論文題目：

Market reaction to big data implementation announcements

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Abstract

Big data implementation recently becomes a popular interest, bringing the tremendous impact on the inside and outside of enterprises. To understand the interior efficiency, some indicators, such as cost or revenue, can be adopted to certainly provide references for managers. Evaluating the exterior effectiveness, however, is a challenging work because managers are not effortless to acquire the perspective of investors on the investment of big data implementation. Hence, this study conducted an event study method, which has been used in the financial, accounting, and management fields, to assess the effect on the news coverage about big data implementation. This is the first study to gauge the impact of big data implementation announcements on the market value of firms and investigate the contextual factors in the abnormal returns. The experimental results show that the big data announcements have almost merely no relevance with the market valuation of firms. While the article with talking about the strategy objective of the big data, the influence of the big data issue will have little reaction to the stock price.

Keywords: big data; market value; announcement; event study; abnormal return
壹、 Introduction

The event study method is a useful instrument, which can help managers to access the impact of events on the market value. The efficient market theory provides a strong theoretical cornerstone for this basic event study methodology (Fama, 1970). In the field of management information systems (MIS), the event study method is not prevalent to study the market reaction on information systems (IS) or information technologies (IT). Albeit the utilization of the event study method is not the mainstream of the IS/IT research, some studies about this topic are still bringing out (Konchitchki and O’Leary, 2011; Roztocki and Weistroffer, 2011).

In recent years, the number of the event study method to gauge the contribution of IS/IT is gradually increased. The reasons are: (1) the capability of IS/IT is shifting from the operation level to the strategy one; therefore, managers are much interesting in the exterior impact on the market value of IS/IT not just the interior and (2) the MIS scholars desire to study the influence of IS/IT on enterprises in order to strengthen the importance of this discipline.

In recent years, big data implementation (BDI) has become a hot topic which is not only in academics but in enterprises or governments. In this study, we decide to use the definition of big data from Gartner Inc. since their definition is more portraying big data in the management concept. They defined big data as: big data is high-volume, high-velocity and high-variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight and decision making (Gartner IT Glossary, 2015).

Because the trend of big data is coming to business, there are more and more managers who commence to consider introducing big data into their firms. BDI becomes a popular interest, bringing the tremendous impact on the inside and outside of enterprises (we will explain the reason later). The measurement of the exterior effectiveness, however, is a challenging work because managers are not effortless to acquire the perspective of investors on the investment of big data implementation. Accordingly, this study conducted the event study method to assess the effect on the news coverage about BDI. We believe that managers are not only willing to know the performance of their investment in big data, but also strongly desire to figure out the market reaction for the BDI announcement.

The objective of this study is to examine the stock market reactions to the BDI announcement. Specifically, with using the event study method, we empirically studied how investors perceive and access the BDI announcement so that there are positive abnormal returns to be generated from the announced firms. With the perspective of the efficient market theory, if the market believes the BDI
announcement is beneficial and positive to the firms, their values should be reflected in the market price of the firms’ stocks. In addition, this study also examined the contextual factors of the BDI announcement, including the technology side, the strategy objective of BDI, and industry type.

This paper is organized as follows: Section 2 reviews related works; Section 3 develops the study hypotheses; Section 4 details the research method in BDI; Section 5 presents the findings; and Section 6 presents our conclusions and future works.

一、Related work

In this section, we discuss two research topics, of which areas are belonging to MIS and financial management and economics. The first is big data which is an emerging study recently in Section 2.1; the second is talking about event study applications in Section 2.2; finally, the third introduces the idea of how to understand market reaction with the measurement of abnormal returns.

一、Big data

There is no buzz word like big data, which is such popular after another buzz work, cloud computing. In 2010, big data received tremendous attention from managers and researchers, and the column of the New York Times in 2012, titled the age of big data, proclaimed the coming of the big data era.

