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Firm's Financial Health and its Impact on SEO Announcement Effects

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Abstract

This paper examines the influence of investors' beliefs about a firm's financial health on the size of announcement effects of seasoned equity offerings. Altman's Z-score for non-manufacturing firms is used as a quantitative measure for company health, and abnormal returns are calculated using event study methodology. The paper departs from a hypothesis that investors of healthy firms will react less negatively to the announcement of a secondary equity offering because they are confident in the firm's stability and the firm's ability to use the new capital profitably to increase shareholder wealth. The study finds that there is no significant difference between announcement effects for healthy firms and unhealthy firms and that the financial health of the firm, as measured by Altman's Z-score, has no significant impact on abnormal returns after equity offering announcements. This suggests that investors' knowledge of company health is insignificant compared to the negative signals sent to the market by the announcement. These signals most likely are the drivers of the negative announcement effects. In addition, the relationship between announcement effect and company financial health, although insignificant, is found to be negative, contrary to the original hypothesis. Ignoring its insignificance, this can be explained by risk averse investor behaviors. Using an unrestricted model with Altman's Z-score variables, it is found that investors' reactions to equity offerings are significantly affected by the illiquidity and the insolvency of the firm.

1 Introduction

1.1 Problem Background

A firm's need for capital can be cured in three basic ways: internal financing, debt financing, or equity financing. The firm may need capital for a variety of reasons. For example, to weather financial distress or take on costly investment opportunities. No matter what defines the firm's need for capital, investors are sensitive to a firm's choice in financing. It is however logical that those investors would be more sensitive to certain types of financing decisions. For example, internal financing is relatively cheap for the firm, and therefore, investors are less sensitive if the firm is able to internally finance new investments. On the other hand, equity financing requiring a seasoned offering is considered expensive for the firm, sends a number of negative signals to investors, and is generally considered a last resort (see pecking order theory later in the paper).

A natural question then is if or how an investor's beliefs about a firm can affect these negative reactions to a firm's decision to go to the market for further equity. This study focuses on investors' beliefs in the firm's financial health and how those beliefs can affect the negative reaction to seasoned equity offerings.

This paper departs from the hypothesis that investors who believe that the firm is healthy will react less negatively to an announcement of a seasoned equity offering. This is intuitively supported by the assumption that investors of healthy firms will feel confident in the firm's use and need of new capital. Kim and Purnanandam (2009) find that if investors are confident that the proceeds from an equity issue will be used for positive NPV projects, investors may even react positively to a seasoned equity offering. Kim and Purnanandam's findings contradict a large number of theories discussing the significantly negative announcement effects of secondary equity offerings. This contradiction triggered an interest in the topic.

1.2 Thesis Outline

In chapter two the theoretical background for Altman's Z-score and for announcement effects for seasoned equity offerings is presented. Altman's Z-score is used in this study as a quantitative measure of company health and as the proxy for

investors' beliefs in a firm's financial health. In addition, a discussion of previous studies that are similar to this one and their results is presented.

Chapter three presents the methodology of the study, including information regarding the data sample, calculation of Altman's Z-score, and the event study used to calculate the announcement effects of the seasoned equity offerings. This is followed by the methodology for the central portion of the study: analyzing the relationship between company health and seasoned equity offering announcement effects. This is done in three main ways: first, using a t-statistic to compare two groups of firms, most and least healthy, and their stocks' experienced announcement effects, second, by running an Ordinary Least Squares (OLS) regression using the Z-score and finally, by running an unrestricted OLS model, which includes the variables from Altman's Z-score.

The next chapter, chapter four, focuses on the presentation of the results of the study as well as interpretations of these results.

Finally, chapter five contains concluding remarks and suggestions for further study.

2 Theoretical Background

The following chapter presents the theoretical background for the two variables in focus for this study. It begins with a discussion of the Altman Z-score, including how it came to be, its transformation over time, and its effectiveness for a study like this one. Following this is a discussion of theoretical motivations for negative announcement effects of seasoned equity offerings, in addition to a number of supporting empirical studies. Finally, the section concludes with a review of studies similar to this one.

2.1 Altman Z-score

Although originally created in order to predict bankruptcy of firms, Altman's Z-score has for years been a popular measure of the financial health of companies. Edward I. Altman developed the original Z-score formula used for predicting bankruptcy in 1968. His model uses data from 66 firms, half of which had already filed for bankruptcy under Chapter 7. All of the firms in the dataset are manufacturing firms that hold assets worth more than one million U.S. dollars. Altman began examining corporate failures in the hope of identifying and measuring the variables that might indicate forthcoming corporate distress. Altman's Z-score can predict the probability of bankruptcy within 2 years using financial and economic ratios. The model has both practical as well as analytical value (Altman 1968). The original Z-score formula developed by Altman follows the following form:

$$Z = 1.2\ X1 + 1.4\ X2 + 3.3\ X3 + 0.6\ X4 + 1.0\ X5$$

As Altman (2002) discusses, the variables are defined as the following:

$$X1 = \text{Working Capital} / \text{Total Assets}$$

This ratio is a measure of the firm's net liquidity compared to its total capitalization. Working capital, which is a measure of the firm's liquidity, is defined as current assets minus current liabilities. The total asset calculation includes only tangible assets. The model assumes that troubled firms will have declining current assets. Even though this ratio is a good indicator of the firm's liquidity compared to its size, it suffers from the common drawback of all univariate performance measures; the ratio may increase immediately before the firm defaults.

X2 = Retained Earnings / Total Assets

This ratio considers the age of the firm and its use of debt. Firms with a high X2 are assumed to have financed operations mainly with retained earnings and without using much debt. On the other hand, the firms with a low X2 use debt as its main source for financing operations. Therefore, a lower X2 implies higher risk for the firm. Younger firms will have lower retained earnings because retained earnings often take time to accumulate. The model might appear to be biased against younger firms. However, real life examples suggest that the probability of failure is indeed higher in the first five years of the firm's life.

X3 = Earnings Before Interest and Taxes / Total Assets

This ratio measures the operating efficiency of the firm. By using EBIT, the ratio does not include tax or leverage effects. This makes it possible to compare firms with varying leverage ratios and across different industries. In addition, as insolvency occurs when total liabilities exceed the market value of assets (the latter being measured by the earning power of the assets (EBIT)) this ratio gives a good indication of the credit risk a firm is facing.

X4 = Market Value of Equity / Book Value of Total Liabilities

This ratio measures how much firm value (market value of equity plus total liabilities) can decline before total liabilities exceed the market value of the firm and the firm becomes insolvent. In contrast to contemporary research, Altman uses the market value of equity as opposed to book value, which gives his model the ability to react to changes in the security prices on the market.

X5 = Sales/ Total Assets

This is the turnover ratio, which measures the ability of total assets to generate sales. It indicates a firm's ability to utilize its assets. Healthier firms will have higher X5 values.

According to Altman's zones of discrimination, companies with Z-scores lower than 1.81 are considered to be close to bankruptcy.

Altman developed his first Z-score equation in the late 60s by analyzing only manufacturing companies. As Altman's Z-score became popular for determining the degree of corporate distress, it was later adjusted to measure the health of private firms.

In addition, Altman revised the model again in order to minimize the potential industry effect that the asset turnover variable can have. Because the original X5 variable is highly industry sensitive, Altman revised the model to be a more reliable measure of the financial health of non-manufacturing firms and firms in emerging markets. The adjusted Z-score formula is the following (Altman 2002):

$$Z = 6.56\ X1 + 3.26\ X2 + 6.72\ X3 + 1.05\ X4$$

For this model, Z-scores below 1.10 indicate corporate distress.

Instead of the original five variables, it only includes the first four, eliminating the asset turnover variable. The coefficients are adjusted, and the X4 variable uses the book value of equity instead of the market value of equity, which is used in the original model. This deprives the adjusted model of the ability to react to changes in security price. This model is applicable for firms within different industries that may have different types of asset financing. The benefit is that it requires no adjustments for different financing techniques e.g. lease capitalization.

Altman's Z-score is able to predict corporate failures within two years with 72% accuracy (Altman 2002). Since the model is easy to apply and interpret, it makes it easy for a firm to detect the signs and sources of deterioration in the company and allows firms to eliminate them in a timely and effective manner. Investors can also easily calculate and use the Z-score to classify firms, much like this study does.

The model's applicability across various industries makes it suitable to this study. Its strength in assessing the health of small as well as large firms also makes it appropriate for a sample set of firms that are not classified by size. The Z-score should give an unbiased picture of a company's financial health. The robustness of the model with respect to lease capitalization is another important characteristic (Altman 2002). This ensures that Z-scores for firms belonging to industries with varying capital intensity are comparable.

Based on the characteristics of the model and its implications, the Altman Z-score modified for non-manufacturing firms should be an appropriate proxy and quantitative measure for the health of companies, and it can be used as a proxy for investors' beliefs and information about a firm's heath.

2.2 Equity Offering Announcement Effects

2.2.1 Theories

Numerous theories are offered in order to explain the change in stock price resulting from announcements of seasoned equity offerings.

Signaling theory developed by Leland and Pyle (1977) argues that a change in the portion of management's stock ownership will result in a similar change in stock price. The theory assumes that managers hold superior information about the future cash flows of the firm compared to investors. Holding large portions of the stock makes managers relatively undiversified. They will be willing to take on this risk only if they are convinced that future cash flows of the firm will be increasing in the future. Investors use management's holdings in the firm as a trustworthy signal of the firm's value. Because an equity issue results in the dilution of management's holding in the firm, investors take this as a negative signal. Therefore, an announcement of an equity issue resulting in a decrease in the portion of management's stock ownership will result in a negative announcement effect.

