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Assessing the Financial Value of Digital Advertising

An Event Study Approach

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Introduction

Advertising practitioners are undergoing pressure to be more accountable for advertising and to communicate its added value to top management as well as to shareholders (Marketing Science Institute, 2004). Determining the value created by digital advertising has become a growing focus, which demands that both practitioners and scholars translate advertising resource allocations into measurable effects. Practitioners and scholars, however, have not adequately demonstrated digital advertising's impact on performance metrics that really matter to top management and shareholders, partly due to the lack of established effectiveness of measures (Marvin, 2013). Consequently, the perceived lack of accountability has threatened digital advertising's credibility or even standing in the media mix (Ha, 2008). Nonetheless, digital advertising continues to play an important role in many firms' advertising strategies.

Advertising practices that include digital advertising can help build long-term assets (e.g., brand equity, customer equity) and can be leveraged to deliver financial and firm value effects (Rust, Ambler, Carpenter, Kumar, & Srivastava, 2004). Although financial methods alone have proved inadequate for justifying advertising investments (Rust et al., 2004), the event study method, which assesses the financial impact of changes in any marketing strategy including digital advertising, seems particularly relevant in today's advertising environment where accountability is imperative. Therefore, the purpose of this chapter is: 1) to introduce the event study framework and procedure for assessing digital advertising accountability, especially, the effects of digital advertising on financial or economic value (i.e., shareholder returns), and 2) to present preliminary research examining the relationship between Fortune 500 firms' launching a digital advertising channel (i.e., Twitter) and shareholder values. This research finds that digital advertising investments may be linked to shareholder values.

Underlying Assumptions of an Event Study

Brown and Warner (1980) note the underlying assumptions of an event study:

> Event studies provide a direct test of market efficiency. Systematically nonzero abnormal security returns, which persist after a particular type of event are inconsistent with the hypothesis that security prices adjust quickly to fully reflect new information. In addition, to the extent that the event is unanticipated, the magnitude of abnormal performance at the time the event actually occurs is a measure of the impact of that type of event on the wealth of the firms' claimholders. Any such

> abnormal performance is consistent with market efficiency, however, since the abnormal returns would only have been attainable by an investor if the occurrence of the event could have been predicted with certainty.
>
> *(pp. 205–206)*

As such, the event study is based on three key theoretical and methodological assumptions (McWilliams & Siegel, 1997; Srinivasan & Bharadwaj, 2004): 1) Financial markets are efficient, and thus, the market's reaction to an event can be measured by stock returns over the event window; that is, the period during which the stock prices of the firm involved in the event will be studied, 2) the event is unexpected, and thus, abnormal (or excess) stock returns—the difference between an asset's actual return and its predicted return—indicate the market's reaction to the unexpected event, and 3) there are no confounding effects during the event window, and thus the effect of the event is isolated from the effects of other events.

In regard to the first assumption, a significant body of work in economics and finance has addressed the efficient market hypothesis (Fama, Fisher, Jensen, & Roll, 1969), suggesting that stock prices incorporate all relevant information available to investors and thus provide unbiased estimates of a firm's discounted future cash flow (Rappaport, 1997). Such an assumption provides a basis for using the event study method. Thus, any financially relevant information that is newly revealed to investors will be quickly reflected in stock prices, and an event is anything that results in new relevant information.

As for the second assumption, only an unexpected event can change stock prices. Because the market previously did not have information on the event, investors would gain information from the event or announcement. Abnormal stock returns can then be assumed to be the results of the stock market's response to new information. Thus, information that may result in a positive or negative change in expected future cash flows also will have a positive or negative effect on the stock price. An event, however, could have been expected, or information may have leaked out to the market prior to a formal event or announcement. Such information leakages may make the event study method challenging because determining when investors become aware of new information may be difficult.

