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Market-Perceived Risk of Project-Related Announcements in the Information Technology Industry

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MARKET-PERCEIVED RISK OF PROJECT-RELATED ANNOUNCEMENTS IN THE INFORMATION TECHNOLOGY INDUSTRY

Anas Alakhras

ABSTRACT

Large, publicly-traded firms often issue public announcements, whether related to ongoing projects (e.g., new product, major investment, joint venture) or general organizational issues (e.g., leadership, markets, finances). Financial markets have varying perceptions of the risks implied by these announcements and their potential impact on profitability. In particular, they are perceived differently depending on the relative rigidity of the organization's cost structure.

For example, if faced with the same event, a highly flexible manufacturing company that easily adapts to demand fluctuations should be perceived as less risky, compared to a project-oriented company where large, ongoing projects represent significant fixed costs, with a high risk of difficulties in adapting to shifting economic conditions. Furthermore, project-related news should have more of an impact on project-oriented companies, as these directly affect their riskiness, while the perceived risk in the manufacturing sector should be more affected by general organizational issues that may impede or reduce the flexibility of the production network.

In order to explore these hypotheses, we perform an event study to test how financial markets perceive the implicit risks from a firm's public announcements, related both to specific projects and to general organizational issues. In order to clearly isolate organization-specific risk, we choose to compare the responses of two segments of the information technology industry, software and computers. Both segments face the same demand fluctuations and economic conditions, while they differ radically in terms of organizational and cost rigidities: software companies are project-oriented, while computer manufacturers are among the most flexible and efficient in the entire economy, mostly due to extensive network-driven and outsourced production.

We developed a web solution that automatically downloads from Yahoo! Finance all the data and news related to the S&P 500 index companies. The software runs over a 10-day or 2-week period, and downloads data and news minute-by-minute. The news is filtered and reduced to 76 news items, selecting only those dealing clearly with the target companies in our 2 segments, which consist of 14 software firms (of which 12 firms had 35 news items) and 10 computer and peripherals manufacturers (of which 7 firms had 41 news items). Overall 52 news items (68%) are project-related, while the rest are regarding organizational and economic issues.

The data was then analyzed using an event study methodology. The Capital Asset Pricing Model (CAPM) was used to estimate the Abnormal Returns (ARs) for each firm and event, but unfortunately produced insignificant results, so we pursued our research with raw returns. The minute-by-minutes were cumulated -30 prior and +30 after each event. We computed the key changes and moments in these windows, and produced pivot tables to help compare the market perceived risk of each industry segment for each type of news. We tested our hypotheses for distinctive and significant differences in the perceived risks, using a paired-sample t-test on difference between the means of each period.

Our results allow us to confirm almost all our hypotheses, with only 1 of 8 unsupported. This study may provide valuable information to both project and company executives who wonder about the market-perceived risk of project and non-project announcements. For instance, our results show that the risk responses for the computer industry are less than the risk responses for the software industry. Moreover, the news have a larger impact in the case of non-project news in the computer segments, compared to project news in the software segment.

Finally, we compared these hypotheses between the 2 weeks of our dataset, where the first week exhibited less volatility than the second week, as measured by the CBOE VIX and Put-Call-Ratio indicators. Our results show that our hypotheses are supported when we control for high volatility and low volatility weeks.

Project managers in the IT industry are therefore invited to consider planning their project announcements by optimizing the perceived risk by financial markets.

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LIST OF ABREVIATIONS

FC	Fixed Cost
XML	Extensible Markup Language
SQL	Structured Query Language
FES	Financial Event Study
CUSUM	Cumulative Abnormal Return Sum
VC	Variable Cost
St.Dev	Standard Deviation
CSAR	Cumulative Standard Abnormal Return
EP	Estimating Period Time
TP	Testing Period Time
SAR	Standardized Abnormal Return
AR	Abnormal Return
CAR	Cumulative Abnormal Return
CAPM	Capital Asset Pricing Model
GICS	Global Industry Classification Standard
GDP	Gross Domestic Product

LIST OF SYMBOLS

$\mathbf{R_{Ti}}$	Event time return of the stock "i" on time "T"
α and β	Risk Ratio Coefficients
$\mathbf{R_{T\text{-}overall\ Market}}$	Overall market return on the Time for the Index 500 Companies.
$\mathbf{R_{observed}}$	Observed event time return
$\mathbf{R_{expected}}$	Expected return for the market
$\pm$	Positive and Negative (value)
x<y	Value x smaller than Value y
x>y	Value x greater than Value y
δ	Standard deviation
df	Degrees of Freedom
Var	Variation of the abnormal return
Z-test	Statistical test for the null-hypotheses
T-test	Student test for the hypotheses
$\mathbf{T_1}$ **and** $\mathbf{T_2}$	Time period where T_2 greater than T_1

INTRODUCTION

The purpose of our study is to examine how financial markets perceive the risk implicit in a firm's public announcements, related both to projects and to general organizational issues. Previous studies have focused on several explanations for this behavior, looking at the impacts of information systems' news announcements on firms' stock prices, in order to capture the expected effect of the new information on the value of the firms.

In our study the data was analyzed using an event study methodology. We first used the Capital Asset Pricing Model (CAPM) to estimate the Abnormal Returns (ARs) for each firm and event, but due to insignificant results the study was carried using raw returns. Many factors have been shown to affect both the raw and abnormal returns of public announcements, and many of these same factors have been shown to be influenced by characteristics of capital markets. However, to the best of our knowledge, there has been little, if any, previous research done on event study which tests how financial markets perceive the implicit risk from a firm's project-related vs. general organizational news.

The rest of the thesis is organized as follows. Section one will provide theoretical foundations about market perceived risk and will discuss implications of the study. Section two will examine the basis for formulating our research hypotheses. Section three will cover the research question and the event study, while the data, our hypothesis, and our methodology will be presented in section four. The results, limitations and further research study will be presented in section five. Finally, we will present the conclusion in section six.

CHAPTER 1 - Theoretical Foundations

1.1 Market-Perceived Risk

Market risk results from probable changes in risk factors and is generally found to be correlated to other consumer behavior concepts, such as cognitive style. Therefore, self-sufficiency and independence are related positively to risk taking, and inflexibility is negatively related to it, which may cause a reduction in the market value of the financial position subject to these parameters [1].

Risk in financial markets is discrepancy in the allocation of possible outcomes, their likelihood and their subjective values. Classical decision theory assumes that decision-makers favour less risk, assuming other factors are constant (such as expected value). There are two ways of measuring risk: a non-linearity in the exposed utility form of money, or a variance of the probability distribution of possible losses and gains linked with a particular alternative. Also, economic factors affect the market in the short and the long term. These factors include supply and demand, inflation, unemployment and foreign exchange rates. Annex I contains more details about economic factor risk perceptions [2].

In the information technology industries, inflexibility can be negatively related to performance, which may cause a reduction in the market value of the financial position subject, especially in the software industries which is typically organized by-projects with higher fixed than variable costs. Furthermore, when the information technology firms issue public announcements, the momentum of the higher equity returns cause higher firm valuations and appreciations. This reduces the perceived risk for such firms and increases the opportunities for investments and the probability that firms' values will end within the default threshold [3].

1.2 Strategic Flexibility

Flexibility in strategy gives the IT sector the chance to enact business plans, and the ability to recognize variations in the marketplace and build alternative options to develop their business strategy. This helps to ensure that the competitive advantage of the information technology sectors is strong enough to allow them to overcome any negative impacts that occur during the events [4, 5].

There are many factors that affect the information technology industries' ability to have strategic flexibility during the events. Some of these factors are [6, 7]:

1. Vision (such as scope of business focus vs. diversity);
2. Internal growth (such as expansion of product lines);
3. Macro environment (such as change in government administration and policies);
4. Competition (such as cooperative alliances of competitors);
5. Sustainable Markets (such as closeness of substitute products);
6. Suppliers (such as scarcity of raw materials).

The computer and software industries have different flexibility, which in turn is reflected by market responses to the perceived risk related to news announcements. Strategic flexibility is particularly important in these sectors to strengthen their current and future standing in the market, achieving competitive advantage [3, 8].

1.3 Risk-Enhancing Events

The stock market prices in the computer and software sectors fluctuate during news events because those sectors have different perceived risk before and after these events. Depending on the investment environments, the computer sector can make changes in their strategy to avoid any major risks that may occur during the events. The software industries on the opposite may suffer more perceived risk, as events which negatively reflect on their performance and

strategy cannot difficulty be overcome due to lack of flexibility. Both segments of the information technology should in theory share the same risk perception, as they share drivers of industry change, long-term growth rates, and shifts in buyer demographics. Differences exist though in their technological change, as well as cost structures and efficiency [9].

There are many factors that could enhance the risk perceived by the computer and software industries in the market. These factors allow the 2 sectors to minimize their risk during the events, regardless of whether the events have positive or negative impacts, in cases where the risk enhancing during the events depends on the external and internal factors. Some of these factors are.[6]:

1. Resources (such as human capital resources, physical capital resources, organizational intangible resources, and organizational tangible resources);
2. Technological resources (such as patents, innovation infrastructure and capability, new technologies, and technological leadership);
3. Financial resources (such as a strong financial base and financial flexibility);
4. Performance (such as product performance, strategic performance, manufacturing performance, and financial performance);
5. Strategic implementation (such as organizational structure, people, strategic processes, strategic controls, culture building, and strategic change);
6. Drivers of industry change (such as change in long-term growth rates, shifts in buyer demographics, technological change,αvδ changes in cost and efficiency);
7. Customer market environment risk (such as: diversity of market segments, growth of specific markets, evolving customer demand, and diverse customer needs within a segment).

Also both sectors have good resources in terms of assets and materials that are used to produce benefits and enhance their risk perceptions, while the software companies have invested more in human resources to increase the performance and efficiency of the product output. A weakness of investments in human capital will weaken risk perception more than the other sectors in information technology.

1.4 Value of Flexibility

If the computer and software industries face the same event, the computer sector will easily adapt to demand fluctuation and will perceive less risk than the software industry because of the high flexibility of this sector, compared to a project-oriented company where large ongoing projects represent significant fixed costs, with a high risk of difficulties in adapting to shifting economic conditions. Computer manufacturing has a higher flexibility than the other information technology sectors within the S&P500 index stock market, depending on the manufacturing situation changes and risk evolution criteria. This result is based on various studies with varying values for flexibility [5, 10].

On the other hand, project-related news has more implications to re-evaluate project options and change the direction of the project. These news may lead to more impact on project-oriented companies as these directly affect their level of risk. The impact of project news will vary according to the IT industry situation, where risk may be lowered depending on the flexibility in the cost and duration of product development [7, 11].

The perceived risk in computer manufacturing behaves differently, as it is more affected by general and organizational issues that may impede or reduce the flexibility within the production network. With higher flexibility, the computer industry is able to respond to changes at the lowest cost possible to develop an efficient development strategy [9].

CHAPTER 2 - Research Hypotheses

2.1 Perceived Risk in the Information Technology Industry

The risks perceived about the information technology by stock market participants are due to the firms' policy environment. Stock market fluctuations during the time of a firm's news announcements will affect decision-making at the firm because of the direct influence of its market value upon its overall performance, and feedback effect on financing growth [6, 12].

There are many factors which have positive or negative impacts on risk perception in the information technology industry, such as: requirements for technological advancement, changes in the firm's internal and external environment and corporate strategies, as well as other reasons for stock market fluctuations in these sectors. These factors increase the chance of risk for the IT sector in general, and signal potential feedback effects upon the performance of each firm differently [13].

This leads to varying perceptions of the risks implied by these announcements and their potential impact on profitability. In particular, the software and computer industries have different risk perception depending on changes in the firm's market environment, customer behaviours and competitors. For example, the highly flexible manufacturing company that easily adapts to demand fluctuations is perceived as less risky [14].

H1: Risk perception of news has a significant impact in the information technology industry.

2.2 Risk perception in Software and Computer Firms

In our study, we found that both computer and software segments (see Annex VII) are flexible to any economic changes in the S&P 500 index stock market, and three cases of flexibility that can be measured between the computer and software firms in information technology industry are as follows:

1. The software segment has less flexibility than the computer segment. The software industry is more sensitive to public announcements than the computer segment, returns of the software sector are more affected by the events than the other sectors, and therefore, the software sector has less flexibility than other segments in the IT industry. However, in order to increase the flexibility, software firms typically have a business model in place that could integrate flexibility into the firm's vision if needed [7, 9].