The definition of big data is of variety; therefore, we can refer to different dimensions to understand the capability of big data (Gandomi and Haider, 2015). In general, they can be classified into technology-oriented and organization-oriented dimensions. For saving the space of this paper, the relevance definitions for big data can refer to the Wamba et al. study (Wamba et al., 2015). There are 3V, volume, variety, and velocity, to describe the characteristics of big data, which are the three challenges in data management (Laney, 2001):

(一) Volume: there is more data than ever before and its size lasts increasing;

(二) Variety: there are many different types or sources of data;

(三) Velocity: the speed of data in and out is significantly increasing so that we want to obtain useful information in real time.

In addition to the 3V’s, there are more 2V, value and variability, to be defined as:

(一) Value: there should have business value, giving firms generate competitive advantages, which is discovered from data;
(二) Variability: there are changes in the structure of the data and how managers are able to interpret them.

As the description above, we understand that although there are numerous technological issues, implementing big data into firms, we believe that the major challenge of BDI is from the organization dimension not the technology one. However, managers pay more attention to the value creation of BDI. Three values of BDI are cost reduction, decision improvements, and improvements in products and services (Davenport, 2014). The three values are the most important factor for firms because their outside investors are all concerning about them. If some firms announce the news about BDI, they would pay more attention to these firms, of which market value should change during the short term of the BDI announcement. Based on the argument, this study conducts the event study method to estimate the abnormal return for the BDI announcement.

二、Applications of market value study

In accordance with the efficient market theory (Fama, 1970), the reflection on stocks prices is definite with all information to potential investors. The event study method has been widely used in the realms of finance and management to examine various types of news announcements. (MacKinlay, 1997; McWilliams and Siegel, 1997). Since the advancement of IS/IT to enterprises become essential, its impact has shifted from the inside to the outside. Accordingly, the event study methodology using in the MIS field can help us to assess the business performance of IS/IT. To our best knowledge, the formal and earliest paper published in the MIS journal is the research of Dos Santos et al. (1993). After that, the MIS researchers commence to adopt this methodology to address various IS/IT investments (Konchitchki and O’Leary, 2011; Roztocki and Weistroffer, 2011).

In general, these investments include the implementation, adoption, purchase, and use of IS/IT. For ease of understanding the related work of IS/IT investments, we provide an overview information in Table 1, whose function in enterprises can be classified into operation and strategy. The operation function defined in this study concerns about the efficiency within organizations.

<table>
<thead>
<tr>
<th>Function</th>
<th>Topic</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation</td>
<td>IT investments</td>
<td>Dos Santos et al. (1993)</td>
</tr>
<tr>
<td></td>
<td>Enterprise resource planning</td>
<td>Hayes et al. (2001)</td>
</tr>
<tr>
<td></td>
<td>Enterprise application integration</td>
<td>Roztocki and Weistroffer (2009)</td>
</tr>
<tr>
<td></td>
<td>IT outsourcing</td>
<td>Hayes et al. (2000)</td>
</tr>
<tr>
<td></td>
<td>E-business outsourcing</td>
<td>Agrawal et al. (2006)</td>
</tr>
</tbody>
</table>
As the classification approach, we understand that IS/IT implemented to firms involving in the issue or improvement of the business process is classified into the operation function. Moreover, IS/IT implementation considering the market position of firms is classified into the strategy function. According to the argument of Davenport (2014), the data analytics from big data not only can improve the business process of firms, but can discover unexpected insights to develop new strategies to strengthen the competitive advantages of firms. Therefore, this study pinpoints the BDI investment on the both functions, i.e. operation and strategy.

三、Market reaction by measuring abnormal returns

The abnormal return is an index which can be utilized to investigate the impact on event announcements. The abnormal return is defined as the difference between the expected return on a stock and the actual return, i.e. \( \text{Abnormal return} = \text{Actual return} - \text{Expected return} \). The expected return is computed in regard to the average market performance over a given year. It can be positive or negative abnormal returns, depending on the perspective of investors on the received news or comments.