The third assumption is based on researchers isolating the effect of an event from other confounding effects. McWilliams and Siegel (1997) have considered this assumption as the most critical for the event study method. Confounding events can include announcements of cash dividends, new products, unexpected earnings, mergers and acquisitions, stock buybacks, changes in key executives, layoffs, restructurings, and local and federal regulations (McWilliams & Siegel, 1997; Wiles & Danielova, 2009). Any of these events might impact stock prices during the event window. Therefore, the length of the event window is very critical, because it is more difficult to control for confounding effects when long windows are used [e.g., ±90 days in Davidson, Worrell, and Dutia's CEO succession study (1993)]. Thus, an event window should be short enough to exclude confounding effects, and long enough to capture the significant effect of an event. Foster (1980) discussed methods that allow researchers to control for confounding events in an event study: 1) eliminating firms that have confounding events, 2) partitioning a sample by grouping firms that have experienced the same confounding events, 3) eliminating a firm from the sample on the day that it experiences a confounding event, and 4) subtracting the financial impact of the confounding effect when calculating the abnormal returns.

Research Design and Methods for the Event Study

Srinivasan and Bharadwaj (2004) suggested that an event study should follow these necessary steps: defining the event and specifying criteria for inclusion, calculating abnormal returns based on the normal

performance model, testing statistical significance, and explaining significant abnormal returns.

Defining the Event as Well as Specifying Criteria for Inclusion

Events are typically found through extensive searches of databases such as LexisNexis or Factiva to ensure the times and dates of the events are clearly identified. The event day is the date that the event actually occurred. In practice, the event window often includes up to one or more days after the event day to capture the price effects of the event and one or more days before the actual event to capture information leakages.

Then, it is necessary to specify the criteria for the inclusion of a firm's event in a study and to identify those firms that experienced confounding events during the event window. Researchers may elect to exclude certain cases from the study because of prior theoretical and methodological considerations. For example, in a study examining the effects of launching a Twitter channel on shareholder value, the launch date and time for a firm's Twitter account can be acquired on its official Twitter page by putting a cursor on the "joined" date. Firms with no stock information on the event day—because they are not publicly traded or because they have an initial public offering (IPO) after launching its Twitter accounts (e.g., Facebook)—would not be included in the study.

Calculating Abnormal Stock Returns

The next step is to assess an event's impact on a firm's shareholder value. It requires a measure of abnormal stock returns that was pioneered by Fama et al. (1969). The percentage change in the stock price is the stock return:

$$(1) \quad Rit = \frac{Pit - Pit-1}{Pit-1}$$

Where P_{it} is the stock price of asset i at time t. This stock return reflects market expectations of the financial impact of information arriving between *t-1* and *t*. When this information deals with an event, such as launching a Twitter channel, an "important and relatively objective indication" (Kalyanaram, Robinson, & Urban, 1995, p. 14) of an event's anticipated financial consequences is obtained.

The link between an event and a firm's stock return would be examined by comparing the stock return R_{it} at the event day with $E(R_{it})$, that is, the return that would be expected if the event had not taken place. According to the market model (i.e., normal performance model), the expected return $E(R_{it})$ to asset i at time t can be expressed as a linear function of the returns from a benchmark portfolio of marketable assets R_{mt}:

$$(2) \quad E(R_{it}) = \alpha_i + \beta_i R_{mt}$$

Where α_i and β_i are the ordinary least squares (OLS) parameter estimates obtained from the regression of R_{it} on R_{mt} over an estimation period preceding the event, for example, 255 trading days, ending 46 days prior to the event. Typically, event studies using daily stock prices have used a 45-day window to separate the estimation period from the event window (Srinivasan & Bharadwaj, 2004).

A benchmark portfolio includes several broad-based stock indices, such as the Center for Research in Securities Price (CRSP) value-weighted index, the CRSP equal-weighted index, and the S&P 500 index. Removing the portion of the stock's return that is related to variations in the general market's return increases the possibility of detecting the event's effect on the stock's return. The difference between the actual return and the estimated expected return provides a measure of the "abnormal" return e_{it} for the shares of firm i and time t:

(3) $e_{it} = R_{it} - E(R_{it}) = R_{it} - (\alpha_i + \beta_i R_{mt})$

This abnormal return, or prediction error, is the unexpected change in the stock price, which is then attributed to the event that took place at time *t*.