2. Computer and software segments have different types of flexibility. As observed in Annex III, the quarterly financial statements extracted for computer and software firms to measure this type of flexibility, we found that, the two segments have different values of flexibility, as calculated in Annex IV. This is a result of the two segments different ability to respond to public news announcements and to reflect on the firm's stock market prices, while, if both segments were to face the same event, the computer manufacturing would easily adapt to demand and perceive less risk than the software segment. This is because this segment represents less ongoing projects that have significantly variable prices (i.e. computer segment can adjust strategy to adapt to shifting economic conditions) which leads to why the software companies are project-oriented, while computer manufacturers are among the most flexible and efficient throughout the economy. This is primarily a result of extensive network-driven and outsourced production [15, 16].

3. Both computer and software segments have a high level of flexibility. If both segments have a high level of flexibility that would enable them to focus on developing business and increasing flexibility. However, this is not the case, as it leads to higher flexibility in the assist those segment, so the less flexibility provides the software segment the ability

to re-evaluate and modify the direction of the project depending on the firm's events. Meanwhile, the high flexibility of the computer segment also gives it the capability to respond to any price changes in the stock market during the firm's events [17].

H2: Risk perception of news is more significant in the software than the computer industries.

2.3 Impact of Project-Related and Non-Project News

This hypothesis will test the market-perceived risk of project and non-project announcements as well as the impact of the project related to news and the impact of non-project to stock market returns. Firms often issue public announcements, whether related to ongoing projects (e.g., new product, major investment, joint venture) or general organizational issues (e.g., leadership, markets, finances), and these public announcements have a significant direct impact on the behaviour of the IT firm [18].

The resulting actions have impacts upon the firm's stock market prices for the computer and software sectors, and the stock market depending on the magnitude of the information received from these industries. As a result of the project-related news having more impact on project-oriented companies (as it directly affects their riskiness), the perceived risk in the manufacturing sector can be affected by general organizational issues that reduce the flexibility of the production network. Thus, news announcements have more direct impacts upon project related news, such as a launch of new products or major investments than the non-project related news, such as leadership or finances [19].

To validate this hypothesis, several procedures have been undertaken to determine if any different impacts have been traced between the computer and software segments in terms of product related and non-product related categories. Thus, because the computer and software firms usually issue public announcements related to ongoing projects, this will instantly be reflected in the stock market prices. Similarly, when these firms issue non- project related news, the stock mar-

ket prices will move slowly in a near-flat trend. This happens because this type of news does not relate directly to these firms [20].

H3a - Risk perception of non-project news is more significant than for project news in the computer industry.

H3b – Risk perception of project news is more significant than for non-project news in the software industry.

2.4 Volatility Over Time in Information Technology Industry

In financially point of view, the terminology of volatility defined as the variations of market prices over the time. Thus, changing the prices of stock market in information technology industry due to company's news events experience periods of high and low volatility. That is, during some periods of news events the stock market prices go up and down quickly, however, during other periods of times the stock market barely move at all.

The information technology stock market prices during the periods of time are often going down and going up by an unusual amount. When stock market prices rise quickly due to unusual news events, it usually followed by prices going up or going down by an unusual amount, due to the effect of the news over the stock market in software and computer segments. These movements of the prices over the time during the news events either have the same direction, or the opposite direction, which results of an increase or decrease in volatility.

Most of the investors care about volatility for many reasons, such as buy assets cheaply and sell them when the market goes overpriced, on the other hand, the high swing in the stock market prices are usually leads the investors to not worry about the market, because the investors are looking at the ongoing market situation for a particular exchange at particular time. Thus, to measure the market volatility in the information technology sector, the time frame has to be chosen in which to examine the IT market volatility, because of the volatility is more accurate within a certain time frame. To evaluate the moving average of the stock market, it is not sufficient to evaluate the prices change over the time frame, it is also beneficent to identify a larger time frame to look at how the stock market has changed over a greater time frame, this will help to

provide an average prices for the stock market over a longer period of time, in this research, two weeks of time have been considered as a time frame to evaluate the volatility of the stock market of the information technology industry.

Our argument regarding risk perception, on the topic of high volatility or less volatility of the IT stock market during the time surrounding public announcements, is that, we can observe that when the investing time increases, the probability of losing money within a risky time period decreases or at least for long term investment with positive expected returns [21].

H4	Industry	News	Hypothesis
H4a	Computer	Non-Project	Risk perception of non-project news is more (less) significant during periods of high (low) volatility in the computer industry.
H4b	Computer	Project	Risk perception of project news is less (more) significant during periods of high (low) volatility in the computer industry.
H4c	Software	Non-Project	Risk perception of non-project news is less (more) significant during periods of high (low) volatility in the software industry.
H4d	Software	Project	Risk perception of project news is more (less) significant during periods of high (low) volatility in the software industry.

CHAPTER 3 - Event Study Methodology

3.1 Theoretical Foundations

Several approaches are proposed to realize event studies in their research especially in the fields of economics and finance.

In [22], Mackinlay has outlined an event study methodology involving the following steps: (A) identification of the event of interest; (B) definition of the event window; (C) selection of the sample set of firms to be included in the analysis; (D) prediction of a "normal" return during the event window in the absence of the event; (E) estimation of the "abnormal" return within the event window, where the abnormal return is defined as the difference between the actual and predicted returns, without the event occurring; and (F) testing whether the abnormal return is statistically different from zero.

In this research we used five steps to examine the event study: firstly, the event study has to be identified in the area of interest. Secondly, the researcher has to be able to identify the event time window as in [24] where the event window has defined by the number of days before and after the announcement date over which the abnormal returns is accumulated. An event window is typically denoted [−x, +y], where x is the number of days before the announcement day and y is the number of days after the announcement day, and where the announcement day is typically denoted as "day 0". Including days before the announcement captures information leaks, whether from the press or internal users. Including days after the announcement captures the notion that it can take time for the information from the announcement to be received, understood, and acted on. Thirdly, the researcher has to select the proper research samples for the study. Fourthly, by using the time window the researcher will be able to predict and estimate the abnormal return for each event. Finally, the testing procedure must take place to determine if the abnormal return is statistically different to zero or not, where the abnormal return is defined as the difference between the actual and the predicted returns [24, 23].

In [11], Anat Hovav and John Darcy are presented the impact of denial of service attack announcements on the market value of firms, they collected data on DOS attacks using a search of

business news articles in the Lexis-Nexis database between 1998 to 2002, they used only the announcements by firms publicly traded on either the New York Stock Exchange (NYSE) or the NASDAQ stock exchange, they used the market asset pricing model (CAPM) to estimate the returns on a firm's stock.

In [42], Aktas, Eric and Jean-Gabriel are presented the an event studies with a contaminated estimation period, In their study, they proposed a test that reduces the impact of potentially unrelated events during the estimation period, based on a two-state version of the classical market model as a return-generating process. They present standard specification and power analyses. The results presented the importance of explicitly controlling for unrelated events occurring during the estimation window, especially in the presence of event-induced increase in return volatility.

In [43], John J. Binder has discussed the event study methodology, including hypothesis testing, the use of different benchmarks for the normal rate of return, the power of the methodology in different applications and the modeling of abnormal returns as coefficients in a (multivariate) regression framework. He also focused on frequently encountered statistical problems in event studies and their solutions.

In [44], Scott E. Hein and Peter Westfall are presented an improving tests of abnormal returns be bootstrapping the multivariate regression model with event parameters, according to them, the proposed methods not only improve upon parametric methods, but also allow development of new and powerful event study tests for which there is no parametric counterpart.

In [45], Yaniv Konchitchki and Daniel E. Oleary are presented the event study methodologies in information systems research, based on the theoretical framework of efficient capital markets and the notion that security prices include all information
available to the market. They investigated the use of event studies in information systems and accounting information systems research using a three-pronged approach.

In [46], Mani Subramani and Eric Walden are presented the impact of E-commerce announcements on the market value of firms, they proposed the returns of shareholder in firms engaging in e-commerce, and how do the returns to conventional, they used event study methodology and assess the cumulative abnormal returns for more than 250 announced by firms between October to December in 1998. The results suggest that e-commerce initiative do lead to significant positive CAR's for firms shareholders, and the CARs for conventional firms are not significantly different from those for net firms.

3.2 Data Collection and Processing

The data was collected and processed using an event study methodology [22, 25]. We developed a web solution to automatically download from Yahoo! Finance all the data and news related to the S&P 500 index companies. The software ran over a 10-day or two week period, and downloaded data and news minute-by-minute, from February 28 to March 11, 2011. The news was filtered and reduced to 76 news items, in order to select only those dealing clearly with the target companies in our 2 segments. These consisted of 14 software firms (of which 12 firms had 35 news events) and 10 computer and peripherals manufacturers (of which 7 firms had 41 news events).

We computed the key changes and moments in the event window of -/+30 minutes, and produced pivot tables to help compare the market perceived risk of each industry segment for each type of news event. We used t-tests to test our hypotheses of distinctive and significant differences in the perceived risks. We performed tests on each of the 4 hypothesis and sub-hypothesis (8 in total) to see how each industry segment may exhibit a limited set of patterns as to the varying risk perception in time [26, 27].

Due to the large amount of data collected, in the range of 100Mb, a database application software was used for storing purposes, categorization and searching, and the output data was stored in XML and SQL format. Tables were generated in SQL format in the following order: company name, company tick, date, time, news summary, news author, stock market values and

all the other necessary elements needed to start up the data analysis and filtrations. Annex VII shows a sample set of the data collections format.

3.3 Flexibility in Computer and Software Industries

To measure the flexibility in the software and computer segments, we used the quarterly financial statement for each of the 24 companies in order to perform a Z-test between variables (see Annexes III and IV) [3, 14]. Figure 3.3-1 shows the comparison between different company's categories financial statements, where the companies DELL, IBM and HPQ belong to the computer segment and MSFT, SYMC and ORCL belong to the software segment. The Z –test indicates the ratio between the variable costs and the fixed costs with the average mean and the standard deviation.

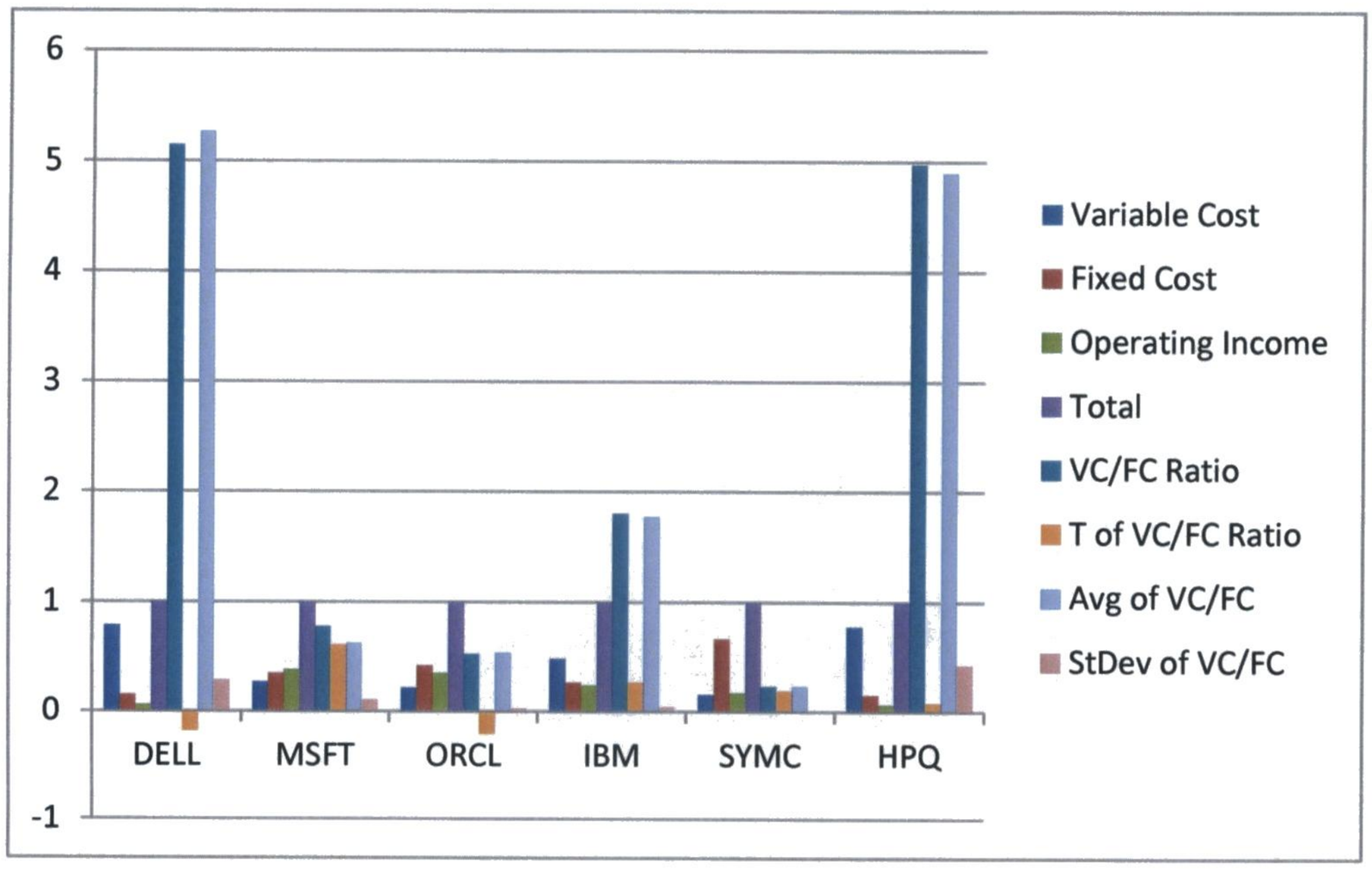


Figure 3.3-1 : Sample of comparing the different segments.