Jensen and Meckling's (1976) agency theory also states that large stock holdings by managers are considered a credible signal to investors. Large management holdings decrease the agency problem between the managers (agents) and the shareholders (principals). When management has large holdings in the firm, they are less likely to maximize their profits by exploiting the firm and more likely to maximize the share price, which is in line with shareholder wishes. If principals and agents are not aligned, managers may not make investment decision to maximize firm value. Alignment of the interests of agents and principals is crucial to sustaining and increasing firm value. Thus, dilution of management's holdings induced by an equity issue is a negative signal to investors and results in a decrease in share price usually proportional to the size of the stock offer.

According to Myers and Majluf's (1984) adverse selection model, managers are assumed to base their capital structure decisions on the interests of existing shareholders. Managers are assumed to be better informed about the future of the firm and its intrinsic value compared to investors. Therefore, managers will issue equity only when they

believe the stock is overvalued. This means that existing shareholders will gain from the sale of overpriced equity. This also means that managers will restrain from issuing equity when they believe the stock is undervalued. According to the adverse selection model, an equity issue is a negative signal to investors that the stock is currently overvalued. As a result, there is a negative announcement effect from an equity issue.

Pecking order theory developed by Myers and Majluf (1984) suggests that firms prefer to rely on internal funds, as they are the cheapest source of financing. Issuing equity is more expensive than issuing debt because proceeds from profitable projects will have to be split with new shareholders. When internal funds are not an option for financing, firms would therefore issue debt before issuing equity. Based on pecking order theory, issuing equity sends a negative signal to investors because it suggests that the firm's debt market has dried out and the firm was forced to turn to a last resort financing option. In this case, an equity issue suggests the firm is of poor financial health and results in a negative reaction from the market.

Bayless and Chaplinsky (1991) study a similar theory, although they modify it slightly. The modified pecking order theory states that the market reacts negatively when a firm issues equity instead of an expected debt issue. They argue that those results show that the informational content of public security offerings is conditioned by investors' prior beliefs. In addition, the results support asymmetric information theory, which says that debt issues convey good news relative to equity issues (Bayless & Chaplinsky 1991).

According to Masulis (1983), when managers alter the capital structure of the firm, specifically the leverage ratio, information about the future cash flows of the firm is communicated to investors. This is assuming that the tax rate, distress costs, and non-debt tax shields remain the same. This theory is also in line with DeAngelo and Masulis' (1980) theory suggesting that an increase in expected cash flows should result in an increase of the firm's optimal leverage ratio. Each firm has its own optimal leverage ratio, which it should attempt to maintain in order to fully exploit all the benefits of holding debt. A stable leverage ratio signals management's confidence in the stability of the firm's future cash flows. Decreasing the leverage ratio by issuing equity signals possible deterioration in the future performance of the firm. Therefore, adjustments to the

leverage ratio are considered to be negative signals by investors and result in a negative announcement effect.

The aforementioned theories all conclude that an announcement of an equity offering should result in a negative market reaction.

2.2.2 Empirical Studies

There are several additional empirical studies that investigate seasoned equity issues and their announcement effects. Extensive research of seasoned equity offerings (SEOs) started in the mid 80s with classical papers such as Asquith and Mullins (1986) and Masulis and Korwar (1986). Masulis and Korwar (1986) investigate the stock price reaction to the announcement of primary offerings, primary-secondary offerings and dual primary offerings (stock-bond). They find, on average, a significant drop in stock price after seasoned equity issue announcements and more negative abnormal returns in cases resulting in a decrease in management's stock ownership. This is consistent with Leland and Pyle's signaling model and Jensen and Meckling's agency theory.

Findings of Masulis and Korwar's (1986) study are generally in line with Asquith and Mullins' (1986) empirical research of 531 SEOs. They investigate announcement day and issue day price effects and find that the average announcement day has statistically significant negative excess returns. Negative returns on the announcement day are significantly and positively related to the size of the issue.

Mikkelson and Partch (1986), Hess and Bhagat (1986), Kolodny and Suhler (1985), Pettway and Radcliffe (1985) and Kalay and Shimrat (1987) also find negative announcement effects of seasoned equity offerings.

More recent research also investigates the announcement effects of NYSE and NASDAQ listed stock SEOs. Eckbo and Masulis (1992) find a 0.44% reduction in prices after SEO announcements compared to the -1 closing day. Examining the yearly average, Altinkilic and Hansen (2003) find a 3.2 % drop in stock price after the announcements in the 1990s. Corwin (2003) finds an average increase of 1.15% in the negative abnormal returns in the 1980s and 2.92% in the 1990s after the SEO announcements. He attributes increased announcement effects to proportionally larger increases in NASDAQ issuers – smaller and younger firms with risky outlook and volatile growth options. Corwin (2003)

also studies the size effect. According to his study, negative abnormal returns are positively related to the relative size (offered shares/total shares outstanding before offer) of the offer.

Findings from these studies are consistent with the theories discussed above. These findings suggest that the market views equity issues as a sign of deteriorating firm performance and poor future growth opportunities. Therefore it is tightly linked to the health of the company.

2.2.3 During Crisis

Since this study uses data from the end of 2007 and forward, there is influence of the current financial crisis on the data sample. As discussed in *Understanding The Financial Crisis: Origin and Impact*, the modern financial crisis originated with a run-up in housing prices from 1994 to 2006. Inflows of foreign funds made borrowing relatively cheap. At the same time, banking deregulations allowed banks to lend more. As a result, inexpensive loans drove up housing prices. The introduction of sophisticated structured products, such as collateralized debt obligations (CDOs), allowed banks to sell their mortgages and transfer the risk to other entities. This increased lending to relatively low-credit profile borrowers. As the price of housing decreased, the value of the CDOs also decreased, as they were accounted for using "mark-to-market" accounting methods introduced earlier during the crisis. Drops in the market value of CDOs caused major losses and bankruptcies of the companies that held them. The asset bubble burst in mid 2008. The cause of this is still unknown, however, declining international confidence in the U.S. starting in 2006 could have played a role. The Great Depression is considered to be a historical equivalent to the current crisis. It is also three times bigger than the Savings and Loan crisis of 1980 (Anon. 2008).

It is important to consider the possible effects that the crisis can have on the study. In general, equity accounts for a larger portion of external financing of a firm in both a promising financial environment and one of economic expansion. Choe et al. (1993) shows that this phenomenon is consistent with the fact that firms issue seasoned equity when they face less adverse selection costs. Adverse selection costs are lower during periods with less uncertainty about the asset value and more promising growth

opportunities. The study finds decreased negative stock price reactions to SEOs in periods with lower adverse selection costs. Their empirical findings confirm their prediction that investors have positive expectations about SEOs during promising financial environment, as abnormal returns are less negative during expansionary business cycles and periods with increased equity issues. They also find larger adverse selection costs confirmed by more negative abnormal returns after SEO announcements during contraction business cycles and periods when uncertainty about the asset value of the firm is prevalent. These findings are in line with Myers and Majluf (1984) adverse selection model predicting higher equity issues and lower adverse selection costs during expansionary business cycles.

This suggests that during a time of economic turmoil, announcement effects should be greater. Therefore, announcement effects during the sample time may be greater than they would be during expansionary times.

2.2.4 Global vs. U.S. Domestic

This study focuses on firms that have announced secondary equity offerings on the U.S. market. There is some research discussing the differences between announcement effects in the U.S. and announcements globally.

The research documenting negative average returns after SEO announcements ((Asquith and Mullins (1986), Masulis and Korwar (1986), Mikkelson and Partch (1986), Eckbo and Masulis (1992)) might be biased towards USA.

Research including international data, such as Bohren et al. (1997) and Tsangarakis (1996) report positive reaction to SEO announcements in Greece and Norway. Gajewski and Ginglinger (2002) find significant negative reactions in France. Slovin et al. (2000) find a significantly negative reaction to SEOs in the U.K market. The average of all these findings, sample weighted, is insignificant and equals 0.7% (Eckbo, Masulis & Norli 2007).

Chaplinsky and Ramchand (2000) investigate 349 global SEOs and 459 solely U.S. domestic issues and find that ceteris paribus the negative reaction following equity issue is reduced by 0.8% in global issues compared to domestic ones with the same size and timing.

Wu and Kwok (2002) and Errunza and Miller (2003) both find that global equity issues have lower stock price reactions compared to U.S. issues. Errunza and Miller (2003) find the decrease in stock price after global SEO announcement is 1.5% less compared to USA announcement effect.

As the studies above suggest, announcement effects in the U.S. are generally greater than in other markets. Since announcements have a greater impact on stock prices in the United States, it suggests that a study focusing on the U.S. market may have more significant use for investors as it has a bigger impact on their investments.

2.3 Previous Related Studies

There are a number of studies, similar to this one, that investigate relationships between proxy measures of company health and announcement effects of some sort.

Griffin and Lemmon (2002) test the earnings announcement effect by sorting firms based on their O-score and book-to-market ratio. O-score is a measure of firm distress risk developed using a dataset from 1970-1976 and analyzing 105 bankrupt firms and 2058 non-bankrupt firms. Like Altman Z-score, it uses financial ratios to assess the firm's distress risk (Ohlson 1980). They test the stock prices of non-financial NYSE, NASDAQ and AMEX monthly stock returns from July 1965 to June 1996. They find that after announcement the difference in returns between the firms with high and low BE/ME belonging to the high O-score group (high distress risk) is two times larger compared to the difference in returns between high and low BE/ME of the firms belonging to other O-score groups. They find that firms with higher risk have more negative price reactions to earnings announcements, and firms with less analyst coverage have more negative abnormal returns after the announcement. Their findings are consistent with the information asymmetry theory, as investors tend to attach higher discount rates to the stocks of the firms about which they do not hold much information.