There are two concerns which will influence the result of measuring abnormal returns. The first is the definition of an event window, and the second is the return estimation during the event window in the absence of the unanticipated event. The event window can officially be denoted as \([-x, +y]\), where \(x\) is the number of days before the announcement day and \(y\) is the number of days after the announcement day; additionally, day 0 means the announcement day. According to the survey of Konchitchki and O’Leary (2011), a short event window, such as \([-1, +1]\) or \([-2, +2]\), is recommended to be used based on their literature study about the event study adoption on IS/IT. Finally, in accordance with another survey (Roztocki and Weistroffer, 2011), the length of the return estimation without the unanticipated event is usually using a 200-day estimation period preceding the event window.
Research hypotheses

As the introduction of the last section, we can conclude that the investment or implementation of IS/IT is a driver, leading enterprises to gain operation efficiency or strategy effectiveness. In the context of this study, the sending party is the news about the BDI announcement, and the receiving party is the investors who will interpret the announcement and react according to their final estimation. The event study methodology can catch the reaction of the receiving party to understand the signal performance of the sending party.

As the concept of the resource-based view (RBV), a firm can hold its own competitive advantage if its resources are heterogeneous in nature and immobile (Barney, 1991). However, to glance the overview information in Table 1 again, we can find that most of IS/IT investments are belonging to the introduction of IS or IT or the business activity with respect to information management. They are certainly beneficial and valuable to firms; yet, not all of them can be inimitable, non-substitutable, and rare. If a first mover firm who is adopting an IS or IT has gained a payoff in its competitiveness, its competitors would purchase the same IS/IT from information companies for pursuing the same competitive advantage. The advantage might be easy to be imitated so that firms could not treat them as a strategic instrument so that their investors may not expect that this kind of IS/IT will produce great revenues to firms (Roztocki and Weistroffer, 2013). However, for the idea of BDI, the resource of a firm which cannot be imitated or moved is its own data. The data collected from the daily transaction or the digitalization of customer behavior with electronic devices is the only resource that other companies cannot copy and imitate if its policy of data management is rigorous. Except for the data as the critical resource of the firm, the usage of data analytics to analyze the data is another catalyst to perfect the whole task of big data. Through the investment and implementation of big data into firms, the result of data analytics can improve their original business process, create novel business process, formulate new strategies, or propose new business models. Any one of the four results can generate enormous benefits to firms so that the expectation of the investors concerning about the BDI announcement should be positive. This leads to the following hypothesis:

Hypothesis 1 (H1): The abnormal return to the BDI announcement is positive.

Firms invest in IS/IT because they provide real economic value to their business, they expect that they can own better performance than those who do not invest too much fund in IS/IT. However, based on the argument of Laudon and Laudon (2007), not all firms who invest a great resources in IS/IT can guarantee good payoffs. Managers should consider complement assets to support IS/IT to receive superior returns.
if managers are willing to introduce big data into their firms, they should also consider the technology issue. The cost of these techniques and the complexity to implement big data are two important considerations of managers. Fortunately, based on the cloud computing environment, some enterprises can furnish the relevance tools to firms who want to implement big data. Accordingly, these firms do not have to purchase the software and build the infrastructure of big data. This will reduce greatly the complexity of BDI.