Figure 3.3-2 shows the negative value of Z for the computer segment and the positive value for the software segment, which indicates how many standard deviations are observed above and below the mean. The Z-test is used to compare a sample to a standard deviation which means that the software segment has less flexibility than the computer segment. Also, the results show that both the computer and software segments have a high level of flexibility.

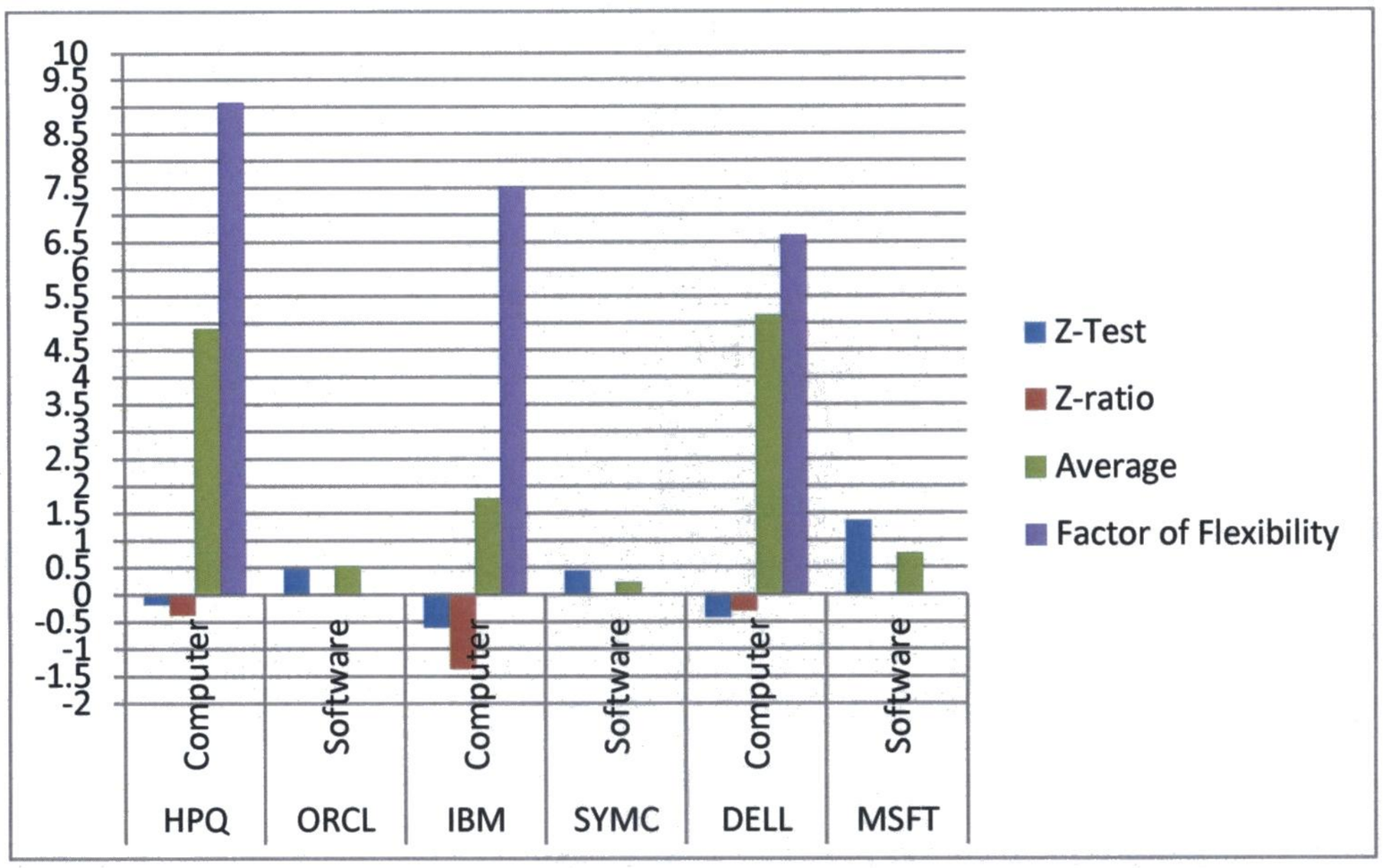


Figure 3.3-2 : Sample of Z-test and factor of flexibility of different segments.

Therefore, our results indicate that the computer segments are more flexible than the software segments in the information technology industry. On the other hand, and based on the Z-test in Figure 4.3-2, the factor of flexibility of the computer segments are much larger than the software segments.

3.4 Estimating Abnormal Returns

We intended to use the Capital Asset Pricing Model (CAPM), which is the most commonly and widely used method for estimating the return on the market firm's stock, the Abnormal Returns (ARs) for each firm. However, we found them insignificant, and therefore had to carry out the study using raw returns.

To test whether the CAPM could be applied, we estimated abnormal returns around the event time denoted at (t), representing the minute an announcement was occurring, while calculating ARs in the time window t=(-30, +30). Thus, if the event time returns (R_{T0}) are larger than the present period time (t) then we say the event time return (R_{T0}) has a significant impact.
We simplified the CAPM by applying a market model to adjust the event time return, as shown in Equation (3.1). The estimation of abnormal return for the market can be calculated as follows:

$$R_{Ti} = \alpha + (\beta * R_{T-overall\_Market}) + e_{ti} \quad 3.41$$

where (R_{Ti}) is the event time return of the stock (i) at time (T), and

$$R_{Ti}=(Price_{Ti}-Price_{Ti-1})/(Price_{Ti-1}) \quad 3.4\text{-}2$$

Table (3.4-1) show an example of the delta and the actual price for IBM company:

Table 3.4-1 : Sample of delta actual price for IBM company

Tick	date	time	actual price	delta actual price
IBM	28/02/2011	9:30:00	162.33	0
IBM	28/02/2011	9:31:00	162.45	0.000739235
IBM	28/02/2011	9:32:00	162.63	0.001108033
IBM	28/02/2011	9:33:00	162.91	0.0017217

($R_{T-overall\_Market}$) represents the overall market return at time (T) for the index 500 companies, and (e_{ti}) is the uncorrelated error with the mean equal to (0) for the firm, (i) is the stock shears for the firm, also (α & β) are the risk ratio coefficients, those elements have to be estimated in our model as well as the linear structure of the market. Table 3.4-2 shows an example of the values of alpha and beta for the IBM company:

Table 3.4-2 : Sample of alpha and beta for IBM company

	date	time	alpha	The standard error alpha	Beta	The standard error beta	sp500
IBM	28/02/201	9:30:00	-9.75396E-07	8.24646E-06	0.754229	0.018008599	1322.75
IBM	28/02/201	9:31:00	-9.75396E-07	Test T	0.754229	Test T	1323.55
IBM	28/02/201	9:32:00	-9.75396E-07	-0.118280519	0.754229	41.88163065	1324.57
IBM	28/02/201	9:33:00	-9.75396E-07		0.754229		1324.96
IBM	28/02/201	9:34:00	-9.75396E-07		0.754229		1325.61

For this study we defined the main window to be (-30, +30) minutes. Therefore, the expected event time return is the ratio between the observed event time return ($R_{observed}$) to the expected return for the market ($R_{expected}$), as follows:

$$E\left(\frac{R_{observed}}{R_{expected}}\right) = \alpha + \beta * R_{expected} \qquad 3.4\text{-}3$$

By adjusting the event time return R_{Ti} we can estimate the abnormal return (AR) where the (AR) represents the T=0 for the firm [28]:

$$AR = R_{Ti} - E\left(\frac{R_{observed}}{R_{expected}}\right) = R_{Ti} - \alpha - \beta * R_{expected} \qquad 3.4\text{-}4$$

A series of abnormal returns has been obtained to cover the time window period (T_1 and T_2), and has been done before and after the event time, as follows:

$$AR = R_t - E\left(\frac{R_{observed\ at\ t,time}}{R_{expected\ at\ t,time}}\right) = R_t - \alpha - \beta * R_{expected\ at\ t,time} \qquad 3.4\text{-}5$$

where, t is the time interval frame from (-30, +30) minutes.

By estimating the abnormal return ratio for our model, we can predict our originally used model and test the risk of the market based on the values of alpha. Then, the minute-by-minute ARs were aggregated into Cumulative Abnormal Returns (CARs) as follows:

$$CAR_{[-30+30]} = \sum_{t=-30}^{t=+30} AR_t \qquad 3.4\text{-}6$$

We aim to calculate the cumulative abnormal returns to identify the determinants of stock market in information technology industry to response to news event at certain time frame. we produced as an outcome abnormal returns, which are cumulated over time to cumulative abnormal returns (CARs), Figure 3.4-1 shows an example of the cumulative abnormal returns for some of selected software and computer companies; the capital asset pricing model has been used to estimate the return on the market firm's stocks, and the Abnormal Returns for each firm.

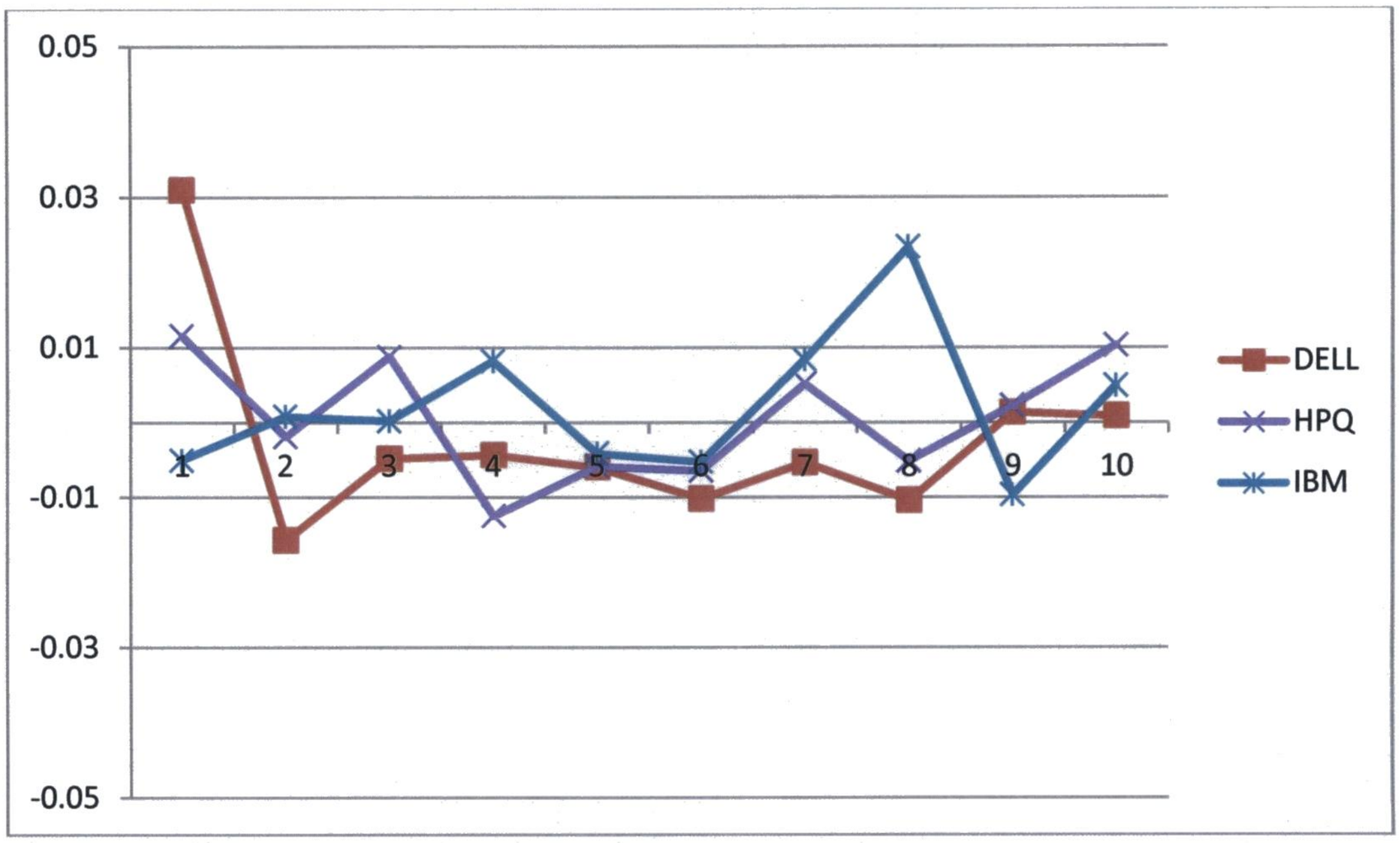


Figure 3.4-1 : Sample of daily CAR's for IT-companies

However, the raw return is the uncontaminated return on the real investment in the information technology industry, ignoring any further loss or gain might be happens due to external factors. In this case, as an example, we calculated the total return interest of the information technology industry for the computer and software segments without any effected of external factors, such as capital gain and dividends over a period of time frame, or add any profit or gain money to the stock market shares during the news events inside the time frame of our test, see (Annex IX).