Lee (2007) examines the common equity issue announcement effect on stock returns using insider trading as a proxy for additional information available to investors about the firm. He finds that 10-day insider trading prior to the issue announcement affects the stock price. Therefore, investors view insider trading as a credible source of information about the quality of the issue. More specifically, Lee (2007) finds that insider

net-selling activity results in more negative abnormal returns compared to insider net-buy activity. Moreover, he finds that insider trading is a more important proxy for the firm value than is the size of the issue, the changes in leverage of the firm, and the changes in insider stock ownership.

Using Altman's Z-score as a proxy for the firm quality, Impson (2000) investigates the reaction to dividend reduction or omission announcements in the electric utility industry. After examining 10 electric utility organizations' dividend announcements during 1979-1991, he finds a significant and direct relationship between the Z-score and the reaction.

Kamstra et al (2006) investigates the relationship between the probability investors attach to the type of the forthcoming security to be issued by the firm and the abnormal returns and long-run stock price performance after the issue announcement. They develop the model by first calculating the probability of issuing a certain type of security. They base this probability on firm information and history using transaction level data and empirical modeling techniques. More specifically, "firms' ex ante characteristics include size, market-to-book ratio, Altman Z-score (or alternatively leverage ratio), depreciation and amortization, cash, taxation, tangibility, profitability, retained earnings, past stock liquidity, past stock return, stock volatility, total amount of external financing in the past year, an IPO dummy and other path-dependent variables" (Kamstra et al 2006 p.13). Consistent with modified pecking order theory, they find that firms that have a high probability of issuing equity have less negative abnormal returns after the announcement and lower long run stock price reaction compared to firms having high probability of debt issue. Furthermore, high probability of issuing equity is considered as a signal of extreme overvaluation.

This thesis adds to the already existing body of work as there is no previous analysis of the relationship between company health, measured with Altman's Z-score specific to non-manufacturing firms, and announcement effects of seasoned equity offerings. In addition to the study's recentness, the financial crisis of 2008-2009 is of course an important and interesting factor influencing the study. It can add to the body of work, which investigates events during this time. The study adds to the work done on

informed investors and their behaviors, by looking at investors' beliefs about company health and its impact on investors' reactions to announcements of seasoned equity offerings.

3 Methodology

This chapter addresses the methodology of the study. The section begins with information regarding the data sample, calculation of Altman's Z-score, and the event study used to calculate the announcement effects of the seasoned equity offerings. This is followed by the methodology for the central portion of the study: analyzing the relationship between company health and announcement effects, which is approached in three different ways.

3.1 Data Sample

The number of completed seasoned equity offerings in the United States in the past ten months was used to determine the starting point for the sample of firms used in the study. Using recent data was important, as the study assumes that investors become increasingly sensitive to announcements of equity offerings during times of crisis. This assumption was discussed previously in section 2.2.3.

Announcement dates for follow-on equity offerings were readily available through the Reuters3000Xtra database. Based on this available data, the sample is determined by what the Reuters database categorizes as follow-on offerings, which include primary (mostly), secondary, and primary-secondary combination offerings. For the remainder of the paper the terms follow-on and seasoned equity offering are used interchangeably.

Event study data compliance required that each firm's security was traded 135 days prior to announcement and 15 days following the announcement. The explanation for this is discussed below in section 3.2.2 about the event study.

Based on the number of firms that had successfully completed a seasoned equity offering and whose security was traded 135 days before announcement, the sample resulted in sixty occurrences of seasoned equity offerings within eight different industries: Cyclical consumer goods and services, utilities, energy, non-cyclical goods, telecommunications services, technology, basic materials, and health care.

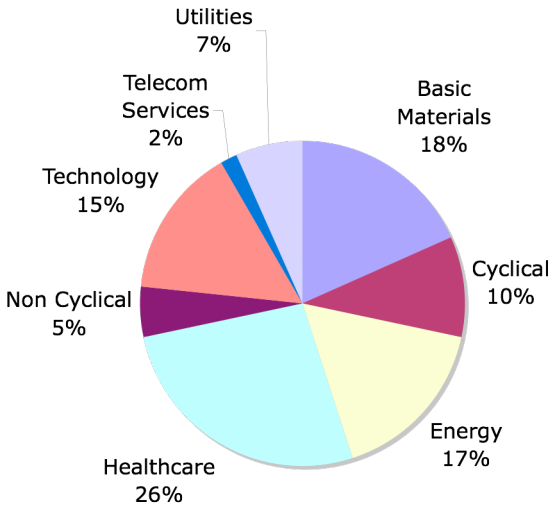

Figure 1: Distribution of sample firms by industry.

Firms from the manufacturing industry were not included in the sample in order to be compliant with the Z-score calculation. A firm was included twice in the study if the firm's seasoned equity offering occurrences were at least one quarter of the year apart from each other.

The sixty firms included in the data sample had announcements of seasoned equity offerings during the time frame of May 1st 2008 to February 28th, 2009. Announcements occurred in each of the ten months except for October 2008, with a large number of announcements in June 2008. The distribution of announcement dates by month can be seen below.

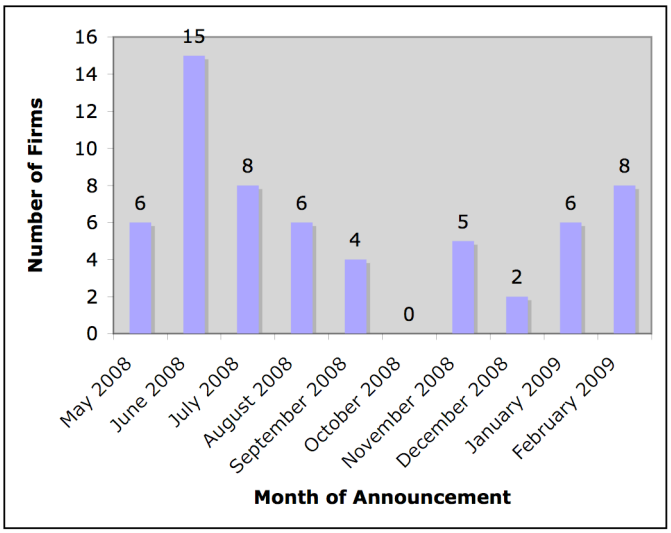

Figure 2: Distribution of sample announcements by announcement month.

In addition to Reuters 3000Xtra, where information on announcement dates of follow-on offerings was found, a variety of other data sources was used for the study. Thomson Financial DataStream was used in order to obtain daily stock prices for each firm, in addition to the information on the returns of the S&P 500 index, which was used as a proxy for the market portfolio. Additional information for the Altman Z-score calculation was taken from finance-related newspapers, for example the Financial Times, with information often coming from their website: www.ft.com.

In summary, the following restrictions are imposed on the data sample:

- The follow-on offering was announced between May 1st, 2008 and February 28th, 2009.
- The firm announced the offering on the U.S. market.
- The exact announcement date for the follow-on offering was clearly defined and available.
- The follow-on offering was completed.
- The firm's stocks were publicly traded 135 days prior to the announcement and 15 days following the announcement.
- The firm was not considered part of the manufacturing industry.
- All information on the firm needed for the study was publicly disclosed.

3.2 Calculation of the Variables

3.2.1 Company Heath Measure – Altman Z-score Calculation

In order to quantitatively measure the financial health of the company for the study, the Altman Z-scores of each firm in the sample were calculated. This would be an easy way for any investor to judge the health of a firm as the information is easily accessible and the calculation is straightforward.

In order to be consistent with the findings on Z-score calculations as discussed in section 2.1, firms in the manufacturing industry are eliminated from the sample in order to have consistent and appropriate Z-score calculations. For each of the companies, *i*, in the remaining eight industries, the Altman Z-score adjusted for non-manufacturing firm is calculated in the following manner:

$$Z_i = 6.56X_{i1} + 3.26X_{i2} + 6.72X_{i3} + 1.05X_{i4} \quad (1)$$

where

$$T_1 = (CurrentAssets - CurrentLiabilities)/TotalAssets$$
$$T_2 = \mathrm{Re}\,tainedEarnings/TotalAssets$$
$$T_3 = EearningsBeforeInterestAndTaxes/TotalAssets$$
$$T_4 = BookValueOfEquity/BookValueOfTotalLiabilities$$

The Z-score calculation for each firm is based on the information from the firm's performance from the year previous to the announcement. For firms with announcements in 2009, the end of the year information provided in annual reports from 2008 is used for the calculation. For announcements in 2008, end of 2007 data is used. This relates the health of the company prior to the seasoned equity offering to the abnormal returns the firm experiences and ensures that the seasoned equity offering itself has no effect on the health measure.

In Appendix I, a list of the sixty occurrences of seasoned equity offerings, the companies, and their accompanying Z-scores can be found. Each company is classified using the zones of discrimination:

Z > 2.6 – "Safe Zone"

1.1 < Z < 2.6 – "Grey Zone"

Z < 1.1 – "Distress Zone"

Finally, any outliers in the sample are removed. Observations that are more than three standard deviations away from the mean Z-score are removed from the data sample.

3.2.2 Announcement Effects - Event Study Approach

In order to determine the abnormal returns each company experiences due to the announcement of their seasoned equity offerings, event study methodology is used.