As the introduction above, we think that if the content of a BDI announcement is talking of how to leverage the techniques of big data into the firm, the investors should believe that its manager indeed understands all details of BDI, including the technology part. In addition, the past studies with respect to IT investments demonstrated that firms adopting IT have abnormal returns from these investments (Dos Santos et al., 1993; Im et al., 2001). Therefore, if the investors know that managers will invest IT resources into their firms, they should expect that the BDI target will be archived. This leads to the following hypothesis:

**Hypothesis 2 (H2): The abnormal return to the BDI announcement mentioning the issue of how to conduct the BDI technology into the firm is different from that without mentioning the issue.**

Based on the description of Davenport (2014), firms should establish the explicit objective, which is one of successful conditions for BDI. They cannot use data analytics to fulfill each task or mission of firms; hence, the statement of why considering BDI into firms has to be described. Is the objective of BDI improving the business process of some functions in firms, such as marketing, accounting, or human management? On the other hand, is the objective proposing new business models? These firms reveal their objective of BDI, making the investors to access their reactions more definitely. This leads to the following hypothesis:

**Hypothesis 3 (H3): The abnormal return to the BDI announcement revealing the BDI objective of the firm is different from that without revealing the BDI objective.**

The past studies showed that even though the announcement of IT investments produces the influence on the market value of firms, the magnitude of industry types is different (Dos Santos et al., 1993; Im et al., 2001). As a result, the market reaction of IT investments may depend on different industry-types. Similarly, different market reactions from the investors to BDI across industry types could be expected. Why the issue of big data is extremely important for enterprises is because managers can analyze these data to gain knowledge or information for formulating new business models or improving business process. Therefore, the different extents on using information should produce different values of BDI. In the former research, the industry type is generally classified into two sectors, service and manufacturing.
sectors, using the Standard Industrial Classification (SIC) system. We argue that the two sectors will produce different abnormal returns to the BDI announcement, but do not judge that the abnormal return of the service sector is greater than that of the manufacturing one as the argument of Dos Santos et al. (1993). Hence, the following hypothesis is presented:

*Hypothesis 4* (H4): The abnormal return to the BDI announcement is different related to industry type.

## Research Methodology

### 一、 Data collection and selection

According to the description of Davenport (2014), the topic of big data caught by media sensation is begin from the fourth quarter of 2010. Therefore, we collected the data from a full text search of firm announcements with respect to BDI in the period between January 1, 2010 and March 15, 2015. Several databases were employed to obtain the relevant data. First, we drew on two databases, LexisNexis Academic Universe (news sources: PR Newswire and Business Wire) and Factiva, to find out the news regarding the BDI announcement. Second, the stock market and financial data were acquired from the Center for Research in Security Prices (CRSP) and Compustat databases.

After downloading the news from database, we found that most of the data were coming from newspaper editorial, only a few of data is released by firm. In addition, there is no certain rule or way to dig the related articles about the BDI topic. Hence, the way we picked up the articles is to read the whole content of the related news and filtering some out if they are without our given keywords, such as big data, data analytics, data mining, strategy objective, and some technical terms (as mentioned above). After scrutinizing the relevant articles, we found 40 companies. We list their GICS sector and the number of firms in Table 2.

<table>
<thead>
<tr>
<th>GICS Sector</th>
<th>Number of companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Technology</td>
<td>24</td>
</tr>
<tr>
<td>Consumer Discretionary</td>
<td>7</td>
</tr>
<tr>
<td>Consumer Staples</td>
<td>3</td>
</tr>
<tr>
<td>Financials</td>
<td>3</td>
</tr>
<tr>
<td>Industrials</td>
<td>3</td>
</tr>
</tbody>
</table>

### 二、 Event study method

The event study method is developed to measure the effect of an event on stock prices. Hence, this study proposes the hypotheses which will be tested using abnormal
Market returns. Abnormal returns estimate the difference between actual returns for a given event day \( t \) and the expected return of event day \( t \). Hence, the rate of return on the stock price of firm \( i \) at event day \( t \) is expressed as:

\[
R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it},
\]

where \( R_{it} \) is the rate of return on the stock price of firm \( i \) at event day \( t \), \( R_{mt} \) is the rate of return on a market portfolio of stocks at event day \( t \), \( \alpha \) and \( \beta \) are the market model parameters from firm \( i \), and \( \varepsilon_{it} \) is the error term with \( E(\varepsilon_{it}) = 0 \).

