Investor's distaste for risk

The effect of company performance on publication policy

Master thesis

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Abstract

In the scientific literature the Net Present Value method is shown to be one of the most suitable ways of determining a company's value. Within NPV calculations, the riskiness of the investment plays a big role; the more risky an investment is, the less value it has to an investor.

This paper examines the effect of a company's performance on its publication policy with regard to its risk management practices. It can be expected that, when the value of company stocks is measured by the NPV method, the perceived riskiness of the company can have a big positive or negative effect on the share prices. As share prices are of great importance to investors and thus to management, it is expected that the company will try to maintain an image of stability and low risk to maintain high share values. This paper tries to quantify the effect of a company's financial performance on risk management publication policy.

Data is collected from two periods: one before the credit crisis of 2007-2010, and one period during the crisis. By comparing the effect of performance on risk management publication between these periods, the hypothesis is be tested that during bad economical times it is more important to maintain an image of stability. Three variables are used to proxy for publications: the amount of times "risk" is found in the company's annual report; the percentage of the annual report devoted to risk management and the number of publications of the company about its risk management.

Results found that the size of the company has by far the biggest influence on company publications, followed by Tobin's Q, Profit Margin and P/E ratio. Only Tobin's Q is significant, but all variables do have influence and as expected are negatively related with publications. There exists no difference in publications between the periods 2005-2006 and 2007-2008, of which the last two years were the years of the Credit Crisis. Although the crisis was expected to influence publications, it did not.

Contents

Preface

This Master thesis is my final work after more than 4 years of studying at the Vrije Universiteit Amsterdam, first as a Bachelor of Science in economics, followed by my current Master of Science in Business Administration.

I would like to thank Dr. Gunseli Tűmer-Alkan, my supervisor for the thesis, for the serious and helpful comments in finishing the thesis. Second, of course, Jansje Bosma, with whom I have spent a lot of days together working together on our thesis's. She kept the energy in the process, and made the times working on the university very enjoyable.

At last I think of Ilias Benjeddi and Melike Almaz, with whom I have worked on a number of group assignments, all with good results. Also with them I laid the foundation for this thesis in our paper for the research seminar (Almaz et al., 2010), which we finished with good results. Thanks for the serious work and your friendship!

To the reader: I hope you will enjoy reading this master's thesis. I hope I could make a (small) contribution to the field of Finance.

Sander van Luit

Emmeloord, June 2010

Introduction

"Risk comes from not knowing what you're doing"

- Warren Buffet

This paper is building on the research, started by the author and two other students, which was undertaken in the context of a research seminar in the Master Business Administration of the Vrije Universiteit Amsterdam (Almaz, Benjeddi & Van Luit, 2010). This research seminar paper focused on the relationship between publication on risk management and the performance of a company.

The hypothesis of their research was that when a company invests in more and better publication about its policy on risk management, this would generate trust, both within the company and to external stakeholders, which in turn would boost net income, profit margin, and share prices. Especially in the context of the current credit crisis, the concept of risk management has become very important for companies and for the financial sector in general. Before coming back to the results of this paper, more will be said about this crisis.

The Credit Crisis of 2007-2010

The credit crisis of 2007-2010 has been one of the biggest crises in the world economy. Some economists even say it is the biggest since the Great Depression (Reuters, 2009). By 2009, the name of the recession that followed this credit crisis already has been dubbed "The Great Recession" (Rampell, 2009)

One of the biggest features that makes it quite unique to this crisis lies within its origin: it has to do with risks.

This risk mainly had to do with the real estate sector. Cheap money and very low interest rates in the United States created a boom in the housing industry, characterized by instruments like Mortgage-Backed Securities (MBS's) and Collateral Debt Obligations (CDO's). Borrowers signed for heavy mortgages in the hope to refinance at better conditions. However, when interest rates rose, many borrowers became financially distressed, leading to a huge drop in the value of real estate and the related securities. Troubled banks, government bailouts, a heavy recession and on this moment danger of sovereign defaults in Europe can, as a consequence, all be attributed to a wrong estimation of mortgage default risk. Defaults were more prosperous and heavier than ever anticipated.

In more normal conditions, the risk of an investment (as well as company risk) is taken into account when pricing it. Higher risk-investments should be compensated for by higher returns on investment (ROI). The basis of this theory has been laid down in the Capital Asset Pricing Model (CAPM) (see e.g. Treynor 1961,1962; Sharpe 1964; Lintner 1965; Mossin 1966). The credit crisis has shown that company's shares heavily react to (perceived) risks of company's investments. This paper is taking a good look at the relationship between these.

Relevance of the research

As said before, the paper of Almaz et al. (2010) set out on a certain relationship between risk and performance. In their paper, the publication about risk management of a company was expected to benefit the company, thus being an independent variable, as the different performance measures were used as dependent variable. However, in their research they find a highly significant negative relationship between a company's performance in one year and the percentage of that year's annual report dedicated to its risk management policies. This means that when a company has a low profit margin, a small return on investment or a small P/E ratio, more pages will be dedicated to risk management policy. Possible explanation for this is that there exists a reversed cause-and-effect relationship. Companies could be seduced to comfort shareholders in their fear for risk. By showing that, despite bad results, the company engages in proper risk management, the price of shares could be held at a stable level.