CHAPTER 4- Data Analysis

4.1 Hypotheses test H1

H1 – Risk perception of news has a significant impact in the information technology industry.

To accept or reject the hypothesis H1, an equal sample sizes and equal variance (a paired-Sample T-test) were used to test the means of the information technology industry. However, theoretically point of view, the means can be calculated as follows:

$$t = (\bar{X} - \bar{Y})\sqrt{\frac{n(n-1)}{\sum_{i=1}^{n}(\hat{X}_i - \hat{Y}_i)^2}} \qquad 4.1\text{-}1$$

Where

$\hat{X}_i = (X_i - \bar{X})$and $\hat{Y}_i = (Y_i - \bar{Y})$

$\bar{X}$: The average sum before the event

$\bar{Y}$: The average sum after the event

n: Sample size

$n - 1$: is the degree of freedom.

Table 4.4-1 shows the values of X at 95% [25], where r is the numbers of degrees of freedom.

Table 4.1-1 : T value for confidence level of 95%

r	95%
30	1.69726

The student T-test has been performed to test hypothesis H1 for the information technology industries, as shown in Table 4.1-1, the test checked whether or not the information technology industries has different stock market impacts before and after the news event. Table 4.1-2 illustrates the results of the two-tail T-test for H1 within the time frame of -20, +20 minutes around event time, depending on the p-values and the confidence level (1-α), where the significant level is (α = 0.05) and the confidence level is (1-α) = 95%. To accept or reject the hypothesis a comparison between the p-value and the significant level has been considered.

Table 4.1-2 : Paired-Sample T-test for information technology industries

	Information technology industries
From-30 to-1 minutes	
Average	0.000096500
Standard Deviation	0.000113684
Skew	-0.357745331
Kurt	-0.540401948
From+1to+30 minutes	
Average	-0.000487932
Standard Deviation	0.000168132
Skew	0.289687098
Kurt	-0.539880641

Table 4.1-3 : T-test for the information technology industries

	Information technology industries
T-test	0.000000
Significant difference	Yes

Figure 4.1-1 shows the response before and after the events for the information technology industries. Before the news event, the information technology industry is behave positively, however, after the news events the information technology industry is respond to the news and behave negatively immediately after the news events. Thus, the news has a significant impact in the

information technology industry. Table 4.1-3 shows the T-test result for the information technology industry during the first and the second week, from the p-value of the T-test, we found that the hypothesis is supported the results.

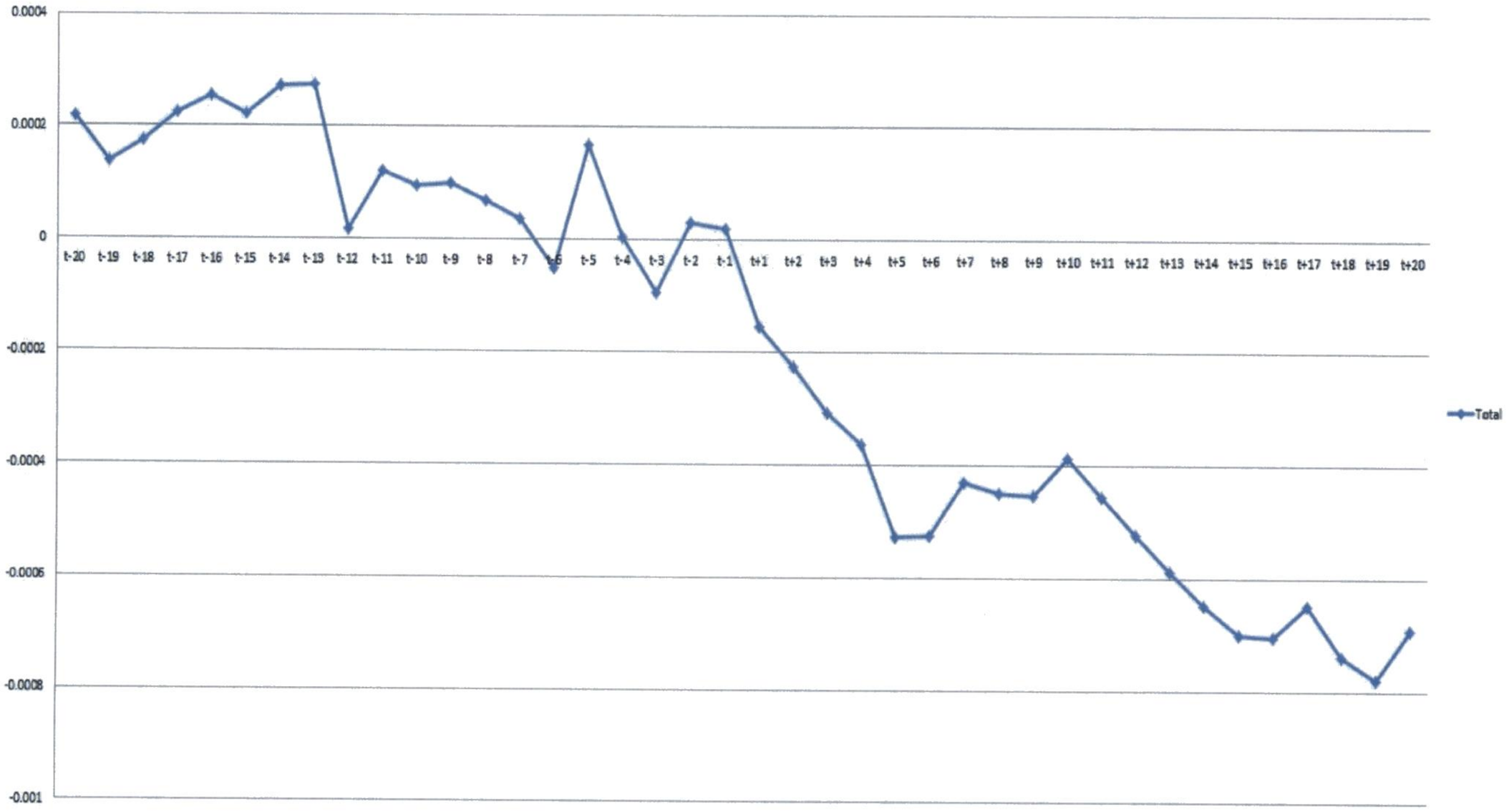


Figure 4.1-1 : Response of information technology industry for the news, + - 20 minute

4.2 Hypothesis test H2

H2 – Risk perception of news is more significant in the software than the computer industries.

The student T-test has been performed to test hypothesis H2 for the computer and software industries, as shown in Table 4.2-1, the test checked whether or not the software and computer industries have different stock market impacts before and after the news event. Table 4.2-2 illustrates the results of the two-tail T-test for H2 within the time frame of -20, +20 minutes around event time:

Table 4.2-1 : paired-Sample t-test for Computer and software industries

	Industry	
	Computer	Software
From-30 to-1 minutes		
Average	-0.000057356	0.000276732
Standard Deviation	0.000181871	0.000200009
Skew	-0.431267371	0.022841495
Kurt	-0.164069483	0.707586499
From+1to+30 minutes		
Average	-0.000115153	0.000924615
Standard Deviation	0.000303160	0.000290272
Skew	0.113025161	0.316488722
Kurt	-0.663179692	2.462021275

Table 4.2-2 : T-test for computer and software industries

T-test	Industry	
	Computer	Software
T-test	0.375061	0.000000
Significant difference	No	Yes

From the Tables 4.2-1 and 4.2-2, the results of alpha in computer industry is greater than the significant level ($\alpha = 0.05$). Figure 4.2-1 shows the response before and after the events for the software and computer industries. Before the news event, the software and computer industry are behave positively, however, after the news events the software and computer industry are respond to the news events and behave negatively immediately after the news events. Thus, from the Figure x-x the news has more significant impact in the software industries than the computer industries. Table 4.2-2 shows the T-test result for the computer and software industry during the first and the second week, from the p-value of the T-test, we found that the hypothesis is supported the results of the software industry and does not support the result of the computer industry, that is because of the the testing p-value is greater than the significant value.

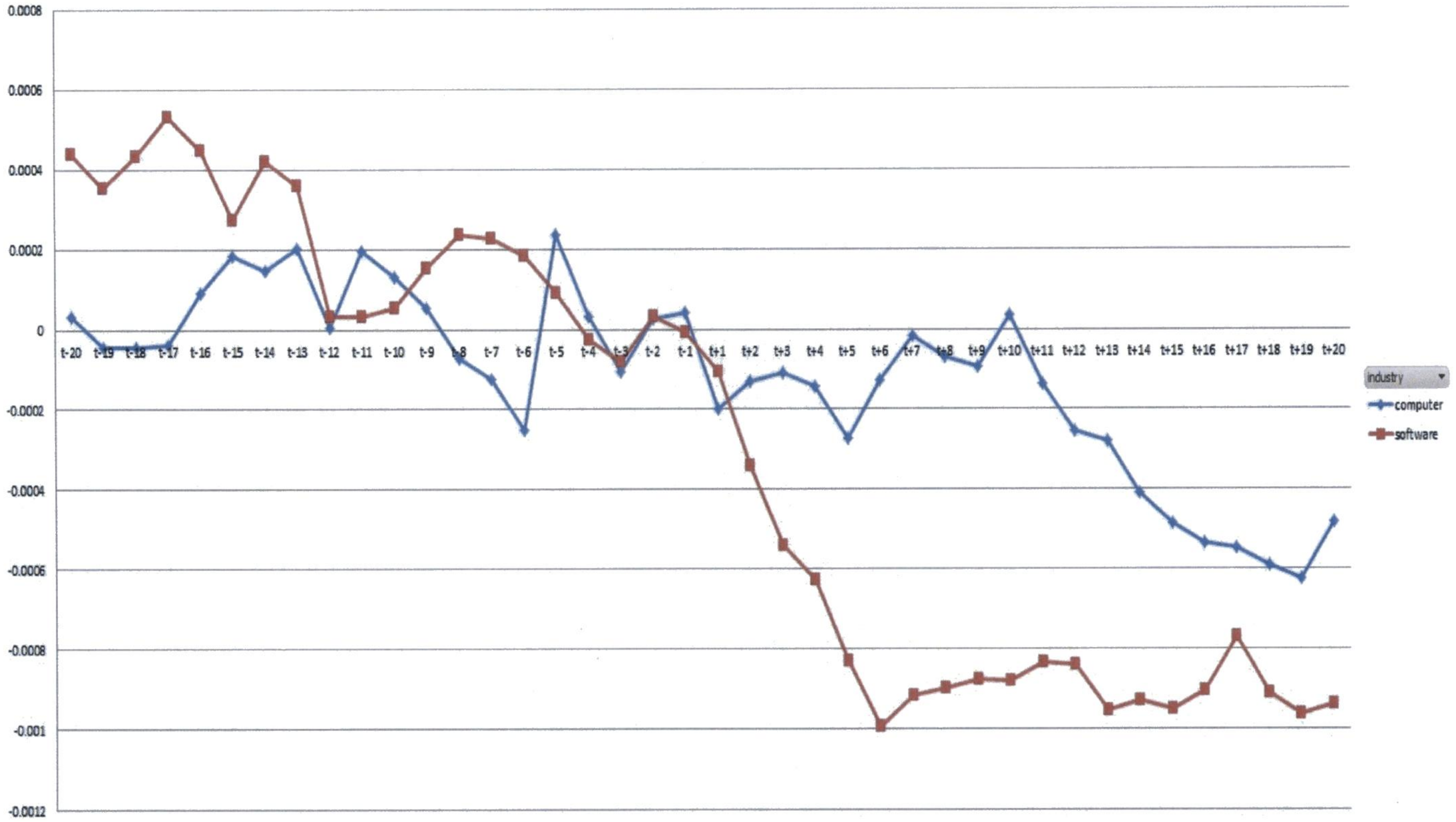


Figure 4.2-1 : Response of software and computer industry for the news, + - 20 minute

4.3 Hypothesis test H3

H3a – Risk perception of non-project news is more significant than for project news in the computer industry.
H3b – Risk perception of project news is more significant than for non-project news in the software industry.