Testing Statistical Significance

Generally, significance tests for an event study can be grouped in parametric and nonparametric tests (Corrado, 1989; McWilliams & Siegel, 1997; Srinivasan & Bharadwaj, 2004; Kolari & Pynnonen, 2011). In a large-sample event study, abnormal returns (ARs) for the event generally are aggregated over time to produce cumulative abnormal returns (CARs) and then averaged over several firms to generate inferences about the event (i.e., Cumulative Average Abnormal Returns: CAARs).

A parametric test is based on the assumption of normal distribution of abnormal returns and depends on a classic t-test, which performs to specify if the abnormal effects in relation to the event are significantly different from zero and, thus, not the result of pure chance. In other words, the null hypothesis is that the event has no impact on firm value, whereas the alternative hypothesis is that the event increases or decreases the firm value. Parametric test statistics, however, tend to be very sensitive to outliers (McWilliams & Siegel, 1997). A useful and important control for outliers is for researchers to report nonparametric test statistics (Corrado, 1989).

Typically two nonparametric tests—a sign test and a rank test—are frequently employed in conjunction with a parametric test. The sign test (Cowan, 1992), such as the binomial Z statistic, tests whether the proportion of positive to negative returns exceeds the number from expected returns from the market model. However, a sign test is not robust in specifying whether the distribution of abnormal stock returns is skewed. To overcome this weakness, a nonparametric rank test, suggested by Corrado and colleagues (Corrado, 1989; Corrado & Zivney, 1992), transforms abnormal returns into ranks (i.e., ranking is done for all abnormal returns of both the event and the estimation period). It tests the null hypothesis that no abnormal return exists on the event day or during the event window.

Explaining Abnormal Returns

The final step of an event study is explaining abnormal returns. After determining the significance of the CAARs, researchers should explain abnormal returns by showing that the cross-sectional variation in abnormal returns is consistent with theoretical models. In order to examine any theoretically presumed association between the magnitude of abnormal returns and characteristics specific to the event, researchers have created a cross-sectional regression model of abnormal returns. Matrix of characteristics of an event and a firm become independent variables, while cumulative abnormal returns (CARs) become dependent variables in Ordinary Least Square (OLS) regression models. The t-statistics in OLS regression models will be used to assess whether or not independent variables are statistically significant.

Use of Event Studies in Assessing the Effects of Digital Advertising

Given that the total revenue of digital advertising is expected to reach about $60 billion in the United States by the end of 2015 (eMarketer, 2015), the effect of digital advertising on a firm's financial value has generated considerable interest. Searches through EBSCO Business Source Complete, using the keyword terms "advertising" and "event study," between 1997 and 2015, returned about 120 academic articles, but no such study has been conducted in the context of digital advertising.

Prior studies demonstrated that advertising decisions, such as changing an advertising slogan (Mathur & Mathur, 1995), changing ad spending before a recall announcement (Gao, Xie, Wang, & Wilbur, 2015), introducing celebrities as spokespersons (Agrawal & Kamakura, 1995), winning one or more Clio Awards (Tippins & Kunkel, 2006), and running Super Bowl commercials (Fehle, Tsyplakov, & Zdorovtsov, 2005), had significant impacts on the shareholder wealth of firms. These studies offer valuable insights into the financial effects of traditional advertising initiatives, but the financial or economic values of digital advertising practices, due to the lack of academic research, remains unclear.

When a firm launches a new digital advertising channel or initiates a new digital advertising campaign, investors could be expected to buy or sell stocks on the basis of their expectations of how the new channel or the campaign will affect the value of future cash flows. For example, investors may expect the firm to maintain its usual level of digital advertising, and thus, they could consider adding a new channel or launching a new digital advertising campaign as either an opportunity or threat.