The event, t=0, is defined as the announcement of a follow-on offering by a firm. The event day is the day of the announcement, which is available and clearly defined for each firm. The selection criteria for the firms and occurrences included in the analysis are discussed in section 3.1, in addition to the sample's characteristics, such as industry representation and distribution of events through time.

The event window is defined as t=T1+1 to t=T2, and the estimation window is defined as t=T0+1 to t=T1. Let L1=T1-T0 represent the length of the

estimation window, and let L2=T2-T1 represent the length of the event window. It is typical to have the event window be larger than the event date itself as there could be rumors of the announcement ahead of time as well as effects in days following the event. Generally the event window and the estimation window should not overlap. This ensures that the normal returns are not influenced by the returns around the event (MacKinlay 1997).

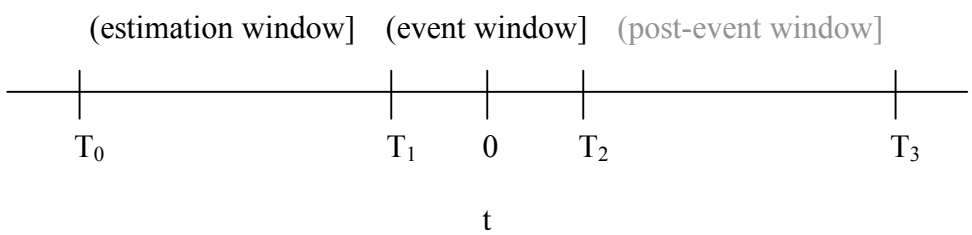

Figure 3: Time line for an event study.

For this study, L1 is set to 120 days and L2 is set to 31 days, 15 days before and 15 days after the announcement. The determined event window ensures that any rumors of announcement as well as speculation of a firm's need for new capital in the form of new equity will not affect the normal return calculation.

Once the sample was determined and the estimation window was defined, the normal returns for each firm's security was determined using the market model. The study assumes that there is a stable linear relationship between market return and security return. The following Ordinary Least Squares (OLS) regression was run for each firm:

$$R_{it} = \alpha_i + \beta R_{mt} + \varepsilon_{it} \tag{2}$$

where

$$E(\varepsilon_{it} = 0) \text{ and } \operatorname{var}(\varepsilon_{it}) = \sigma^2_{\varepsilon_i}$$

R_{it} and R_{mt} are the period-t daily returns on security *i* and the market portfolio respectively. Returns are calculated using logarithmic returns. The S&P 500 index is used as a proxy for the market portfolio; this is a standard proxy used for such an analysis. The period used for this model is the estimation window of 120 days prior to 15 days before the announcement. As discussed in MacKinlay (1997), under general conditions, OLS is a consistent estimation procedure for the market model parameters. In addition, under the assumption of joint normality of asset returns, OLS is efficient.

Table 1 shows the highest R^2 from the market model regression for each industry. By using the market model, the portion of variation in return related to variation in the market is removed. This can help to better detect event effects. The benefit of the market model depends on the R^2 of the market model regression. The higher the R^2 is, the greater the variance reduction of the abnormal returns and the larger the gain in using the model (MacKinlay 1997). Given the fairly large R^2s shown here, the market model is appropriate for this study.

Industry	Company	R^2
Basic Materials	Nucor Corp	0,525
Cyclical	Las Vegas Sands Corp	0,468
Energy	Whiting Petroleum Corp	0,561
Healthcare	Geron Corp	0,542
Non Cyclical	Ecolab Inc	0,727
Technology	Ciber Inc	0,514
Telecommunications Services	Hughes Communications Inc	0,220
Utilities	Spectra Energy Corp	0,787

Table 1: Example of market model R^2 for each industry.

Once the parameters were estimated using equation (2), the sample abnormal returns were calculated using the following equation:

$$AR_{it} = R_{it} - E(R_{it}|X_t) \tag{3}$$

where

$$E(R_{it}|X_t) = \hat{\alpha}_i + \hat{\beta}_i R_{mt} \tag{4}$$

AR_{it} is the abnormal return, R_{it} is the actual return, $E(R_{it})$ is the expected return, and X_t is the conditional information for the normal return model. In this case, the conditional information for the normal return model was the market model.

Under the null hypothesis that the abnormal returns are not significantly different from the normal returns, the abnormal returns follow the following distribution (MacKinlay 1997):

$$AR_{it} \sim N(0, \sigma^2(AR_{it})) \tag{5}$$

Abnormal returns are then aggregated across time in order to analyze the event and test the significance of the abnormal returns. Cumulative abnormal return (CAR) must be calculated. CAR ranges from t_1 to t_2 where $T_1 < t_1 \leq t_2 \leq T_2$, which is defined as

$CAR_1(t_1, t_2)$. The study tests a number of different CARs: (-15,+15), (-10,+10), (-5,+5), (-1,+3), and (0,+1). The CAR from t_1 to t_2 is calculated as follows:

$$CAR_i(t_1,t_2) = \sum_{t=t_1}^{t_2} AR_{it} \tag{6}$$

Under the null hypothesis, the cumulative abnormal return's distribution is (MacKinlay 1997):

$$CAR_i(t_1,t_2) \sim N(0,\sigma_i^2(t_1,t_2)) \tag{7}$$

Given this distribution, it is possible to test the null hypothesis for each security, but this is generally not very useful. It is therefore necessary to aggregate the observations across securities as well.

It is assumed that when aggregating across securities there is no clustering in the observations. This means that there are no overlaps in event windows. Absence of overlap implies that the abnormal returns and cumulative abnormal returns are independent across securities (MacKinlay 1997). The data sample in this study does have clustering, i.e. overlap of event windows, but since the significance tests of the events are not the focus of the analysis, clustering is ignored and the study continues as though this is not a problem.

Since the CARs were already calculated for each security through time, they then need to be aggregated over securities by implementing the following equation for N events:

$$\overline{CAR}(t_1,t_2) = \frac{1}{N}\sum_{i=1}^{N} CAR_i(t_1,t_2) \tag{8}$$

with variance equal to

$$\text{var}(\overline{CAR}(t_1,t_2)) = \frac{1}{N^2}\sum_{i=1}^{N} \sigma_i^2(t_1,t_2) \tag{9}$$

and distribution

$$\overline{CAR}(t_1,t_2) \sim N[0,\text{var}(\overline{CAR}(t_1,t_2))] \tag{10}$$

It is then possible to derive a significance test for the null hypothesis from the z-value, which takes the following form:

$$z = \frac{\overline{CAR}(t_1,t_2)}{\frac{\sqrt{\text{var}(\overline{CAR}(t_1,t_2))}}{\sqrt{N}}} \tag{11}$$

After testing the five CARs mentioned above, the CAR with the highest level of significance is selected to use for the remaining portion of the study.

Finally, outlying abnormal returns are eliminated. Cumulative abnormal returns more than three standard deviations from the mean cumulative abnormal return are no longer included in the data sample.

3.3 Measuring the Relationship - Company Health and Announcement Effects

3.3.1 Event Study Comparison Statistic

The relationship between company health and announcement effects was first tested by analyzing the difference between the top 10 healthiest companies' mean announcement effects and the bottom 10 companies' announcement effects. To do this, the study follows DeLong (2001). A t-statistic is used to test if the means of two groups are statistically different from each other. The calculation of the t-statistic follows the following form:

$$t = \frac{\overline{CAR}_{TOP} - \overline{CAR}_{BOTTOM}}{\sqrt{\frac{\mathrm{var}(\overline{CAR}_{TOP})}{N_{TOP}} - \frac{\mathrm{var}(\overline{CAR}_{BOTTOM})}{N_{BOTTOM}}}} \tag{12}$$

The t-statistic is distributed as a Student-t under the null hypothesis that there is no difference in the mean abnormal returns of the two groups (DeLong 2001).

3.3.2 Restricted Regression Analysis

The next step of the study of the relationship between the two variables is a linear OLS regression of the following form:

$$CAR_i(-1,+3) = \alpha + \beta Z_i + \varepsilon \tag{13}$$

This is a restricted regression because the coefficients for each Z-score variable are restricted based on Altman's coefficients. Once the parameters are estimated, the significance of the β term can be determined as well as if the relationship between the two variables is positive or negative.

3.3.3 Unrestricted Regression Analysis

The final step in the analysis was to run an unrestricted regression using the variables from Altman's model but not the coefficients. This model takes the following from:

$$CAR_i(-1,+3) = \alpha + \beta_1 X1_i + \beta_2 X2_i + \beta_3 X3_i + \beta_4 X4_i + \varepsilon \qquad (14)$$

Because this regression is unrestricted, the independent variables can show the impact they have on announcement effects separately. The results will show which, if any, of the variables included in Altman's Z-score have an effect on the abnormal returns following a seasoned equity offering announcement. It can reveal which financial measures are more influential on investors' reactions to the announcement.

4 Empirical Results

This chapter reviews the results of the study and provides an interpretation of them.

4.1 Results of Variable Calculation - Recap

4.1.1 Health of the Company

For the remainder of the paper, the Altman Z-score of each firm defines the financial health of the company. The Altman Z-score calculations, as discussed above, are straightforward. Refer to Appendix I for a list of companies, their Z-scores, and the zone of discrimination they are located in. This variable is often referred to as just "Z-score" in the remainder of the paper.

The process of eliminating outliers based on Z-score removed one announcement occurrence from the sample, leaving 59 firms for further study.

4.1.2 Announcement Effect

The announcement effect of the seasoned equity offering is for the remainder of the paper defined as the cumulative abnormal return from one day before the announcement to three days after, CAR(-1,+3). This range was determined by selecting the most significant CAR after testing five different cumulative average return ranges.