This hypothesis investigates the risk perception of the software and computer segments, and what are the impacts of the news announcement on the stock market returns. H3 has been tested using the student T-test, and the results are performed by creating a matrix (segments vs. event type) as shown in table 4.3-1. The student T-test is executed on each element in the matrix as shown in table 4.3-2, from the value of the T-test, the hypothesis has investigated if the software and computer segments have different impacts on the stock market.

Table 4.3-1 : paired-Sample t-test for Computer and software segments

	Computer industry		Software industry	
Time period	non-project	project	non-project	project
From-30 to-1 minutes				
Average	0.000417106	0.000277642	0.000089966	0.000362333
Standard Deviation	0.000486698	0.000270533	0.000206501	0.000342202
Skew	0.153598807	0.944314896	0.742899141	0.126962756
Kurt	0.180724137	0.155853241	1.250694815	1.018545164
From+1to+30 minutes				
Average	0.001456158	0.000844691	0.001200405	0.000798212
Standard Deviation	0.000811478	0.000382341	0.000339807	0.000350791
Skew	0.047600032	0.431034721	1.502652053	1.103181785
Kurt	-0.658117231	0.572753795	2.747214413	2.160586327

Table 4.3-2 : T-test for computer and software segments

T-test	Computer industry		Software industry	
	non-project	project	non-project	project
T-test	0.000000	0.000000	0.000032	0.000000
Significant difference	Yes	Yes	Yes	Yes

Table 4.3-1 shows the actual statistically paired sample T-test results for the matrix type, the time interval between -30 to -1 and +1 to +30 minutes. Considering only 30 minutes before and after the news event, there are a significant difference between the segments of the industries, the t-value for each segment is different. Conversely, we found that the four types of industries are significant, where the p-values are greater than the significant confidence value (0.05). Thus, the four types of news events have a "perception window" of +/-30 minutes, and otherwise have no significant effect.

Figure 4.3-1 shows the response before and after the events for the computer and software industries, for the non-project and the project news for the computer industry the companies are behaves similarly before the news, however, after the events the non-project news, companies are respond to the news and behave positively, while the project news companies are respond negatively after the events, thus, the non-project news is more significant than the project news in the computer industry.

From Figure 4.3-1, the risk perception of the non-project news is more significant than the project news for the software industry, which is the reverse of the hypothesis H3b, that is mean, the non-project news are actually gives more risky than the project news, which is true in the case of computer industry. The risk of losing money from the industry point of view has effect profitability of the companies. For example, company like DELL don not produce computers, they managing a huge network of manufacturing companies, and whatever affects their bottom lines it is primarily the non-project demand, legal aspect of contract and big sourcing contracts. So technically, it is logical that non-project news have more important for companies like DELL. Table 4.3-2 shows the T-test result for the computer and software segments during the first and the second week, from the p-value of the T-test, we found that the hypothesis is supported the results.

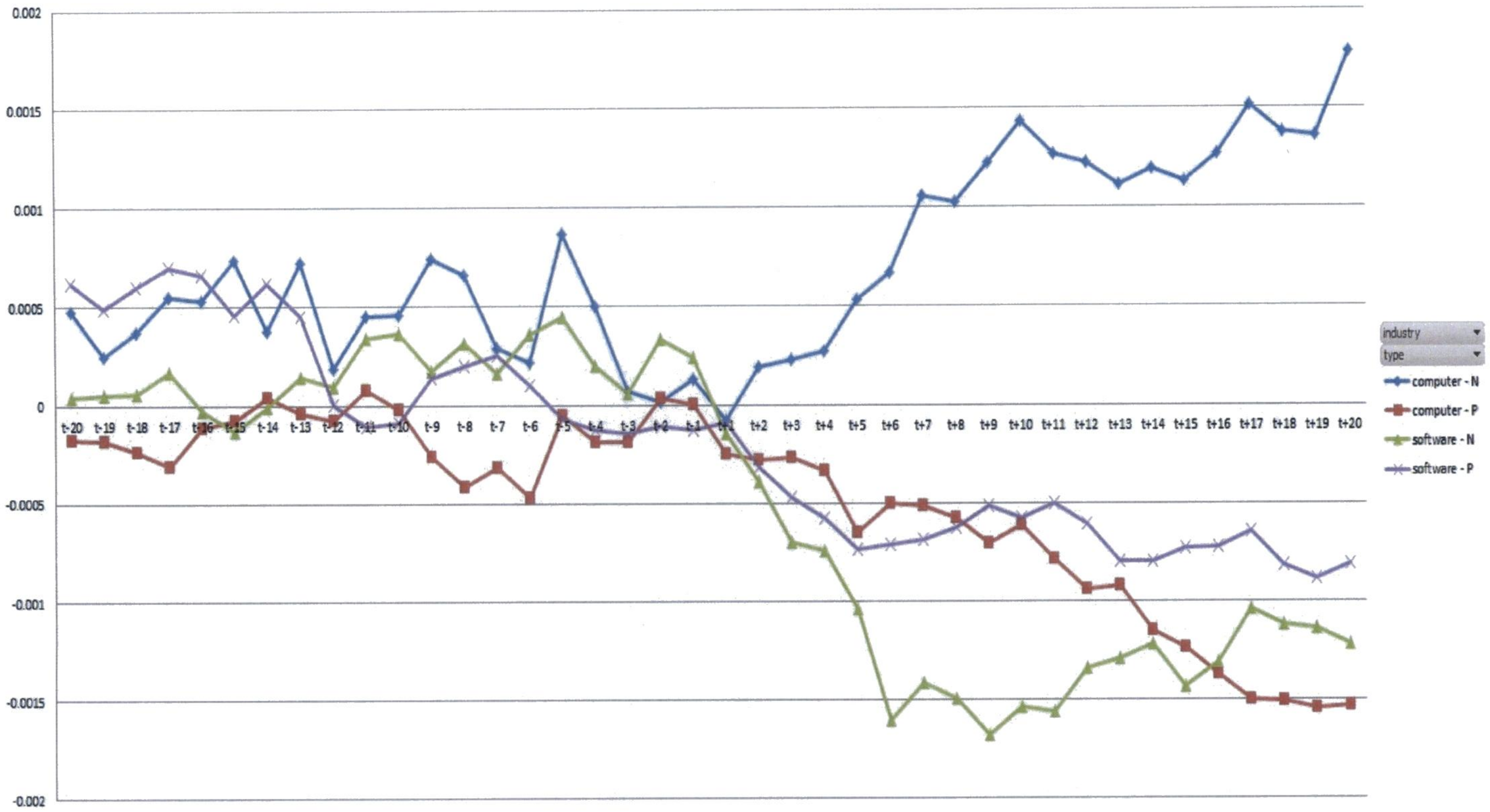


Figure 4.3-1 : Response of software and computer segments for the news, + - 20 minute

4.4 Hypothesis test H4

H4	Industry	News	Hypothesis
H4a	Computer	Non-Project	Risk perception of non-project news is more (less) significant during periods of high (low) volatility in the computer industry.
H4b	Computer	Project	Risk perception of project news is less (more) significant during periods of high (low) volatility in the computer industry.
H4c	Software	Non-Project	Risk perception of non-project news is less (more) significant during periods of high (low) volatility in the software industry.
H4d	Software	Project	Risk perception of project news is more (less) significant during periods of high (low) volatility in the software industry.

If we are in a week (week 1) where the prices are moving slowly vs. a week (week 2) where the prices have more standard deviation, those two weeks have different risk perceptions.

This hypothesis investigates if the non-project news verses the project news in the computer industry are significant at low and high volatility, respectively. On the other hand, it also investigates if the non-project and the project news in the software industry are significant at high and low volatility. H4 has been tested using the student T-test method, the results are performed by creating a matrix of (industry segments vs. event type) as shown in table 4.4-1 and 4.4-2. The student T-test is executed on each element in the matrix as shown in tables 4.4-3,4,5,6, from the values of the T-test the hypothesis has investigated and verified.

Table 4.4-1 : paired-Sample t-test for Computer and software segments

	Computer industry		Computer industry	
Time period	non-project Week 1	non-project Week 2	Project Week 1	Project Week 2
From-30 to-1 minutes				
Average	0.000774451	0.000000203	0.000221943	0.000710615
Standard Deviation	0.000539099	0.000770675	0.000160212	0.000536318
Skew	-0.067993093	0.608643013	0.624289088	0.843291994
Kurt	-0.716128325	-0.069123461	0.135368062	0.432432169
From+1to+30 minutes				
Average	0.000897849	0.002107518	-0.000769629	0.000909744
Standard Deviation	0.000661150	0.001223779	0.000337351	0.000486737
Skew	-0.146516525	0.196428005	0.582818316	0.592471099
Kurt	-1.199895546	-0.806781265	0.067021254	0.935220799

Table 4.4-2 : paired-Sample t-test for Computer and software segments

	Software industry		Software industry	
Time period	non-project Week 1	non-project Week 2	Project Week 1	Project Week 2
From-30 to-1 minutes				
Average	0.000095080	0.000076329	0.000354951	0.000372669
Standard Deviation	0.000345129	0.000349688	0.000237801	0.000612919
Skew	-0.134348451	-0.930616531	0.531489226	0.022814640
Kurt	0.168560562	1.212937198	0.500571257	0.665231358
From+1to+30 minutes				
Average	-0.001572329	-0.000208609	-0.000536815	0.001164167
Standard Deviation	0.000429909	0.000473668	0.000294617	0.000527645
Skew	0.510424646	0.470472582	-0.515324765	0.462039427
Kurt	1.209930713	-0.964084158	0.388246291	1.443543429