After calculating the rate of return, we can estimate the abnormal return (\( AR \)) of firm \( i \) at event day \( t \) as the following equation:

\[
AR_{iE} = R_{iE} - E(R_{iE}) = R_{iE} - (a_i + b_i R_{mE})
\]

where \( a_i \) and \( b_i \) are the ordinary least squares parameter estimates obtained from the regression of \( R_{iE} \) on \( R_{mE} \) over an estimation period \( T \) preceding event day \( t \).

And the residual standard deviation in the event period is

\[
\hat{S}_i = \sqrt{\frac{\sum_{t=1}^{T_i} (\hat{\varepsilon}_{it} - \bar{\varepsilon}_i)^2}{T_i - 1}}
\]

The significance of the stock price reaction during the event window (from \( t_1 \) to \( t_2 \)) is measured that is related to what is referred to as the normal return period. We believe that the conclusion with the event study method is valid that the abnormal return of an event is identified because (1) markets are efficient, (2) the event is unanticipated, and (3) there are no confounding effects during the event window (McWilliams and Siegel, 1997). With respect to the specification of the event window, the usage of a shorter event period is often recommended to avoid some unexpected noises during the event window. We will describe the specification of the event window for this study in the experimental part afterward.

The final task of the event study method is to examine whether abnormal returns over the event window are significantly different from zero. Therefore, the variance abnormal return (\( VAR \)) of firm \( i \) at event day \( t \) can be formulated as:

\[
VAR(AR_{iE}) = \hat{S}_i^2 \left( 1 + \frac{1}{T_i} + \frac{(R_{mE} - \bar{R}_m)^2}{\sum_{t=1}^{T_i} (R_{mE} - \bar{R}_m)^2} \right)
\]

where \( \hat{S}_i^2 \) is the residual variance from the market model as calculated form firm \( i \), \( R_{mE} \) is the average return on the market portfolio calculated during the estimation period, and \( T \) is the number of days in the estimation period.

Ultimately, for evaluating the statistical significance of the average effect of the event on the market value of the \( n \) firms, we use two way to test the significance: the traditional method and the standardized-residual method.
In the traditional method, 
\[ t_{TM}^{AR} = \frac{AR_E}{\frac{1}{N} \sqrt{\sum_{i=1}^{N} \hat{S}_i^2}} = \frac{AR_E}{\frac{1}{N} \sqrt{\sum_{i=1}^{N} \frac{1}{(T_i - 1)} \sum_{t=1}^{T_i} \left( \hat{e}_{it} - \frac{1}{\sum_{t=1}^{T_i} \frac{T_i}{T_i}} \right)^2}} \]

And in the standardized-residual method, 
\[ t_{SRM}^{AR} = \frac{SAR_E}{\sqrt{\text{Var}(SAR_E)}} = \frac{\sum_{i=1}^{N} SAR_{iE}}{\left[ \sum_{i=1}^{N} \frac{T_i - 2}{T_i - 4} \right]^{\frac{1}{2}}} \]

After explaining the rationale of the event study method, we can realize how to examine the significance of the abnormal return based on the T-statistic test.

In addition, if we want to reckon a specified interval from \( t_1 \) to \( t_2 \), the cumulative abnormal returns for firm \( i \) (\( CAR_i \)), In the traditional method,
\[ t_{TM}^{CAR} = \frac{\sum_{E=T_1}^{T_2} \left( \frac{AR_{iE}}{S_i} \right)}{\sqrt{\sum_{i=1}^{N} \frac{T_i - 2}{T_i - 4}}} \]

; in the standardized-residual method, 
\[ t_{SRM}^{SCAR} = \frac{\sum_{i=1}^{N} \sum_{E=T_1}^{T_2} \left( \frac{SAR_{iE}}{\sqrt{m}} \right)}{\left[ \sum_{i=1}^{N} \frac{T_i - 2}{T_i - 4} \right]^{\frac{1}{2}}} \]

Therefore, we employ the method to infer whether the BDI announcements have a significant impact on the market value of firms.