	Mean	Std. Deviation	P-value
CAR (-15,+15)	-0,07	0,35	0,06883
CAR (-10,+10)	-0,08	0,25	0,00603
CAR (-5,+5)	-0,09	0,17	0,00002
CAR(-1,+3)	-0,10	0,15	0,00000
CAR(0,+1)	-0,04	0,08	0,00017
Announcement	-0,03	0,07	0,00030

Table 2: CAR window means and significance.

It can be seen above that the mean abnormal returns become more negative as the CAR windows close in on the announcement date. The CAR used for the study, CAR(-1,+3), has the most negative mean abnormal return, -.10, and the most significant abnormal returns.

The values for the announcement effects can be found in Appendix II, and a graphical representation of the abnormal return for each announcement occurrence can be found in Appendix III. Announcement effects may also be referred to as only "abnormal returns."

Two outlier firms, based on CARs, were removed from the sample, leaving a sample of 57 firms for further study. A list of the final 57 companies included in the study can be found in Appendix II.

4.2 Results - Part 1

4.2.1 A Quick Glance at the Data

By looking first at the basic characteristics of the data, a general idea of the relationship between the health of a company and the announcement effect can be formed. Below is a simple scatter plot of the 57 companies used in the analysis based on their abnormal returns and their Z-score.

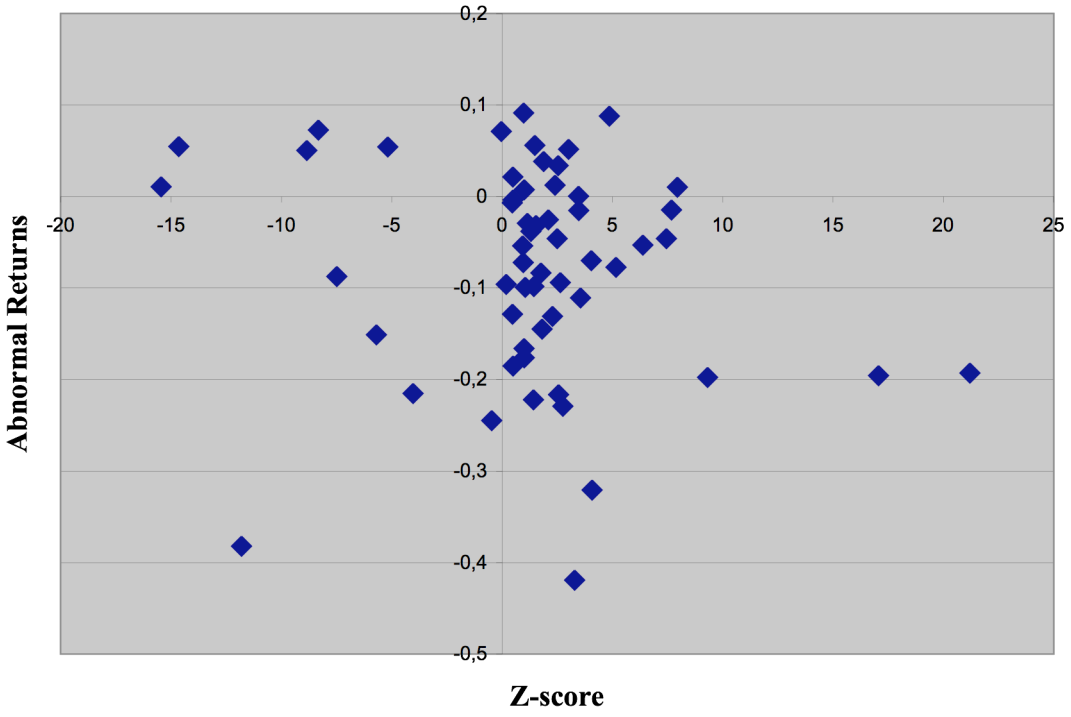

Figure 4: Scatter plot with each occurrence's abnormal return and Z-score.

From this simple representation of the data, it is unclear if there is a relationship between the two measures, but it looks highly unlikely that there is any strong relationship.

In addition, a simple measure of the correlation between the two variables reveals a very weak correlation of -.15. The negative correlation suggests that an increase in Z-score, i.e. company health, results in a decrease in abnormal returns. This result is contrary to the original hypothesis.

4.2.2 Comparison of Top and Bottom Groups

The next step of the study is to test for a significant difference between the mean cumulative abnormal return of the top ten healthiest companies and the bottom ten companies using the DeLong (2001) comparison t-statistic. In Appendix II, the top and bottom companies are marked in the list of firms. The results of this test can be seen below:

	Mean Top	P-value Top	Mean Bottom	P-value Bottom	Mean Difference	P-value
CAR(-1,+3)	-0,12	0,01	-0,08	0,05	0,04	0,31

Table 3: Comparison statistic results for top and bottom firms.

The abnormal returns for both the top and the bottom companies are significant at the 95% level and negative, as they should be based on theory. It should be noted that, as discussed in the section on event study, this type of significance testing is not necessarily appropriate for this sample as there is clustering in the data. This is ignored since the significance test of the abnormal returns is not of major importance to the study, and the abnormal returns are used in the comparison testing.

The comparison t-statistic is calculated as given by DeLong (2001) and as mentioned in section 3.3.1. The result of this test, as seen in the p-value of .31, is not significant at the 95% level. Therefore, the null hypothesis that the difference in mean abnormal returns is zero cannot be rejected. In other words, the top ten healthiest companies do not have a mean abnormal return significantly different from the mean abnormal returns of the ten least healthy companies.

It is also important to note that, contrary to the original hypothesis, the mean announcement effect for the top ten firms is actually more negative than the mean for the bottom ten firms. The mean abnormal return for the ten healthiest firms is -.12 and the mean for the bottom ten firms is -.08. This is in agreement with the negative correlation between the two variables as discussed in the previous section. Because these results are in line with the previous findings and the next model, the results will be discussed collectively in section 4.5.

4.2.3 Restricted Regression Analysis

The linear OLS regression is run in order to obtain further understanding of the relationship between announcement effects and company health. The results from the regression can be found below as well as in Appendix IV in more detail:

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0,07	0,02	-4,72	0,00
Z-score	0,00	0,00	-1,16	0,25
R Square	0,02			

Table 4: Restricted regression results.

The Z-score coefficient ends up negative, -.00297, and insignificant at the 95% level. This suggests that the null hypothesis, that the Z-score coefficient is significantly different from zero, cannot be rejected. The R2 of the regression is extremely low at .024. This suggests that the regression itself has little explanatory power.

In order to test that the assumptions of OLS hold, heteroskedasticity, serial correlation and normality of the residuals are tested for. Using White's test, the residuals are homoskedastic, which means the variance of the residuals is constant. Using the Breusch-Godfrey serial correlation test, it is found that there is no serial correlation in the residuals. Errors terms are significantly independent from one another, which is necessary in order to satisfy OLS assumptions. The Jarque-Bera test shows that the residuals are not normally distributed, which means that the parameters may be biased and the p-value may not be reliable. The cause of non-normality may be because the sample is only fifty-seven occurrences. Under the assumptions of the central limit

theorem, the analysis is continued assuming that normality of residuals is not a problem. Note that the unrestricted regression discussed later in the paper has normal residuals.

Below is the original scatter plot of the data with the line fit plot from the regression.

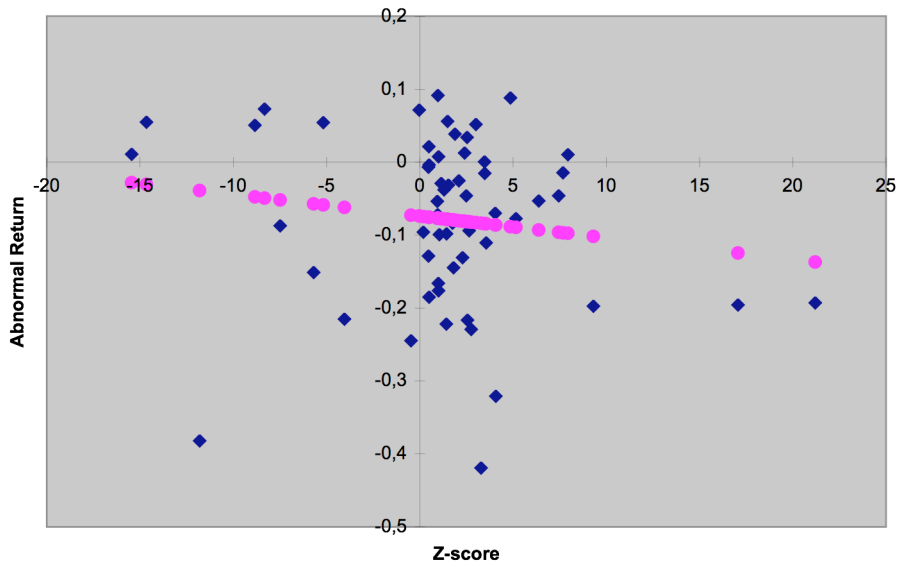

Figure 5: Scatter plot with regression line-fit.

The conclusion from the OLS regression is that there is no significant relationship between Z-score and abnormal returns.

The results of the discussed tests of relationship between announcement effect and company financial health all point to a lack of significant relationship. In addition, the relationship, although not significant, is always negative. This is contrary to the initial hypothesis.

The following section explains this relationship found in the above three analyses.