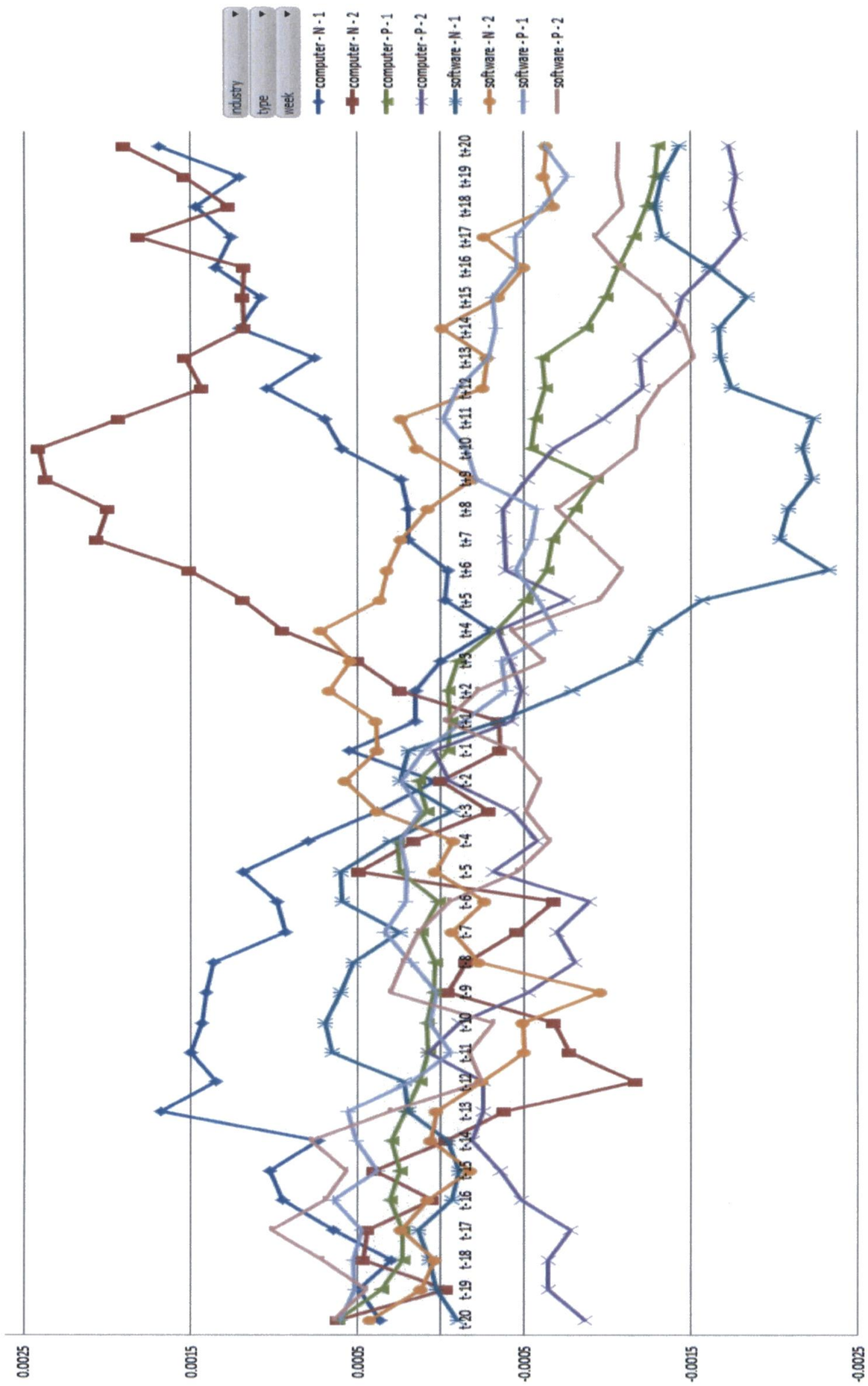


Figure 4.4-1 : Response of software and computer segments for the news, + - 20 minute

a. Computer non-project (week 1 vs. week 2)

Consider the blue and the red color curve in the Figure 4.4-1, as an example consider the Dell production system company, during a week where the prices move very slowly, that is mean the volatility is low, and the risk perception are generally low, the events that occurs will not have strong reactions from that events, they will have smooth reaction which means in this context during the low volatility non-project news are important , but during a high volatility week in that terms non-project news will be strong, for example DELL they don't developed innovative product, it is mainly a production company will extremely will effected the production system, in this context what did investors react to , any news will have an impact on the efficiency of the production system that is primarily the bottom line of the profitability of DELL company. So in period of low volatility reactions to pick news will be normal, but in period of high volatility reactions will be more production system news, which is the case. So, the non-project news which has direct impact into DELL in week 2 has very cute reaction compare with a smooth reaction in the week 1. Table 4.4-3 shows the T-test result for the computer non-project during the first and the second week, from the p-value of the T-test, we found that the hypothesis is supported the results.

Table 4.4-3 : T-test for Computer non-project (week 1 vs. week 2)

T-test	Computer industry	
	non-project Week 1	non-project Week 2
T-test	0.431559	0.000000
Significant difference	N	Y
graph line/color	1 (blue)	2 (red)
Hypothesis number	H4a	H4a
Hypothesis supported	yes	yes

b. Computer project (week 1 vs. week 2)

Consider the green and purple curve in the Figure 4.4-1, the news have normal impact during the first week, as well as behave the same way during the second week, which is mean that the reverse is not true which is good the project news do not have much impact on the computer industry, which is logical because it has less impact on the profitability because they are primarily a production system , making money out of the grow of market demand , they don't have fixed cost like Microsoft, their margin are very low, so project news have neutral impact. Table 4.4-4 shows the T-test result for the computer non-project during the first and the second week, from the p-value of the T-test, we found that the hypothesis is neutral and supported the results.

Table 4.4-4 : T-test for Computer project (week 1 vs. week 2)

T-test	Computer industry	
	Project Week 1	Project Week 2
T-test	0.000000	0.137567
Significant difference	Y	N
graph line/color	3 (green)	4 (purple)
Hypothesis number	H4b	H4b
Hypothesis supported	Yes, neutral	Yes, neutral

c. Software non-project (week 1 vs. week 2)

Consider the cyan and the orange curve in the Figure 4.4-1, in the first week for the software company like Microsoft, and because of the low volatility period (the project news and the non-project news), in the non-project news they have direct impact, but in the second week they have very much no impact, they are neutral. Recall the computer sector, when the volatility goes high then the market react more due to relevant news and became neutral to the non-relevant news,

because for the computer companies like DELL, the relevant news mostly is the non-project news, so they are neutral and not react very much. Same thing for the software sector, in high volatility period the investor will be carful and care about the project related news, they will be became more neutral to the non-project news, so the neutrality here is very interesting, for the software sector, companies like Microsoft is react more neutral in the period of non-project news, they care about project news and they are more significant in high volatility period, which is the case in the graph results. Table 4.4-5 shows the T-test result for the computer non-project during the first and the second week, from the p-value of the T-test, we found that the hypothesis is neutral and supported the results.

Table 4.4-5 : T-test for Software non-project (week 1 vs. week 2)

T-test	Software industry	
	non-project Week 1	non-project Week 2
T-test	0.000000	0.010547
Significant difference	Y	N
graph line/color	5 (cyan)	6 (orange)
Hypothesis number	H4c	H4c
Hypothesis supported	Yes, neutral	Yes, neutral

d. Software project (week 1 vs. week 2)

Consider the gray and the pink curve in Figure 4.4-1, because of the software industries are primarily project related, project oriented, the non-project news in period of high volatility what do investors care about?, news that will have direct impact on the profitability of the company, these news of the software sector are project news, so whatever are news related to project success they will definitely have a higher risk perception in high volatility week. In high volatility week the software companies have more risk perception and they are more significant related to project news. Table 4.4-6 shows the T-test result for the computer non-project during the first and the second week, from the p-value of the T-test, we found that the hypothesis is supported the results.

Table 4.4-6 : T-test for Software project (week 1 vs. week 2)

T-test	Software industry	
	Project Week 1	Project Week 2
T-test	0.000000	0.000000
Significant difference	Y	Y
graph line/color	7 (grey)	8 (pink)
Hypothesis number	H4d	H4c
Hypothesis supported	Yes, worsen	Yes, worsen

CHAPTER 5 - Results Discussion

5.1 Causes for Varying Risk Perceptions

The objectives of risk management are to identify potential risks and to minimize the impact of identified risks on cost, schedule and objectives of the project. As well, the intention is to eliminate risks when possible, to develop strategies to deal with potential risks if they happen, and to follow up and control the identified risks [27, 29].

In this study, we found that the flexibility present in computer manufacturing companies leads to the perception of less risk compared with the software (project-oriented) companies [30], where these risk perceptions depend on many factors, including: time of news announcements, time varying before and after the news events, firm's capital investment, fluctuation in the firm's stock price before and after the news event time, changes of abnormal returns for the firm, increases in the mean and variance of returns and limitation of event study research, where the time and data samples were very limited.

Thus, the project manager has to be able to estimate the risk from many factors related to the project, for example, the variance of the stock market returns. However, there are many techniques that are used to assist the managers in reducing the impact of identified risks that could adversely affect the expected results of the project, and evaluate the risks associated with the strategic stakes [31, 32].

5.2 Solutions to Mitigate Adverse Risk Perceptions

There are some improvements that have already been applied in order to reduce the market risk perceptions that these methods present, such as the minute-by-minute ARs being aggregated into Cumulative Abnormal Returns (CARs) of varying time windows around each event. These study findings are not relevant to measure and perform an event study to test how the financial markets perceive the implicit risk from a firm's public announcements. However its findings may also be extended in the appraisal of other impacts, such as: influence of the public and spe-

cific announcements on the firm's capital. However, further research and empirical studies would be required to test the applicability of the approach in different circumstances [33].

5.3 Lessons for Project Management Executives

An important contribution of this research, is to synthesize and interpret recent news announcements for firms in field of information technology industry. In particular, we demonstrate based on news announcements, project management executives will consider the options, such as waiting to invest, abandoning the project, or to continuing the project. This will provide better direction to the project based on alternative business plans to insure that the firm has a competitive advantage in it is industry.

In aspect of IT project management, it is most likely that, the way to manage the IT project and the knowledge of the IT manager to execute the projects, have a significant impact on what purposes the project fulfills and how the project should be managed to achieve the goals. In this thesis, the market perceived risk of project related announcements in the information technology industry has been discussed to provide some representative of what is meant by strategic project issues in information technology industry. How to identify project announcement, how to analyze the significance of news announcement on the stock market, and how to manage project strategic during the events and what is the impact of the events on the stock market.

In project management philosophy, there is saying says "successful project is not the result of successful planning, it is the result of successful execution", thus once the project team and the project elements have identified, the analyzed its potential impact on the project, strategies can be developed and executed to deal with those elements that might have an positive or negative impact on the management of the project, as well as its outcome. On the other hand, the IT manager should also focus on the external environment continues to change stock market shares, as well as focus on goals to rally and coordinate the information gathering from the stock market, so that reduce the negative impact of the news to the stock market due to news events, and the IT companies thrive in their shares stock market.

5.4 Limitations of this Study

Our research focused on the impact of the Yahoo! Finance news announcements on the Yahoo! stock market, and measured the perception risk of the S&P 500 companies. Our results are not very accurate and are fuzzy, as the stock market perception risk is carried out under many restricted conditions, including, but not limited to: limited time for data collection, where the number of the data points collected is very small and limited compared with the huge amount of data that Yahoo! Finance announced. This reason directly limits and affects our data sample size.

Another limitation of the study is the interaction between the two different segments was very limited since those segment comparisons are conducted in an open marketplace where a huge number of variables are settings.

We conclude that whether or not the project is related to the news within the time window we tested (-30, +30 minutes) we know that this time window is very limited due to the time periods chosen. In other words, to choose a minute before and after the event is not very accurate, and as such, many researchers have chosen a wide time frame to estimate the abnormal return for the event study. For example, in our study we knew from the beginning that the computer segment has more flexibility than the software segment, from the data collected within the time interval limitation and based on the company's financial statements [11].

5.5 Future Research

This is an exciting area which has a lot of potential for future research. There are many things that can be done to extend our current approach.

Firstly, in our current approach, we have studied only the information technology (IT) sector (computers and software). Further studies could be done in different industries such as health care, consumer discretionary, finance, and others.

Secondly, future researchers may consider merging other related markets such as the Toronto Exchange market and NASDAQ in North America. Many firms have common relations in more than one country, so increasing the range of this study will help to produce more accurate and precise results.

Thirdly, one could use robust sources for data and news announcements, such as Bloomberg and Reuters. More advanced data and news mining algorithms will be required to fully extract the knowledge base and decision rules in this richer database.

Finally, the study of more than one time window for each sector will be more informative and superior than just a single time period. The biggest challenge, however, still remains to be the production and integration of a complete study in Yahoo! financial news and stock market using proper sample times and element sizes. To achieve these objectives, the financial data collection, filtration, and other techniques will have to be improved and fully developed.

CONCLUSION

In this study, we used an event study methodology to estimate the market perceived risk toward news announcements of IT firms, both project-related and general organizational issues. We then filtered the returns into specific criteria, thus creating cumulative returns based on the event study period, -30,+30 minutes. Pivot tables were created to determine the perceived risk for each market segment, and we used t-tests to test our hypotheses.

Our results showed that:

1. Computer manufacturing companies have higher flexibility that can enable them to easily adapt to stock market fluctuations and therefore they are perceived as less risky, when compared to project-oriented companies where large ongoing projects represent significant fixed costs, with high level of difficulty required to adapt to shifting economic conditions.
2. Project-related news events have more impact on project-oriented companies, as these directly affect their riskiness, while the perceived risk in the manufacturing sector is affected more by general organizational issues that reduce the flexibility of the production network.
3. The news announcements have positive impacts on both segment of the information technology (computer and software), based on the stock market return for each company. As well as, the risk response for the computer industry is less than the risk response for the software industry.
4. The stock market prices for the non-product computer and product software segments have been more affected by news events than the product computer and non-product software segments.