Digital advertising developments that positively affect future cash flows should be expected to increase stock prices, whereas those that negatively affect cash flows should be expected to decrease them. Thus, an event in a digital advertising environment might have an impact on the financial performance of a firm and might produce an abnormal movement in stock prices. These hypotheses could be especially ripe for research given the increased emphasis among advertising practitioners and scholars on the accountability of digital advertising and the relationship between digital advertising investments and financial values of firms.

Accordingly, event studies could be designed in different ways to reflect specific research purposes and questions in the context of digital advertising. The event study method could be used in clinical studies as well as large sample studies. A clinical study could investigate the effect of a digital advertising event on stock prices of a single firm, such as an analysis of the market's reaction to a new Instagram sweepstakes campaign. Meanwhile, large sample studies could examine the impact of an important event (e.g., launching a new social media account as a digital advertising channel) on stock prices of different sample firms.

The following sections present how the latter (i.e., large sample event studies) could be conducted using steps suggested by Srinivasan and Bharadwaj (2004). Specifically, an exploratory event study, examining the relationship between launching a firm's Twitter account as a digital advertising channel and shareholder value, illustrates each step of the research procedure. Furthermore, the results of the study highlight how digital advertising investments could be linked to the expected financial value of a firm.

The Exploratory Event Study: Assessing the Financial Value of Launching a Twitter Channel

Information about a firm's launch of a Twitter channel is typically distributed to the market via cross-media campaigns through slogans such as "Follow us on Twitter" and other promotions (i.e., events and sweepstakes). This firm-initiated communication effort cues investors to the use of Twitter as a digital advertising channel. Therefore, launching a Twitter channel is considered an unexpected event controlled mainly by an advertiser, and it becomes a market signal directed at influencing the behavior of one or more investors of the firm. Information about a firm's decision to add a Twitter channel to its advertising portfolio should be expected to change investors' perceptions regarding a firm's future financial performance. Ultimately, information-based trading is expected in response to the event of launching a Twitter channel.

Identifying the Event and the Event Window

When research is interested in examining the financial value of launching a Twitter channel, the event is defined as launching an official Twitter account, and the event day is defined as the date when the Twitter account first appeared. Putting a cursor on the "joined" date on a Twitter account page obtains the accurate timing of the event. For example, Starbucks launched its official Twitter channel on November 29, 2006 at 11:19 a.m. In this study, however, the event windows were set, ranging from five days before through five days after the event, because of the potential for information leakage (e.g., advertisers' early press release about their launch of a Twitter channel) and the gradual dissemination of information via post-launch promotions.

Samples and Data

Fortune 500 companies are deemed to be appropriate as the sampling units for the study because they include firms from a variety of industries as well as the nations' largest firms with respect to revenues. Thus, they are more likely to adopt Twitter to interact with shareholders and customers (Culnan, McHugh, & Zubillaga, 2010), and their use of Twitter has been examined in the prior studies (Rybalko & Seltzer, 2010; Lee, Oh, & Kim, 2013). All Fortune 500 companies were searched through Twitter via typing each company name into the search box. A total of 96 firms (e.g., Energy Transfer Equity, World Fuel Service Corporation) were identified as not having official Twitter accounts at the time of searching, and they were dropped from the dataset.

Launch dates (i.e., event day) for those firms were recorded by checking the "joined" date of the official Twitter page. Daily stock-price returns for each firm were obtained from the CRSP databases, and 41 cases were dropped from the further analyses, because they were either privately held (e.g., State Farm Insurance, United Services Automobile Associations, etc.) or their stock-price data around the Twitter launching date were not available (e.g., Facebook, Vanguard Health Systems, etc.). These deletions reduced the sample to 363 cases.