4.2.4 Interpretation of Results – Part 1

The original hypothesis for this study is based on an instinctive thought that investors of financially healthy companies would react less to the announcement of equity issues. This can be rationalized by the idea that investors of healthy companies can be more confident in the investments that would be used with the equity inflow, and

because of the quality of the company, the investment would most likely also be viewed as increasing shareholder value.

This hypothesis was not supported by the study, instead the opposite relationship was found, although it is insignificant. Possible explanations for the opposite relationship can be explored, ignoring its insignificance.

The main driving factor of the results could be investor risk aversion. It could be argued that healthy companies and companies of poor health attract different kinds of investors. It can be safe to assume that investors of healthy companies are more risk averse, and there are a number of impacts that this can have on the announcement effects for financially healthy companies. This assumption is based on the fact that healthy companies are probably viewed by investors as more stable and less likely to face financial distress, as the Z-score suggests it also means the company is out of risk for bankruptcy.

Investors who are more risk averse may be more sensitive to an announcement of seasoned equity offerings, especially during a crisis. The announcement may signal to investors that the firm is suffering from the impacts of crisis more than would be expected and more than is acceptable for risk averse investors who chose to invest in healthy companies. The change in capital structure signals that management is uncertain about future cash flows of the firm and the firm's stability. Straying from optimal leverage ratios and changing capital structure sends a negative signal to the market. Investors would expect a company with better health, i.e. with higher Z-score, to weather a crisis without the need for capital and without changing capital structure. On the contrary, investors who invest in a company of poor health would be less concerned about the firm's need for more equity because the investor was aware from the start the firm was a risky investment and may be close to financial distress. Therefore, investors of healthy companies react more negatively to the equity issue.

In connection with this idea, investors of healthy firms may expect the firm to issue new debt instead of equity when capital is needed. This is in line with pecking order theory mentioned earlier. This is a reasonable argument as healthy companies are more likely capable of taking on new debt. When the company instead decides to issue equity in such a situation, it may confuse investors and create a more negative announcement

effect. The opposite is true for investors of firm's with poor financial health. Those investors may be aware the company will have to issue new equity if they are in need because the firm will not have access to debt in such a case. This understanding may in fact cause a less negative announcement effect for poor health firms. This can be backed by the study done by Bayless and Chaplinsky (1991) on modified pecking order theory.

Finally, a more risk averse investor would most likely be weary of equity issues used for business investments. They would most likely prefer that the company continue its business practices as usual. Issuing equity for investment purposes may raise concern in investors, as they would be skeptical to the benefits of the investment, its possible differences from current business practices and its possible destabilizing effect on the firm. Investors for poor health companies, with a higher tolerance for risk, may view the announcement as less negative because they are not basing their investment on expected stability. Instead, a new business venture for a poor health company may be looked upon positively as it may help improve the business for a poor firm. Although, this may be less relevant during times of crisis when equity issues are more likely to be necessary because of a need for capital and lack of access to debt capital markets.

In addition, more risk averse investors may be more sensitive to some of the other theoretical arguments mentioned in section 2.2.1. They may be more sensitive to management's ownership in a firm, relating back to signaling theory and agency theory. It may also be that investors of healthy companies are more aware of adverse selection costs and may react more negatively when they feel that management is issuing equity because the firm is overvalued. However, this is probably not relevant to this sample as it is assumed that the equity issues are not made during crisis because of overvaluation but due to a need for capital.

In conclusion, it can be reasonable that investors of companies with good financial health react more negatively to seasoned equity offerings because of risk aversion. On the contrary, investors of less healthy companies may be less sensitive and more tolerant of the risk inherent in the company, and therefore react less negatively to the announcement. This can explain the negative relationship found in the study.

It is important to remember that the relationship, while negative, also is insignificant. Though the above theories of risk averse investors may have an effect on abnormal returns as suggested when assuming they are significant, the insignificance of the results may suggest something else entirely. It is possible that the theories about announcement effects, i.e. signaling theory, agency theory, adverse selection theory, so strongly drive the abnormal returns, that an investors' knowledge and belief of company health prior to the signal are insignificant and do not affect abnormal returns. Instead, investors' decisions are less affected by their own beliefs of the company's financial health, based on measures like Altman's Z-score, and are more affected by the signals conveyed to the market when an equity offering is announced.

Another important factor, which is addressed in the next section of the study, is the restrictiveness and narrowness of Altman's Z-score. The insignificance of the Z-score in the previous tests may not mean that measures of company health are not significant to announcement effects but that only some of the variables included in Z-score affect abnormal returns. Removing the restrictions on the Z-score model and using the variables as independent variables can highlight the importance of each measure separately.

4.3 Results - Part 2

4.3.1 Unrestricted Regression Analysis

The final model that is tested and presented is an unrestricted OLS regression using the variables from Altman's Z-score without restricting their coefficients according to his model. A summary of the results of the unrestricted regression can be found below:

	Coefficients	Standard Error	t Stat	P-value
Intercept	-0,08	0,02	-4,24	0,00
X1	0,14	0,08	1,90	0,06
X2	0,00	0,02	0,25	0,80
X3	0,00	0,13	-0,01	0,99
X4	-0,01	0,00	-2,29	0,03
R Square	0,11			

Table 5: Unrestricted regression results.

At the 90% confidence level, this regression yields three significant variables: the intercept and the X1 and X4 variables from the Altman Z-score calculation. The R-squared value, .11, is higher than the R-squared of the restricted regression, which suggests that this model has more explanatory power than the original restricted model.

The X1 variable, working capital divided by total assets, has a positive coefficient, .14. Therefore an increase in the X1 variable will make the announcement effect less negative. Large X1s influence investors to react less negatively to announcements of equity offerings. This relationship will be interpreted in the following section.

The X4 variable, book value of equity divided by book value of total liabilities, has a negative coefficient. This means that an increase in the X4 variable will make the announcement effect more negative. Larger X4s influence investors to react more negatively to announcements. This relationship will also be discussed in the following section.

The OLS assumptions of homoskedasticity, normality, and statistical independence of residuals hold for this model.

In addition to the models mentioned in the methodology section and discussed in the results portion, a number of other models were also run in order to further investigate possible relationships. Because the models do not reveal any significant additional information, they are discussed only briefly below.

Two models were run in order to test if there was any industry effect on the announcement effects. One model used the restricted Altman Z-score, and the second used the variables in unrestricted form. These regressions included dummy variables in order to determine any industry effects. The results for these regressions as well as the form of the models can be found in Appendix VI. Because of the relatively similar results, and the insignificance of all but one industry dummy, the results are not reported in this study in detail. A brief summary of the results follows.

At the 90% significance level, the model using the restricted Z-score results in no significant variables besides the intercept, which is a similar result to the original restricted regression. The model using unrestricted Z-score variables results in similar

results as the unrestricted model discussed above. At the 90% significance level, the X4 variable is significant, and the X1 variable's p-value lays just over .10, making it insignificant. However, the intercept is no longer significant. None of the industry dummy variables are significant. The conclusion being that abnormal returns do not have significant industry effects.

Two additional models were run in order to test if there is an effect on the abnormal returns from the year the announcement was made, 2008 or 2009. Similar to above, two models were run: one with the restricted Z-score and the second with unrestricted Altman's Z-score variables. The results and form of the models can be found in Appendix VII. Using a 90% significance level, the year dummy is insignificant in both models. In addition, only the intercept is significant when using the restricted Z-score. For the unrestricted variables, both X1 and X4 are significant using a 95% significance level.

4.3.2 Interpretation of Results – Part 2

The results of the unrestricted model show that the X1 and X4 variables from the Altman Z-score have significant influence on the announcement effects of a seasoned equity offering.

The X1 variable is a measure of the firm's liquidity. When a firm is highly liquid, it means that under financial distress or bankruptcy investors can access capital more easily through asset sales. In such a case, investors have a larger probability to recover some of their investment even if the firm goes bankrupt. The more liquid the firm, the higher the chance investors will receive a payment after creditors have been paid. It is reasonable then that an increase in the firm's liquidity, measured by X1, will result in less negative abnormal returns. Investors are less sensitive to the signals sent by an equity issue if they also feel like their investment is more likely to be repaid even in the event of bankruptcy. Liquid firms are a less risky investment than highly illiquid firms. Investors will be less concerned about the risk implied by the equity issue when they can feel more secure because of a firms relatively high liquidity. On the contrary, investors of troubled and more illiquid firms would react more negatively to the equity issue announcement.

The X4 variable from Altman's Z-score is a measure for firm insolvency. Investors of a firm with a high X4, with large amounts of equity, would expect the firm to use internal funds or issue debt when capital is needed. This has to do with the pecking order theory discussed previously in the paper. When a firm that is considered to be healthy and solvent by investors issues equity, it signals that it has poor access to the debt markets and the outlook of future cash flows is poor. Issuing equity in this case is contradictory to investors' expectations and, according to modified pecking order theory (Bayless & Chaplinsky 1990), will result in more negative abnormal returns compared to the case when investors expect the firm to issue equity instead of debt. Because the decision of the firm to issue equity is not in line with investors' expectations as the X4 variable increases, the reaction of investors is more extreme the larger the X4 becomes. Thus it is reasonable that an increase in the solvency measure will cause more negative abnormal returns.

Therefore it can be concluded that, using the unrestricted model, liquidity of the firm and insolvency of the firm both have a significant impact on investors' reactions to an equity offering.