We also tested to see whether news from the firms would have an effect on related and non-related stock prices in the market, and our results confirm the hypotheses as follows:

1. News events have a positive impact on both related and non-related firms based on the public announcements. This result is based on Figure 4.5 in Chapter 4, where the sum of the cumulative abnormal returns has generated fluctuation waves inside the test time window. This is because of the effect of the news announcements on the non-product computer segments and product software segment.
2. The product computer and non-product software segments have a flat curve inside the time window, which shows that the news announcements have no direct influence on those sectors.
3. Risk response for the computer industry is less than the risk response for the software industry. This is because the computer segments are more flexible than the software segments inside the test time window.

This research also analyzes the relation of stock volatility of the information technology industry with real financial variations, and stock activities using weekly data, from last week of February 2011 to the first week of March in 2011. An important fact, noted is that stock return variability was unusually high during the first week. While a smooth curve is significantly correlated with volatility in the second week, it explains a relatively small part of the movements in stock volatility during the non project news in computer segment and project news in software segment. The amplitude of the fluctuations in aggregate stock volatility is difficult to explain using simple models of stock valuation, especially with a small time frame of two weeks period.
In hypothesis-4-a, the non-project computer segment, has more risk perception of non-project news and more significant during periods of high volatility in the computer industry. While the risk perception is less significant during the period of low volatility of the same segment.
In hypothesis-4-b, the project computer segment has less risk perception of project news and less significant during periods of high volatility in the computer industry. While the risk perception is more significant during the same period of low volatility of the same segment.
In hypothesis-4-c, the non-project software has less risk perception of non-project news and less significant during periods of high volatility in the software industry. While the risk perception is more significant during the period of low volatility of the same segment.

In hypothesis-4-d, the project software has more risk perception of project news and more significant during periods of high volatility in the software industry. While the risk perception is less significant during the period of low volatility of the same segment.

In conclusion, this thesis allowed us to develop an empirical tool to verify and control for market-perceived risk in the IT industry. Our hypotheses and results provide valuable information to both project managers and company executives who need to plan their strategies according to market-perceived risk of news announcements. This analytical framework will be useful to project managers in the various industry segments, as our hypotheses were specified for both the software and computer segments, and for both project and non-project announcements.

ANNEX I Information technology companies

COMP_ID	COMP_NAME	COMP_TICK	IN-DUSTRY	COMP_GICS	COMP_GICS_A_T	COMP_GICS_B_N	COMP_GICS_B_T	COMP_GICS_C_N	COMP_GICS_C_T
3	Apple	AAPL	Com-puters	45	Information Technology	4520	Technology Hardware and Equipment	452020	Computers and Peripherals
7	Adobe	ADBE	Soft-ware	45	Information Technology	4510	Software and Services	451030	Software
11	Autodesk	ADSK	Soft-ware	45	Information Technology	4510	Software and Services	451030	Software
62	BMC Software	BMC	Soft-ware	45	Information Technology	4510	Software and Services	451030	Software
71	CA	CA	Soft-ware	45	Information Technology	4510	Software and Services	451030	Software
108	Compu-ware	CPWR	Soft-ware	45	Information Technology	4510	Software and Services	451030	Software
109	Salesforce	CRM	Soft-ware	45	Information Technology	4510	Software and Services	451030	Software
116	Citrix Sys-tems	CTXS	Soft-ware	45	Information Technology	4510	Software and Services	451030	Software
124	Dell	DELL	Com-puters	45	Information Technology	4520	Technology Hardware and Equipment	452020	Computers and Peripherals
151	EMC	EMC	Com-puters	45	Information Technology	4520	Technology Hardware and Equipment	452020	Computers and Peripherals
158	Electronic Arts	ERTS	Soft-ware	45	Information Technology	4510	Software and Services	451030	Software
219	Hewlett-Packard	HPQ	Com-puters	45	Information Technology	4520	Technology Hardware and Equipment	452020	Computers and Peripherals
227	IBM	IBM	Com-puters	45	Information Technology	4520	Technology Hardware and Equipment	452020	Computers and Peripherals
232	Intuit	INTU	Soft-ware	45	Information Technology	4510	Software and Services	451030	Software
278	Lexmark	LXK	Com-puters	45	Information Technology	4520	Technology Hardware and Equipment	452020	Computers and Peripherals
306	Microsoft	MSFT	Soft-ware	45	Information Technology	4510	Software and Services	451030	Software
326	Novell	NOVL	Soft-	45	Information	4510	Software and Services	451030	Software

			ware		Technology				
330	NetApp	NTAP	Com-puters	45	Information Technology	4520	Technology Hardware and Equipment	452020	Computers and Peripherals
342	Oracle	ORCL	Soft-ware	45	Information Technology	4510	Software and Services	451030	Software
386	Red Hat	RHT	Soft-ware	45	Information Technology	4510	Software and Services	451030	Software
411	SanDisk	SNDK	Com-puters	45	Information Technology	4520	Technology Hardware and Equipment	452020	Computers and Peripherals
428	Symantec	SYMC	Soft-ware	45	Information Technology	4510	Software and Services	451030	Software
432	Teradata	TDC	Com-puters	45	Information Technology	4520	Technology Hardware and Equipment	452020	Computers and Peripherals
473	Western Digital	WDC	Com-puters	45	Information Technology	4520	Technology Hardware and Equipment	452020	Computers and Peripherals

ANNEX II Statistical analysis

	computer						computer Total
	N		N Total	P		P Total	
	Week 1	Week 2		Week 1	Week 2		
From -30 to -1 minutes							
alpha	0.000011	0.000015	0.000010	0.000003	0.000007	0.000004	0.000003
beta	0.000012	-0.000037	-0.000011	-0.000010	0.000047	0.000021	0.000011
correlation	4%	18%	4%	28%	59%	45%	27%
steyx	0.000538	0.000711	0.000486	0.000139	0.000350	0.000204	0.000158
From +1 to +30 minutes							
alpha	0.000009	0.000015	0.000007	0.000006	0.000010	0.000007	0.000006
beta	0.000059	0.000115	0.000085	-0.000024	-0.000016	-0.000020	0.000013
correlation	62%	68%	85%	38%	9%	21%	15%
steyx	0.000412	0.000704	0.000322	0.000271	0.000473	0.000347	0.000284

	software						software Total	Grand Total
	N		N Total	P		P Total		
	Week 1	Week 2		Week 1	Week 2			
From -30 to -1 minutes								
alpha	0.000005	0.000007	0.000003	0.000004	0.000006	0.000004	0.000003	0.000002
beta	0.000027	-0.000013	0.000016	-0.000013	-0.000061	-0.000033	-0.000018	-0.000002
correlation	48%	11%	47%	23%	76%	72%	60%	3%
steyx	0.000254	0.000335	0.000154	0.000212	0.000304	0.000185	0.000129	0.000114
From +1 to +30 minutes								
alpha	0.000009	0.000005	0.000007	0.000005	0.000007	0.000004	0.000004	0.000003
beta	0.000000	-0.000047	-0.000013	-0.000023	-0.000048	-0.000033	-0.000027	-0.000005
correlation	0%	77%	11%	47%	63%	70%	66%	7%
steyx	0.000438	0.000230	0.000326	0.000217	0.000326	0.000196	0.000171	0.000165

ANNEX III Number of news by industry, company, type, and category

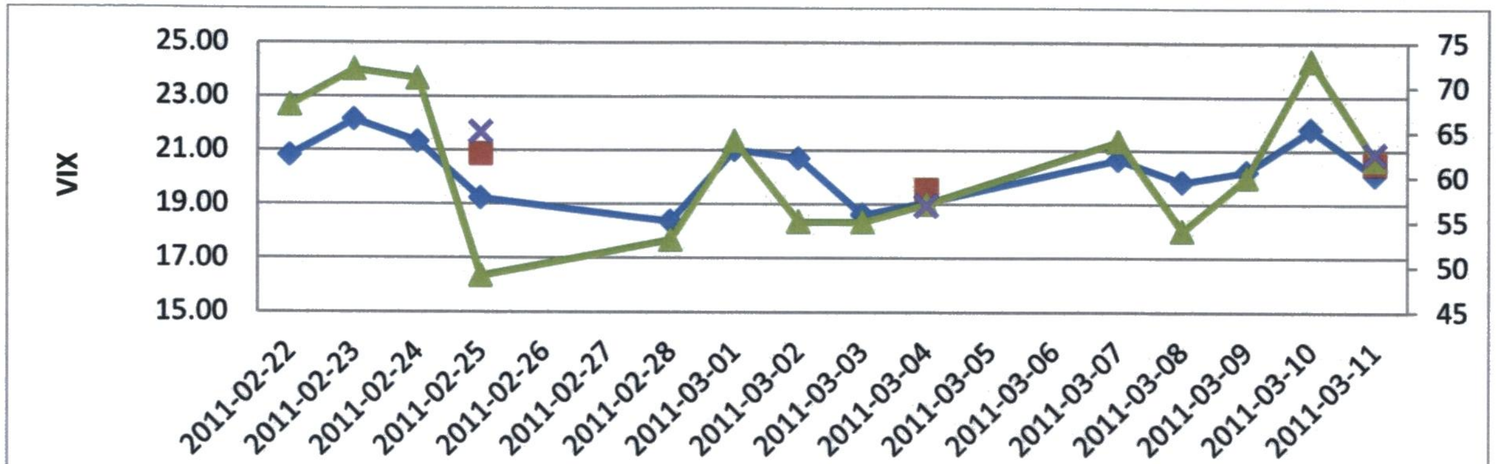
	N				**N Total**	**P**				**P Total**	**Grand Total**
	executive	**financial**	**legal**	**stock**		**customer**	**partner**	**product**	**technology**		
computer	**4**		**1**	**8**	**13**	**8**	**2**	**15**	**3**	**28**	**41**
AAPL	1		1	1	**3**		2	10	1	**13**	16
DELL	1			4	**5**						5
EMC								1		**1**	1
HPQ	1				**1**	3		1		**4**	5
IBM	1			1	**2**	5			2	**7**	9
NTAP								1		**1**	1
WDC				2	**2**			2		**2**	4
software	**5**	**4**	**1**	**1**	**11**	**2**	**10**	**7**	**5**	**24**	**35**
ADBE							1		1	**2**	2
ADSK									1	**1**	1
BMC						2	1			**3**	3
CRM	1				**1**						1
CTXS				1	**1**		1			**1**	2
ERTS	1				**1**			1	1	**2**	3
INTU	1				**1**						1
MSFT	2		1		**3**		5	6	1	**12**	15
NOVL		2			**2**						2
ORCL		1			**1**		2			**2**	3
RHT		1			**1**						1
TDC									1	**1**	1
Grand Total	**9**	**4**	**2**	**9**	**24**	**10**	**12**	**22**	**8**	**52**	**76**

ANNEX IV CBOE market summary for two weeks on 2011

DateFinal	Call	Put	Total	Ratio	Day	Month	Year
22/02/2011	1817321	1237376	3054697	0.68	22	2	2011
23/02/2011	1822930	1310392	3133322	0.72	23	2	2011
24/02/2011	1400155	989406	2389561	0.71	24	2	2011
25/02/2011	1387325	683836	2071161	0.49	25	2	2011
28/02/2011	1247689	666797	1914486	0.53	28	2	2011
01/03/2011	1335116	857859	2192975	0.64	1	3	2011
02/03/2011	1202768	666213	1868981	0.55	2	3	2011
03/03/2011	1318148	719369	2037517	0.55	3	3	2011
04/03/2011	1416865	802282	2219147	0.57	4	3	2011
07/03/2011	1276233	815715	2091948	0.64	7	3	2011
08/03/2011	1339628	726328	2065956	0.54	8	3	2011
09/03/2011	1188077	716388	1904465	0.6	9	3	2011
10/03/2011	1424462	1035358	2459820	0.73	10	3	2011
11/03/2011	1086201	670492	1756693	0.62	11	3	2011

ANNEX VCBOE_graph

Date	1-VIX	2-Avg VIX	3-Put/Call	4-Avg P/C
2011-02-22	20.80		68	
2011-02-23	22.13		72	
2011-02-24	21.32		71	
2011-02-25	19.22	20.87	49	65.00
2011-02-28	18.35		53	
2011-03-01	21.01		64	
2011-03-02	20.70		55	
2011-03-03	18.60		55	
2011-03-04	19.06	19.54	57	56.80
2011-03-07	20.66		64	
2011-03-08	19.82		54	
2011-03-09	20.22		60	
2011-03-10	21.79		73	
2011-03-11	20.08	20.51	62	62.60