伍、Data analysis and results

一、Effect of big data announcements

The average abnormal return observed for 40 companies in the sample and the test for significance of the effect are provided in Table 3. The value of T-Statistic in the traditional method on day 9 is positive (\( t=1.893123 \), Significant at 10%); Besides, the values on other days are no significant. The value of T-Statistic in the standardized-residual method on day 9 is positive (\( t=2.202926 \), Significant at 10%); moreover, the values on other days also are not significant.

The CARs in the 10-day window are presented in Figure 1. In the event period, the positive and negative average abnormal return values offset each other – the histograms in Figure 1 are no rules and own positive and negative values in the event period. In addition, the cumulative abnormal return in the event period is -0.812700, almost to zero. This indicates that the market return is not affected by big data
announcements. The results in Table 4 indicate that the CARs to firms are negative and no significant in the event windows; therefore, the H1 is not supported.

Table 3. Cumulative average abnormal return of firms for windows

<table>
<thead>
<tr>
<th>Window</th>
<th>Cumulative abnormal return (%)</th>
<th>T-Statistic1</th>
<th>T-Statistic2</th>
</tr>
</thead>
<tbody>
<tr>
<td>[-1, +1]</td>
<td>0.168700</td>
<td>0.106736</td>
<td>0.262892</td>
</tr>
<tr>
<td>[-3, +3]</td>
<td>-0.168500</td>
<td>-0.276359</td>
<td>-0.270662</td>
</tr>
<tr>
<td>[-5, +5]</td>
<td>-0.879400</td>
<td>-1.219972</td>
<td>-1.215724</td>
</tr>
<tr>
<td>[-10, +10]</td>
<td>-0.812700</td>
<td>-0.867972</td>
<td>-0.867483</td>
</tr>
</tbody>
</table>

*, **, *** Significant at 10%, 5%, and 1% levels, respectively, for two-tailed tests.

Figure 1. The average abnormal return of the firms in the event period

Table 4. The summary of the firms in the event period.

<table>
<thead>
<tr>
<th>Event day</th>
<th>Average abnormal return</th>
<th>Standard deviation</th>
<th>T-Statistic the traditional method</th>
<th>T-Statistic the standardized-residual method</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10</td>
<td>-0.000974</td>
<td>0.009872</td>
<td>-0.387936</td>
<td>-0.602995</td>
</tr>
<tr>
<td>-9</td>
<td>0.000348</td>
<td>0.012342</td>
<td>0.138603</td>
<td>0.074384</td>
</tr>
<tr>
<td>-8</td>
<td>-0.000470</td>
<td>0.014080</td>
<td>-0.186916</td>
<td>-0.251196</td>
</tr>
<tr>
<td>-7</td>
<td>0.002154</td>
<td>0.014203</td>
<td>0.857418</td>
<td>0.525865</td>
</tr>
<tr>
<td>-6</td>
<td>-0.002426</td>
<td>0.012420</td>
<td>-0.965938</td>
<td>-1.125871</td>
</tr>
<tr>
<td>-5</td>
<td>-0.001802</td>
<td>0.010923</td>
<td>-0.717423</td>
<td>-0.449836</td>
</tr>
<tr>
<td>-4</td>
<td>-0.004231</td>
<td>0.016246</td>
<td>-1.684507</td>
<td>-1.996763</td>
</tr>
<tr>
<td>-3</td>
<td>-0.003111</td>
<td>0.013892</td>
<td>-1.238455</td>
<td>-1.432720</td>
</tr>
<tr>
<td>-2</td>
<td>0.001259</td>
<td>0.012285</td>
<td>0.501322</td>
<td>1.325031</td>
</tr>
<tr>
<td>-1</td>
<td>0.001727</td>
<td>0.013536</td>
<td>0.687629</td>
<td>0.816178</td>
</tr>
<tr>
<td>0</td>
<td>0.001538</td>
<td>0.013689</td>
<td>0.612267</td>
<td>-0.038961</td>
</tr>
</tbody>
</table>
二、Effect of announcement for BDI technology