5 Conclusion

The study reveals that investors' beliefs of a firm's financial health, quantitatively measured by Altman's Z-score, have no significant impact on the announcement effects of seasoned equity offerings. In addition, there is no significant difference between the announcement effects experienced by financially healthy firms and those experienced by unhealthy firms. The conclusion, which can be drawn from this result, is that investors' knowledge about the financial health of the firm has no effect on their negative response to the announcement. Instead it is likely that the negative signals sent to the market due to the announcement are the drivers of decreasing stock prices due to announcements of seasoned equity offerings. Announcement effects are instead most likely driven by, for example, adverse selection costs, agency costs, and lowered confidence due to changes in capital structure.

In addition, the relationship between announcement effects and a company's financial health, although insignificant, is negative. This is contrary to the original hypothesis that investors' of healthy firms would react less to announcement effects, as they would feel confident in the firm's use of capital and its ability to increase shareholder wealth. Ignoring the resulting insignificance, the negative correlation between announcement effects and company health can be explained by more risk averse investment behaviors of investors of healthy firms. More risk averse investors may be attracted to firms with better financial heath, as they are further from financial distress and more stable. Therefore, investors of healthy firms who are more risk averse may be more sensitive to the announcement.

The study also suggests that the liquidity of the firm and the insolvency of the firm play a significant role in investors' reactions to an announcement of an equity offering. The more liquid a firm is, the less investors react to the negative signaling of the equity offering. Therefore, increases in liquidity will make the announcement effects less negative. In addition, the greater the solvency of the firm, book value of equity over book value of total debt, the more the market will react to an announcement. This is because investors of highly equity-financed firms would be less likely to expect equity issues and

instead expect the firm to take on debt. The further the firm's actions are from investors' expectations, the more negative the announcement effect.

For successive analysis, a larger sample size, expanding the time frame of the sample and the number of firms, may be used to continue testing for significant impacts of Z-score on announcements effects. Adding analysis on further countries or cross sectional country studies may also result in additional information.

In addition, it would be beneficial for further studies, to analyze other measures of company health or additional financial measures impact on announcement effects. As Altman's Z-score is a relatively narrow variable, more expansive measures could be used to analyze the relationship of investors' beliefs in company health and announcement effects. Consideration of investor protection through bankruptcy laws may also reveal how investors' reactions to announcement effects of company health may become more or less significant.

In order to further investigate the suggestion that announcement effects are driven by the signals sent to the market when equity issues are announced, it would be suggested that quantitative measures of signaling, i.e. adverse selection costs or agency costs, would be tested for significant effects on abnormal returns. A study like this would be challenging because proxies for these costs would be difficult to quantify.

The results of this thesis could be used to conduct further analysis on the importance of company health measures and announcement effects by comparing its importance during crisis and during expansion.

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Appendix

I: Firms' Z-score categorized by zone of discrimination.

	Industry	Company	Z-score
	Distress Zone		
1	Healthcare	La Jolla Pharmaceutical Co *	-26,27
2	Healthcare	Sequenom Inc	-15,45
3	Healthcare	InterMune Inc	-14,65
4	Cyclical	Sirius Satellite Radio Inc	-11,81
5	Healthcare	Vertex Pharmaceuticals Inc	-8,85
6	Healthcare	Incyte Corp	-8,33
7	Healthcare	HealthSouth Corp	-7,49
8	Healthcare	Allos Therapeutics Inc	-5,69
9	Healthcare	Vertex Pharmaceuticals Inc	-5,18
10	Healthcare	Acorda Therapeutics Inc	-4,04
11	Energy	Goodrich Petroleum Corp	-0,48
12	Basic Materials	Century Aluminum Co	-0,04
13	Healthcare	Illumina Inc	0,18
14	Energy	Petrohawk Energy Corp	0,46
15	Energy	Quest Resource Corp	0,47
16	Utilities	Spectra Energy Corp	0,49
17	Technology	Solera Holdings Inc	0,50
18	Technology	Solera Holdings Inc	0,50
19	Cyclical	Las Vegas Sands Corp	0,76
20	Telecommunications Services	Hughes Communications Inc	0,94
21	Energy	Petrohawk Energy Corp	0,96
22	Energy	Cano Petroleum Inc	0,97
23	Basic Materials	Minefinders Corp Ltd	0,99
24	Utilities	Pepco Holdings Inc	1,00
25	Utilities	Central Vermont Public Service Corp	1,00
26	Technology	Nuance Communications Inc	1,04
	Grey Zone		
27	Utilities	SCANA Corp	1,14
28	Cyclical	Burger King Holdings Inc	1,30
29	Energy	GMX Resources Inc	1,42
30	Energy	Chesapeake Energy Corp	1,43
31	Basic Materials	Innophos Holdings Inc	1,48
32	Technology	INX Inc	1,53
33	Basic Materials	Newmont Mining Corp	1,76
34	Basic Materials	Jaguar Mining Inc	1,81
35	Basic Materials	Rockwood Holdings Inc	1,88
36	Energy	Whiting Petroleum Corp	2,09
37	Cyclical	Smith & Wesson Holding Corp	2,29
38	Non Cyclical	Central European Distribution Corp.	2,40
39	Healthcare	NATUS MEDICAL INC. (CA) (USA	2,49
40	Basic Materials	Kinross Gold Corp	2,54
41	Energy	XTO Energy Inc	2,56
	Safe Zone		
42	Healthcare	Hanger Orthopedic Group Inc	2,64
43	Energy	Massey Energy Co	2,75
44	Basic Materials	Silver Wheaton Corp	3,01
45	Non Cyclical	Tyson Foods Inc.	3,28
46	Cyclical	Fleetwood Enterprises Inc	3,47
47	Technology	LDK Solar Co Ltd	3,48
48	Non Cyclical	Ecolab Inc	3,55
49	Technology	China Sunergy Co Ltd	4,04
50	Technology	Ciber Inc	4,08
51	Technology	Canadian Solar Inc	4,86
52	Healthcare	Luminex Corp	5,16
53	Basic Materials	Hecla Mining Co	6,37
54	Basic Materials	Nucor Corp	7,44
55	Healthcare	Abiomed Inc	7,67
56	Technology	Energy Conversion Devices Inc	7,94
57	Basic Materials	Great Basin Gold Ltd	9,31
58	Healthcare	Medis Technologies Ltd	10,62
59	Healthcare	Geron Corp	17,05
60	Cyclical	VisionChina Media Inc	21,20

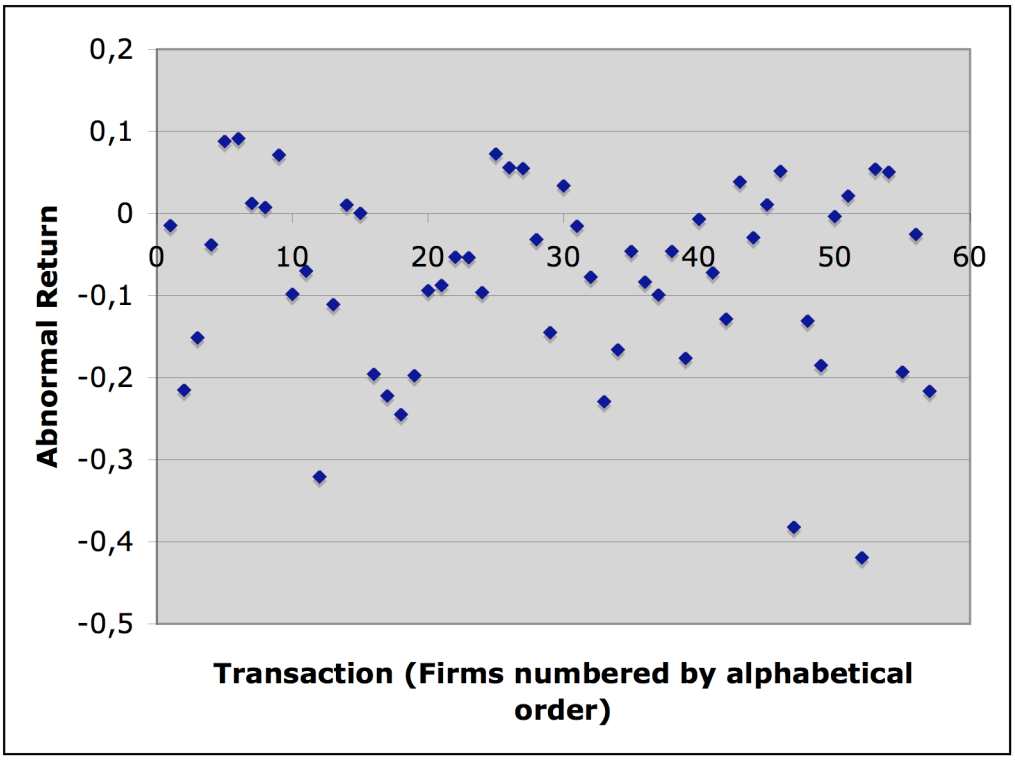
* Outlier

II: Abnormal returns and Z-score for each firm.

