \( \epsilon_{it} \) is a random variable with mean equal to 0, because the deviations between the actual returns to asset i and their expected values, conditional on all available information at time \( t-1 \), should not be systematically different from 0. To test if abnormal returns resulted because of an event, test the hypothesis that the cross-sectional mean of \( \epsilon_{it} \) at the event day is different from 0. The hypothesis is tested as follows.

Estimate the coefficients \( \alpha_i \) and \( \beta_i \) from Equation 3 through a linear regression over an estimation period of T days (for example, -244 to -6 days relative to event day = 0).
for each firm announcing a celebrity endorsement contract. The standardized abnormal return for the event day \( t = 0 \) is

\[ e_0 = \frac{\epsilon_0}{S_0} \]

where \( S_0 \) is the standard deviation of the regression residuals that were obtained prior to the contract announcement.

Because the event study is conducted over multiple events observed for several firms for various calendar dates, the effect of a particular type of event (e.g., celebrity endorsement contracts) can be tested by first computing the average of standardized abnormal returns over all observed events:

\[ e_t = \frac{\sum_{t=1}^{T} e_{t_0}}{T} \]

where \( T \) is the number of events being studied among multiple firms and \( t \) represents the event day (which falls on different calendar days for different events). To test whether the average abnormal return is different from 0 on the event day \( t = 0 \), use the test statistic,

\[ z_t = \frac{\sum_{t=1}^{T} e_{t_0}}{\sqrt{T}} \]

which is distributed unit normal for large \( T \).

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— (1987), "Adwhirl" (July 13), 88.


Reuter's, (1987), (April 3).