The CARs related to BDI announcements for the 18 firms mentioning the BDI technology and the other 22 firms without mentioning the BDI technology are presented in Table 5. The results in Table 5 indicate that the CARs to firms that mentioning the BDI technology issue are negative in the 5-day and 10-day window and positive in the 1-day and 3-day window; however, all of them are no significant.

The average abnormal returns of firms in the 10-day window are presented in Figure 2 and Figure 3, respectively. The histograms in Figure 2 or Figure 3 are irregular so that the positive and negative values of days offset each other day in the event period. To sum up, the H2 is not supported.

<table>
<thead>
<tr>
<th>Window</th>
<th>Mentioning the BDI technology issue</th>
<th>No mentioning BDI technology issue</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cumulative abnormal return(%)</td>
<td>T-test</td>
</tr>
<tr>
<td>[-1, +1]</td>
<td>0.107113</td>
<td>1.058215</td>
</tr>
<tr>
<td>[-3, +3]</td>
<td>0.009017</td>
<td>0.090322</td>
</tr>
<tr>
<td>[-5, +5]</td>
<td>-0.169247</td>
<td>-0.957037</td>
</tr>
<tr>
<td>[-10, +10]</td>
<td>-0.077990</td>
<td>-0.725336</td>
</tr>
</tbody>
</table>

*, **, *** Significant at 10%, 5%, and 1% levels, respectively, for two-tailed tests.
三、Effect of announcement for the BDI announcement for mentioning the BDI objective of firms

The CARs related to BDI announcements for the 21 firms mentioning the BDI objective and the other 19 firms in the sample are presented in Table 6. The CARs for the firms mentioning the BDI objective are higher than those without mentioning the BDI objective; the former is only marginally significant in the 10-day window (CAR=0.393519, t=1.912576*) and the latter is negative and significant (CAR=0.393519, t=-3.075523***).

The average abnormal returns of firms with mentioning and without mentioning the BDI objective in the 10-day window are presented in Figure 4 and Figure 5, respectively. The histograms in Figure 4 and Figure 5 are no rules in the event period.
To sum up, although there is significant in the 10-day window, yet this phenomenon is not continued in the 1-day, 3-day, and 5-day windows. The result is not statistically representative; hence, the H3 is not supported.

Table 6. Cumulative average abnormal return and T-test of the firms about the BDI objective.

<table>
<thead>
<tr>
<th>Window</th>
<th>mentioning the BDI objective</th>
<th>without mentioning the BDI objective</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cumulative abnormal return(%)</td>
<td>T-test</td>
</tr>
<tr>
<td>[-1, +1]</td>
<td>0.060238</td>
<td>0.924061</td>
</tr>
<tr>
<td></td>
<td>0.007242</td>
<td>-0.556952</td>
</tr>
<tr>
<td>[-3, +3]</td>
<td>0.140321</td>
<td>0.604940</td>
</tr>
<tr>
<td></td>
<td>-0.207679</td>
<td>-0.364611</td>
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<tr>
<td>[-5, +5]</td>
<td>0.215099</td>
<td>1.585593</td>
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<tr>
<td></td>
<td>-0.566833</td>
<td>-3.283268***</td>
</tr>
<tr>
<td>[-10, +10]</td>
<td>0.393519</td>
<td>1.912576*</td>
</tr>
<tr>
<td></td>
<td>-0.718577</td>
<td>-3.075523***</td>
</tr>
</tbody>
</table>

Figure 4. The average abnormal return of firms with mentioning the BDI objective in the event period.