Finally, a Factiva database was extensively searched to identify any case with confounding events during the event window. Firms with confounding events were removed, including those with announcements of cash dividend, new products, unexpected earnings, mergers and acquisitions, stock buybacks, changes in key executives, layoffs, restructurings, local and federal regulations, and lawsuits (McWilliams & Siegel, 1997) five days before and after the event day. This process retained 217 firms in the sample (see Appendix).

Results of the Event Study

The parameters of the market model for each firm were estimated during a window of 255 trading days, ending 46 days prior to the event, using the CRSP's equal-weighted index to model the market portfolio. All statistical calculations were performed using the EVENTUS program developed by Cowan Research, LLC. The sample firms' cumulative average abnormal returns (CAARs) and test statistics, five days before and after the event day, appear in Table 13.1.

Empirically determining the event window is standard practice in an event study to allow for any uncertainty regarding when the information was available to investors and to understand the cumulative effect of an event (Agrawal & Kamakura, 1995; Wiles & Danielova, 2009). No significant CAARs were found for the event windows prior to launching a Twitter channel (e.g., [−5 to −1], [−3 to −1], and [−1 to 0]), indicating information regarding the pending addition of a Twitter channel did not leak into the marketplace in a substantial enough manner to cause investors to reassess the firms. However, significant CAARs for the [0 to +3] event window were found. This event window fits the expectations that the market

can become gradually aware of a launch of a Twitter channel via advertisers' post-promotions. The direction and pattern of the results for the post-event windows are similar, but further interpretations should be made for the statistically significant [0 to +3] event window.

Table 13.1 Cumulative Average Abnormal Returns (CAARs) of Launching a Twitter Channel for Fortune 500 Firms

Event Window	*CAAR (%)*	*Sample Size (N)*	*The Number of Firms with Positive Abnormal Returns (%)*	*The Number of Firms with Negative Abnormal Returns (%)*	*Brown and Warner (1985) Portfolio t-Statistic*	*Patell (1976) Z-Statistic*	*Kolari and Pynnonen (2011) Generalized Rank t-Statistic*
−5 to −1	.11	217	123 (56.7)	94 (43.3)	.25	.63	.29
−3 to 0	−.10	217	116 (53.5)	101 (46.5)	−.30	−.32	−.34
−1 to 0	−.21	217	110 (50.7)	107 (49.3)	−.78[a]	−.70	−.91
−1 to +1	−.31	217	108 (49.8)	109 (50.2)	−.91	−1.24	−.92
0 to +1	−.15	217	98 (45.2)	119 (54.8)	−.253	−1.11	−.58
0 to +3	−.58	217	94 (43.3)	123 (56.7)	−1.48*	−1.94*	−1.65*
0 to +5	−.25	217	100 (46.1)	117 (53.9)	−0.49	−.52	−.55

[a]p < .10, *p < .05

Results show that on average, sample Fortune 500 firms experienced -0.58 percent abnormal returns on [0 to +3] days after adding Twitter as their digital advertising channel. The associated binomial proportionality test statistic (Z) was significant, providing additional support for the robustness of the negative abnormal returns (123 of 217 abnormal returns are negative; Z = -1.94, p < .05). Furthermore, t-statistics for the crude dependence adjustment (CDA) time-series portfolio test (t = -1.48, p < .05) (Brown & Warner, 1985) as well as the generalized rank t-test (t = -1.65, p < .05) (Kolari & Pynnonen, 2011) were statistically significant, indicating that the results were not due to the outliers in the sample. Combining all together, launching a Twitter account as a firm's digital advertising channel negatively affected the shareholder's value.

Explaining Negative Abnormal Returns

Given that the use of Twitter is believed to generate positive consequences such as the co-creation and the speedy transmission of advertising content, and the potential to build relationships with millions of customers, the finding that the stock market reacted to the firm's launching Twitter channel in a negative manner was surprising. On average, launching a Twitter channel decreased the value of the firm by 0.58 percent.