	2011-02-22	2011-02-23	2011-02-24	2011-02-25	2011-02-28	2011-03-01	2011-03-02	2011-03-03	2011-03-04	2011-03-07	2011-03-08	2011-03-09	2011-03-10	2011-03-11
1-VIX	20.80	22.13	21.32	19.22	18.35	21.01	20.70	18.60	19.06	20.66	19.82	20.22	21.79	20.08
2-Avg VIX				20.87					19.54					20.51
3-Put/Call	68	72	71	49	53	64	55	55	57	64	54	60	73	62
4-Avg P/C				65.00					56.80					62.60

ANNEX VI

Short and long run economic factors

- Supply and Demand: Supply and demand impacts country's Gross Domestic Product (GDP), and higher demand for goods and services leads to a greater employment rate to produce the goods and to service the country, hence leading to economic growth.
- Interest Rates: Fluctuation in interest rates will impact consumer purchasing power. The presence of higher interest rates will lead consumers and firms to borrow less money. Therefore, consumers will borrow less money for products and services and this may lead to the decrease of a firm's capital due to incline in business growth.
- Inflation: Increase in inflation leads to higher prices, and as a result consumers will be less inclined to purchase luxury items, or nonessential products and services. As inflation increases, the dollar value decreases, and this leads to a decrease in the consumer`s buying power.
- Unemployment: Unemployment rates can have a major effect on the country`s economy. Higher unemployment rates will lead to less money circulating into the economy due to the decrease in purchasing power of products and services.
- Foreign Exchange Rate: A country`s foreign exchange rate is the value of its currency in the international market. An increase in a specific country`s currency in contrast to other countries' currencies will lead to an increase in imports of both products and services. The higher value of currency in a country makes it unattractive to other nations, and so nations may be less inclined to import goods from overseas.

ANNEX VII

Flexibility of Companies in 2 Segments (DELL and MSFT)

DELL	13 weeks ending 2012-02-03	13 weeks ending 2011-10-28	13 weeks ending 2011-07-29	13 weeks ending 2011-04-29	13 weeks ending 2011-01-28
Gross Profit	21%	23%	23%	23%	21%
Selling/General/Admin. Expenses, Total	14%	14%	14%	13%	13%
Research & Development	1%	1%	1%	1%	1%
Depreciation/Amortization	0%	0%	0%	0%	0%
Interest Expense(Income) - Net Operating	0%	0%	0%	0%	0%
Unusual Expense (Income)	0%	0%	0%	0%	0%
Other Operating Expenses, Total	0%	0%	0%	0%	0%
Total Operating Expense	94%	93%	93%	92%	93%
Operating Income	6%	7%	7%	8%	7%

MSFT	3 months ending 2011-12-31	3 months ending 2011-09-30	3 months ending 2011-06-30	3 months ending 2011-03-31	3 months ending 2010-12-31
Gross Profit	73%	78%	79%	76%	76%
Selling/General/Admin. Expenses, Total	23%	23%	29%	28%	24%
Research & Development	11%	13%	14%	14%	11%
Depreciation/Amortization	0%	0%	0%	0%	0%
Interest Expense(Income) - Net Operating	0%	0%	0%	0%	0%
Unusual Expense (Income)	0%	0%	0%	0%	0%
Other Operating Expenses, Total	0%	0%	0%	0%	0%
Total Operating Expense	62%	59%	64%	65%	59%
Operating Income	38%	41%	36%	35%	41%

DELL					
Variable Cost	79%	77%	77%	77%	79%
Fixed Cost	15%	15%	15%	15%	14%
Operating Income	6%	7%	7%	8%	7%
Total	100%	100%	100%	100%	100%
VC/FC Ratio	5.15	5.11	5.10	5.22	5.78
T of VC/FC Ratio	(0.19)	(0.25)	(0.27)	(0.08)	0.79
Avg of VC/FC	5.27				
StDev of VC/FC	0.29				

MSFT					
Variable Cost	27%	22%	21%	24%	24%
Fixed Cost	35%	37%	43%	42%	35%
Operating Income	38%	41%	36%	35%	41%
Total	100%	100%	100%	100%	100%
VC/FC Ratio	0.78	0.59	0.50	0.57	0.69
T of VC/FC Ratio	0.61	(0.14)	(0.53)	(0.22)	0.28
Avg of VC/FC	0.63				
StDev of VC/FC	0.11				

ANNEX VIII

Sample of daily Cumulative Abnormal Returns (CARs) for IT companies

Industry	Company	Ticker	2/28/2011	3/1/2011	3/2/2011	3/3/2011	3/4/2011	3/7/2011	3/8/2011	3/9/2011	3/10/2011	3/11/2011
Computers	Apple Inc.	AAPL	-0.004263096	-0.002134688	0.001749138	0.001902139	0.002746506	-0.010842133	-0.011071274	-0.012869591	-0.006373377	0.013363815
Computers	Dell Inc	DELL	0.03093308	-0.01573577	-0.004842813	-0.004348593	-0.006005904	-0.010196843	-0.005350086	-0.010434812	0.001330174	0.00083476
Computers	EMC Corp	EMC	0.003576422	-0.012399583	-0.00036763	0.006824856	0.002365935	-0.015526709	-0.007829818	-0.005710703	-0.009916377	0.015917011
Computers	Hewlett-Packard Co	HPQ	0.011501574	-0.001905254	0.008759881	-0.01251205	-0.005844152	-0.006432933	0.005175497	-0.00513762	0.002246399	0.010276243
Computers	Intl Business Machines Corp	IBM	-0.005064285	0.000784008	0.000203932	0.008172057	-0.004095712	-0.005250138	0.008353838	0.023323603	-0.009657889	0.004914977
Computers	Lexmark International Inc	LXK	0.003492861	-0.001953593	0.006875977	-0.0096082	0.001192955	0.009794538	0.025343397	0.003015784	-0.011858098	0.024951387
Computers	NetApp Inc	NTAP	-0.018141579	-0.003052875	0.008571276	0.011862009	0.000761168	-0.008519012	0.003098322	0.000690047	-0.042153748	-0.013731891
Computers	SanDisk Corp	SNDK	-0.012155128	-0.003977937	0.005685548	5.49098E-05	0.010392608	0.005412784	-0.000409332	-0.003523846	0.009252767	0.019491633
Computers	Teradata Corp	TDC	-0.009517692	-0.028902475	0.015472284	0.040761908	-0.017814025	-0.001405228	-0.005265086	-0.015300915	-0.019962093	0.011004198
Computers	Western Digital Corp	WDC	0.02857831	-0.026243275	0.006554785	-0.001086466	-0.007803355	0.157721428	0.034084462	-0.024583311	-0.018485125	0.002238316
Software	Adobe Systems Inc	ADBE	-0.012774887	-0.004315029	0.009804516	-0.002279963	0.009565363	-0.011775309	0.005139491	-0.00673855	0.004841551	-0.007534543
Software	Autodesk Inc	ADSK	-0.00933741	0.005403831	-0.013779934	0.012265252	0.005448261	0.002661911	0.014345615	0.002244381	0.01626145	0.017913337
Software	BMC Software Inc	BMC	0.001540564	-0.007365389	-0.008003905	0.013333459	0.000495271	-0.014993566	0.000739372	-0.00254507	-0.018517913	0.010925683
Software	CA Inc	CA	0.002161619	0.001895182	0.004682969	0.007977803	-0.016717573	0.003923191	0.000813244	0.003203749	0.004554004	0.00336258
Software	Compuware Corp	CPWR	0.001930306	-0.012898339	-0.000111104	0.008754564	0.002324573	0.005533998	0.011624338	0.001763381	-0.013648131	0.018413678
Software	Salesforce.com	CRM	-0.028385248	-0.002898761	0.007418457	0.005573083	0.018292468	0.004478917	-0.006319252	0.015005413	0.027223363	0.019450191

ANNEX IX CAR's of the IT companies

Tick	Company	CAR-30	CAR+30
EMC	EMC Corp	-8.8E-05	-0.00236
AAPL	Apple Inc.	-0.00099	-0.00535
WDC	Western Digital Corp	-0.00014	0.157212
WDC	Western Digital Corp	0.005731	-0.00265
EMC	EMC Corp	-0.00056	0.000384
WDC	Western Digital Corp	-0.00248	-0.0124
WDC	Western Digital Corp	0.003655	0.028118
TDC	Teradata Corp	0.003907	0.001967
AAPL	Apple Inc.	0.000673	0.000694
AAPL	Apple Inc.	-0.00062	-0.00526
WDC	Western Digital Corp	0.004194	0.003478
AAPL	Apple Inc.	-0.00091	-0.0043
HPQ	Hewlett-Packard Co	-8.7E-07	0.000645
DELL	Dell Inc	0.001129	-0.0095
NTAP	NetApp Inc	-8.2E-05	-0.05735
AAPL	Apple Inc.	0.000846	0.00351
DELL	Dell Inc	0.00276	0.000756
DELL	Dell Inc	0.001261	0.001506
CRM	Salesforce.com	-0.00039	-0.00655
SYMC	Symantec Corp	0.000517	0.002091
INTU	Intuit Inc	-0.00031	-0.00651
INTU	Intuit Inc	-0.00031	-0.00651
MSFT	Microsoft Corp	0.000586	0.008339
SYMC	Symantec Corp	0.001048	0.002993
CRM	Salesforce.com	-0.00036	-0.00407

MSFT	Microsoft Corp	0.000787	0.001374
BMC	BMC Software Inc	0.003885	0.002362
ERTS	Electronic Arts	-0.00085	-0.00126
MSFT	Microsoft Corp	0.001677	0.001862
CRM	Salesforce.com	-0.00063	0.002128
CRM	Salesforce.com	-0.00063	0.002128
MSFT	Microsoft Corp	0.0016	0.001207
ADBE	Adobe Systems Inc	0.000195	-0.0014
MSFT	Microsoft Corp	0.002335	0.004278
MSFT	Microsoft Corp	0.001367	0.000365
EMC	EMC Corp	-0.00088	-0.00799
AAPL	Apple Inc.	-0.00058	-0.00265
TDC	Teradata Corp	-0.00247	-0.01319
AAPL	Apple Inc.	0.000589	0.001231
AAPL	Apple Inc.	-0.00029	0.000868
AAPL	Apple Inc.	0.000761	0.003571
AAPL	Apple Inc.	0.000761	0.003571
AAPL	Apple Inc.	0.000761	0.003571
AAPL	Apple Inc.	-0.00053	-0.00044
ERTS	Electronic Arts	-0.00256	-0.00668
ORCL	Oracle Corp	-0.00022	-0.00179
ADBE	Adobe Systems Inc	0.000195	-0.0014
SYMC	Symantec Corp	0.002095	0.012432
MSFT	Microsoft Corp	0.001367	0.000365

ANNEX X Sample of the news title for the IT companies

Tick	Company	Industry	Product News	News Title
EMC	EMC Corp	Computers	0	Analyst Firm Says EMC Outpaced Storage Software Market in 2010; Leads for 9th Consecutive Year
AAPL	Apple Inc.	Computers	0	Early Glance: Computer companies
WDC	Western Digital Corp	Computers	0	Western Digital buying Hitachi unit for $4.3B
WDC	Western Digital Corp	Computers	0	NYSE stocks posting largest percentage increases
MSFT	Microsoft Corp	Software	0	Microsoft Announces New Long-Term Licensing Option for Academic Institutions
EMC	EMC Corp	Computers	1	New EMC VNXe and VNX Unified Storage Now Shipping Worldwide
AAPL	Apple Inc.	Computers	1	As competitors pop up, iPad keeps price advantage
TDC	Teradata Corp	Computers	1	Teradata Customer Station Casinos Earns Industry Accolades Recognizing Value of Data Analytics in Operational Excellence
AAPL	Apple Inc.	Computers	1	Summary Box: Review of iPad 2
ERTS	Electronic Arts	Software	1	EA and Medieval Times Announce the “Be a Hero” Partnership in Honor of the Launch of The Sims Medieval
ORCL	Oracle Corp	Software	1	Oracle Rolls Out New Application
ADBE	Adobe Systems Inc	Software	1	Adobe SocialAnalytics, Powered by Omniture, Delivers Marketers Ability to Monitor, Measure and Monetize Social Media
SYMC	Symantec Corp	Software	1	Symantec Takes the Pain Out of Renewing SSL Certificates

ANNEX XI

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