Figure 5. The average abnormal return of firms without the BDI objective in the event.
四、 Effect of announcement for IT or none-IT firms

The CARs related to the 23 IT firms and 17 none-IT firms are provided in Table 7. The T-value for IT firms is between -0.837518 to 0.134837. Moreover, they are no significant in the 1-day, 3-day, 5-day, and 10-day windows.

The average abnormal returns of IT firms and non-IT firms in the 10-day window are presented in Figure 6 and Figure 7, respectively. The histogram fluctuation of none-IT firms is larger than that of IT firms. Our explanation is that the none-IT firms face to more difficulties than IT firms as taking actions about the big data issue. To sum up, the result shows that there is no significantly different between IT firms and none-IT firms. Accordingly, the H4 is not supported.

Table 7. Cumulative average abnormal return and T-test of the firms in different industry types.

<table>
<thead>
<tr>
<th>Window</th>
<th>IT firms</th>
<th>None-IT firms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cumulative abnormal return(%)</td>
<td>T-test</td>
</tr>
<tr>
<td>[-1, +1]</td>
<td>0.134837</td>
<td>0.857082</td>
</tr>
<tr>
<td>[-3, +3]</td>
<td>0.016589</td>
<td>-0.003205</td>
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<tr>
<td>[-5, +5]</td>
<td>-0.175120</td>
<td>-0.756157</td>
</tr>
<tr>
<td>[-10, +10]</td>
<td>-0.262248</td>
<td>-0.837518</td>
</tr>
</tbody>
</table>

Figure 7. The average abnormal return of IT firms in the event period.
Figure 8. The average abnormal return of none-IT firms in the event period.

Discussion

一、limitations

There are several limitations in this study. First, the sample only chose the firms in S&P500 for the experiment, and we only found 40 firms. The size of the collected firms is too small, leading to the hypotheses we proposed in this research are not significant. Second, the firm size is one consideration factor that we did not specifically include in this analysis. In order to implement big data in business, different sizes of firms may be all willing to invest their financial resources. Therefore, we only chose the big companies from S&P 500, not including the firms which are small or not in the S&P500. Third, big data implementation is still an ongoing and hot issue in enterprises. Therefore, searching the related announcements with respect to big data implementation from news is difficult, resulting that we only obtained 40 samples.

二、Implications and conclusion

Overall, the results with the event study methodology suggest that big data announcements have almost merely no relevance with the market valuation of firms. Inventors expect firms improves their operational efficiency and furthermore creating significant future benefit streams. The news about BDI is directly correlated with the investment and more attractive and persuasive to investors. The event study method assumes that share prices reflect expected future earnings. However, the big data issue
may not make investors think about the growth of business and have almost no effect on the stock price.

The findings indicate that the magnitude of CARs is not related to announcements about the BDI technology and industry type. One explanation is that investors may not utterly realize the business benefit of information technologies using in BDI. Most companies engage in the big data development are information technology firms. Hence, investor may not think that the business benefit can also be from other types of firms such as service or manufacturing firms.

Our results suggest that the magnitude of CARs related to the announcements of the big data strategy objective is higher than that related to no announcement of the big data strategy objective. One explanation is that the description about the big data strategy objective will make investors think of operating performance. Investors can obtain the general knowledge about the big data issue from newspaper editorial. In addition, as the news released, the 10-day window is positive in the result. However, there is no positive and significant in the 1-day, 3-day, or 5-day window. The reason why the long-term is significant yet the short-term is not is the big data implementation is not an urgent topic with respect to corporative governance such as mergers and acquisitions. Hence, investors may not reflect on the influence of the news on the stock price imminently; however, in the long-term, the stock price is somehow influenced.

Two directions that the researchers are interesting on the issue can be considering and to be investigated hereafter. First, we should place greater emphasis on returns to firms which use the big data technology and strategy in different industry groups. Second, we can consider the relative proportion of a business influenced by the big data initiatives to derive a more detailed understanding of the big data topic.

収、References