Explaining the negative abnormal return is the necessary step of the event study. It is expected that the type of customers with whom the firm communicates should be relevant to the negative impact of a firm's Twitter launch. The buying process for consumer goods has been shown to be less rational, and it involves the exchange of smaller monetary amounts than the sale and purchase of industrial goods (Turley & Kelley, 1997). Furthermore, consumer goods firms tend to have a larger group of stakeholders (Jeong & Yoo, 2011), and they may need to send more market signals than industrial goods firms. Thus, if launching a Twitter channel has a positive effect on stakeholders' perception of the firm, then it is more likely with consumer goods, where brand images and brand relationships play important roles. Oppositely, the benefits of

launching a Twitter channel should not be as great for industrial goods firms. Industrial goods are more likely to be tested and assessed in an objective manner, which makes industrial goods firms more prone to develop a sales orientation rather than a marketing orientation, leading to less appreciation of marketing intelligence and marketing communications (Avlonitis & Gounaris, 1997).

To examine the above scenario, a cross-sectional regression model was tested with the independent variable of industrial goods firms (i.e., dichotomously coded: 1 or 0) and two control variables (the firms' total assets and market value in millions of dollars). Note that the significant multicollinearity between consumer- and industrial-goods firms did not allow the entering of both as independent variables into the model. The model ($F_{3, 179} = 3.69$, $p < .01$, adjusted R-square = .11) found that industrial goods firms yielded significantly negative abnormal stock returns to the firms' Twitter launch ($\beta = -.18$, $t = -3.03$, $p < .01$), suggesting that the overall negative abnormal returns on the [0 to +3] event window were attributable to industrial goods firms in the Fortune 500 list.

Conclusion

The exponential growth of digital advertising is intuitively understandable because digital media are especially powerful in facilitating real-time engagement with shareholders and customers, which has become critical for driving sales. Digital advertising's credibility, however, has been questioned and the pressing need has been also accentuated for advertisers to link digital advertising investment to financial performance. Furthermore, due to a lack of compelling empirical evidence, it remains unclear whether digital advertising investments, such as adding a new social media channel, will increase or decrease the financial value of a firm.

This chapter suggests that an event study would be a supplemental, but appropriate, method for evaluating the financial value effects of digital advertising practices. Event studies have been frequently employed to detect the effects of event-induced variance on abnormal returns in the field of finance and economics as well as in the past advertising studies, but have virtually never been used in the context of digital advertising. Acknowledging the gap, this chapter outlines the study framework and procedure for an event study and discusses how the event study method could be utilized to explain digital advertising's accountability and to examine the effect of digital advertising on the financial value of a firm. Furthermore, it demonstrates how the event study can be applied to the context of digital advertising, especially for examining the financial value of launching a digital advertising channel.

The exploratory event study found that launching a Twitter account as a firm's digital advertising channel has a negative impact on shareholder's value, and further analysis revealed that unexpected negative abnormal returns are attributable to a large number of industrial goods firms. A number of speculative reasons emerged: investors' fear in a new social media channel may play a role in generating negative market reactions, or their concern about increased security risk, which seemingly involve information leakage and inadvertent disclosure of internal corporate data (Waxer, 2011), may outweigh the expected benefits of using a Twitter channel.

Future studies, therefore, should examine in more detailed manner why industrial goods firms suffered negative abnormal returns upon launching a Twitter channel to provide further theoretical and practical explanations. Furthermore, digital advertisers should bear in mind that the results only reflect the short-term effect of launching a Twitter channel on the firm's financial performance for the [0 to +3] event window. While maintaining a Twitter presence, advertisers can harness its power by successfully implementing intended strategies, facilitating real-time communication and user engagement, and sharing knowledge with shareholders and customers. Thus, advertisers should not be discouraged by the overall

negative abnormal returns found in the study. Further event studies, however, are recommended to examine whether the financial value effects of Twitter or other digital advertising channels could be enhanced or attenuated with continuous management and care.

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