Company	Industry	Abnormal Returns	Z-Score
Abiomed Inc**	Healthcare	-0,0146	7,6711
Acorda Therapeutics Inc*	Healthcare	-0,2150	-4,0380
Allos Therapeutics Inc*	Healthcare	-0,1510	-5,6939
Burger King Holdings Inc	Cyclical	-0,0379	1,3031
Canadian Solar Inc**	Technology	0,0880	4,8577
Cano Petroleum Inc	Energy	0,0915	0,9725
Central European Distribution Corp.	Non Cyclical	0,0126	2,4000
Central Vermont Public Service Corp	Utilities	0,0077	1,0012
Century Aluminum Co	Basic Materials	0,0714	-0,0377
Chesapeake Energy Corp	Energy	-0,0981	1,4341
China Sunergy Co Ltd	Technology	-0,0699	4,0397
Ciber Inc**	Technology	-0,3207	4,0767
Ecolab Inc	Non Cyclical	-0,1107	3,5526
Energy Conversion Devices Inc**	Technology	0,0104	7,9413
Fleetwood Enterprises Inc	Cyclical	0,0006	3,4684
Geron Corp **	Healthcare	-0,1955	17,0541
GMX Resources Inc	Energy	-0,2220	1,4222
Goodrich Petroleum Corp*	Energy	-0,2448	-0,4755
Great Basin Gold Ltd**	Basic Materials	-0,1974	9,3093
Hanger Orthopedic Group Inc	Healthcare	-0,0938	2,6402
HealthSouth Corp*	Healthcare	-0,0872	-7,4941
Hecla Mining Co**	Basic Materials	-0,0530	6,3742
Hughes Communications Inc	Telecommunications Services	-0,0537	0,9356
Illumina Inc	Healthcare	-0,0959	0,1848
Incyte Corp*	Healthcare	0,0728	-8,3253
Innophos Holdings Inc	Basic Materials	0,0560	1,4824
InterMune Inc*	Healthcare	0,0548	-14,6537
INX Inc	Technology	-0,0314	1,5346
Jaguar Mining Inc	Basic Materials	-0,1447	1,8114
Kinross Gold Corp	Basic Materials	0,0339	2,5372
LDK Solar Co Ltd	Technology	-0,0152	3,4765
Luminex Corp**	Healthcare	-0,0772	5,1582
Massey Energy Co	Energy	-0,2291	2,7515
Minefinders Corp Ltd	Basic Materials	-0,1660	0,9946
NATUS MEDICAL INC. (CA) (USA	Healthcare	-0,0459	2,4920
Newmont Mining Corp	Basic Materials	-0,0834	1,7564
Nuance Communications Inc	Technology	-0,0992	1,0431
Nucor Corp**	Basic Materials	-0,0459	7,4435
Pepco Holdings Inc	Utilities	-0,1761	0,9992
Petrohawk Energy Corp	Energy	-0,0068	0,4577
Petrohawk Energy Corp	Energy	-0,0720	0,9576
Quest Resource Corp	Energy	-0,1285	0,4679
Rockwood Holdings Inc	Basic Materials	0,0385	1,8836
SCANA Corp	Utilities	-0,0291	1,1425
Sequenom Inc*	Healthcare	0,0109	-15,4478
Silver Wheaton Corp	Basic Materials	0,0517	3,0066
Sirius Satellite Radio Inc*	Cyclical	-0,3819	-11,8087
Smith & Wesson Holding Corp	Cyclical	-0,1307	2,2855
Solera Holdings Inc	Technology	-0,1850	0,4963
Solera Holdings Inc	Technology	-0,0036	0,4963
Spectra Energy Corp	Utilities	0,0214	0,4856
Tyson Foods Inc.	Non Cyclical	-0,4191	3,2843
Vertex Pharmaceuticals Inc*	Healthcare	0,0505	-8,8483
Vertex Pharmaceuticals Inc*	Healthcare	0,0544	-5,1765
VisionChina Media Inc**	Cyclical	-0,1929	21,2015
Whiting Petroleum Corp	Energy	-0,0253	2,0915
XTO Energy Inc	Energy	-0,2164	2,5565

* Bottom 10 Z-score
** Top 10 Z-score

III: Abnormal returns for each announcement occurrence.



IV: Restricted Regression

Regression with form:

$$CAR_i(-1,+3) = \alpha + \beta Z_i + \varepsilon$$

Regression Statistics	
Multiple R	0,1543
R Square	0,0238
Adjusted R Square	0,0061
Standard Error	0,1159
Observations	57

Jarque-Bera	10,1279
Probability	0,0063
White P-value	0,8601
Breusch-Godfrey P-value	0,5069

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0,0180	0,0180	1,3421	0,2517
Residual	55	0,7388	0,0134		
Total	56	0,7569			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0,0741	0,0157	-4,7195	0,0000
Z-score	-0,0030	0,0026	-1,1585	0,2517

V: Unrestricted Regression

Regression with form:

$$CAR_i(-1,+3) = \alpha + \beta_1 X1_i + \beta_2 X2_i + \beta_3 X3_i + \beta_4 X4_i + \varepsilon$$

Regression Statistics	
Multiple R	0,3340
R Square	0,1116
Adjusted R Square	0,0432
Standard Error	0,1137
Observations	57

Jarque-Bera	4,9411
Probability	0,0845
White P-value	0,2507
Breusch-Godfrey P-value	0,3375

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	0,0845	0,0211	1,6327	0,1800
Residual	52	0,6724	0,0129		
Total	56	0,7569			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0,0839	0,0198	-4,2444	0,0001
X1	0,1429	0,0754	1,8963	0,0635
X2	0,0047	0,0187	0,2489	0,8044
X3	-0,0017	0,1275	-0,0133	0,9895
X4	-0,0105	0,0046	-2,2853	0,0264

VI: Regressions with Industry Dummy

Restricted regression with form:

$$CAR_i(-1,+3) = \alpha + \beta Z_i + \gamma_1 BM_i + \gamma_2 Tech_i + \gamma_3 Tele_3 + \gamma_4 Non_i + \gamma_5 Nrg_i + \gamma_6 Util_i + \gamma_7 Cyc_i + \varepsilon$$

Where BM_i, $Tech_i$, $Tele_i$, Non_i, Nrg_i, $Util_i$, and Cyc_i are industry dummy variables for basic materials, technology, tele communications, non-cyclical, energy, utility, and cyclical industries respectively. The effect of the health care industry is found in the error term together with the noise.

Regression Statistics	
Multiple R	0,3774
R Square	0,1425
Adjusted R Square	-0,0005
Standard Error	0,1163
Observations	57

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	8	0,1078	0,0135	0,9967	0,4508
Residual	48	0,6491	0,0135		
Total	56	0,7569			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0,0586	0,0318	-1,8424	0,0716
Basic Materials	0,0272	0,0496	0,5495	0,5852
Technology	-0,0030	0,0521	-0,0584	0,9537
Telecom	0,0073	0,1207	0,0605	0,9520
Non-Cyclical	-0,1059	0,0756	-1,4010	0,1676
Energy	-0,0533	0,0493	-1,0820	0,2847
Utilities	0,0169	0,0666	0,2542	0,8004
Cyclical	-0,0815	0,0627	-1,3009	0,1995
Z score	-0,0026	0,0028	-0,9168	0,3638

Unrestricted regression with form:

$$CAR_i(-1,+3) = \alpha + \beta_1 X1_i + \beta_2 X2_i + \beta_3 X3_i + \beta_4 X4_i + \gamma_1 BM_i +$$
$$+\gamma_2 Tech_i + \gamma_3 Tele_3 + \gamma_4 Non_i + \gamma_5 Nrg_i + \gamma_6 Util_i + \gamma_7 Cyc_i + \varepsilon$$

Regression Statistics	
Multiple R	0,4760
R Square	0,2266
Adjusted R Square	0,0375
Standard Error	0,1141
Observations	57

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	11	0,1715	0,0156	1,1986	0,3155
Residual	45	0,5854	0,0130		
Total	56	0,7569			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0,0668	0,0551	-1,2110	0,2322
X1	0,1406	0,0850	1,6555	0,1048
X2	0,0070	0,0201	0,3460	0,7310
X3	0,0152	0,1306	0,1162	0,9080
X4	-0,0107	0,0047	-2,2749	0,0277
Basic Materials	0,0316	0,0608	0,5200	0,6056
Technology	-0,0183	0,0622	-0,2951	0,7692
Telecom	-0,0067	0,1247	-0,0541	0,9571
Non-Cyclical	-0,1143	0,0866	-1,3187	0,1939
Energy	-0,0402	0,0670	-0,5994	0,5519
Utilities	0,0327	0,0820	0,3986	0,6920
Cyclical	-0,0741	0,0694	-1,0674	0,2915

VII: Regressions with Year Dummy

Restricted regression with form:

$$CAR_i(-1,+3) = \alpha + \beta Z_i + \gamma Y09_i + \varepsilon$$

Where Y09 is a dummy variable representing announcements that take place in 2009.

Regression Statistics	
Multiple R	0,1714
R Square	0,0294
Adjusted R Square	-0,0066
Standard Error	0,1166
Observations	57

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	0,0222	0,0111	0,8168	0,4472
Residual	54	0,7347	0,0136		
Total	56	0,7569			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0,0784	0,0176	-4,4499	0,0000
Z-score	-0,0030	0,0026	-1,1791	0,2435
Year Dummy	0,0211	0,0379	0,5553	0,5810

Unrestricted regression with form:

$$CAR_i(-1,+3) = \alpha + \beta_1 X1_i + \beta_2 X2_i + \beta_3 X3_i + \beta_4 X4_i + \gamma Y09_i + \varepsilon$$

Regression Statistics	
Multiple R	0,3733
R Square	0,1394
Adjusted R Square	0,0550
Standard Error	0,1130
Observations	57

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	0,1055	0,0211	1,6518	0,1633
Residual	51	0,6514	0,0128		
Total	56	0,7569			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0,0951	0,0215	-4,4240	0,0001
Year Dummy	0,0507	0,0395	1,2834	0,2051
X1	0,1656	0,0769	2,1517	0,0362
X2	0,0037	0,0186	0,1985	0,8434
X3	0,0334	0,1297	0,2575	0,7978
X4	-0,0121	0,0047	-2,5609	0,0134