This paper focuses on this expected negative impact of company performance on risk management publications, providing a more accurate research to the subject than the paper Almaz et al (2010) provide. Goal is to examine whether this relationship is as predicted, and if, and so how, this relationship changed during the years 2007-2008.

Structure of the paper

The rest of the paper is used to investigate the impact of firm performance on risk management publication. First, a review of the currently existing literature on the subject is given. After that, the methodology and data are worked out.

After this, the results of the study will be given together with an analysis, followed by a discussion in relation to the current knowledge about the subject. The paper will end with a conclusion and recommendations.

Literature review

Risk theory

The CAPM theory describes the immediate relationship between the risk of an investment and the required return. This is done by using an investment's Beta (β), which is the sensitivity of an investment's return to the return of the market. If β is 1, the investment is just as risky as the market as a whole. When the investments β is 2, both losses and profits will be twice as big compared to the market. Because an investor does not like risk, the relationship between the risk and the investments return can be graphed as follows:

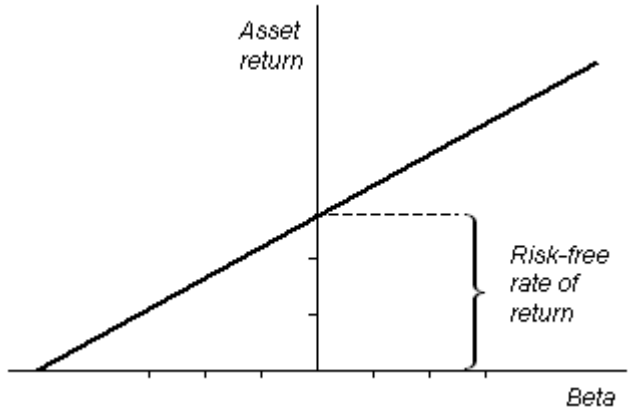

Figure 1. The relationship between risk and return. *(Taken from Wikipedia)*

When an investments risk (β) is equal to 0 (intersection with the vertical axis), the required return will be the same as the risk-free rate of return (often proxied by the return on U.S. government bonds). When the β is equal to 1, the return will be the risk-free rate of return plus the difference between the market return and the return on the risk-free asset. In formula form:

$$E(R_i) = R_f + \beta_i(E(R_m) - R_f)$$

Where $E(R_i)$ is the expected return on investment i, R_f is the risk-free rate of return, β_i is the beta of investment I and $E(R_m)$ is the expected return for the whole market.

From this theory, it can be deducted that a higher risk poses a higher demanded return, and thus this creates a relatively lower value of investments (as a compensation for the higher demanded return).

Another very important part of finance theory where risk plays a big role, is the Net Present Value method (NPV) to determine the value of an investment.

This method discounts the present and future cash flows of the company to a Net Present Value:

$$NPV = \sum_{t=1}^{N} \frac{CF_t}{(1+i)^t}$$

Where CF stands for the free cash flows of the company, t is the year index number and *i* stands for the firm's discount rate. This calculation can be done on a company basis, but also on the basis of a project and its characteristics.

The discount rate is defined as the rate of return of an average investment in the market with the same risk profile as the investment that is subject of the NPV method. Companies with a higher risk therefore will be discounted with a higher interest rate (which comes from the higher return as described in the Capital Asset Pricing Model).

From both the CAPM and NPV models, investors are risk averse; they are only willing to take on more risk when more return is given. When the actual risk or the supposed risk of a company or investment becomes higher, the demanded return also will rise, thereby lowering the value of the investment.

The importance of share value

Share prices have become a very important number used by both investors and managers to determine the success of a company. Therefore, it is worth taking into account the effect of a rise or decline in these share prices.

The price of a company's share represents the value which is attributed to the company (see e.g. Elton, Gruber & Gultekin, 1981 and Sloan, 1996). When referring to the NPV model of valuing investments, the value of a company share can be calculated by discounting all the future free cash flows with a certain discount factor. When a company will gain in its profits, future free cash flows will rise, thereby increasing the value of the investment. Thus, the price of a share represents the profitability of the company, and, most of all, the future expectations about performance. Furthermore, share prices are very important when determining to sell or buy. With rising share prices, current shareholders can gain money and thus the share price plays an important role.

Thus, the share price is of great importance to investors. But also for management, the share price has become more important the last decades. This is partly the effect of a big growth of the amount of

shares and share options in the compensation package of managers (see e.g. Yermack, 1995; Ofeck & Yermack, 2000).

The choice for share compensation and not mere cash remuneration, lies in the fact that the share price of a company can be used as a way of measuring profitability and, especially important, as a way of benchmarking vis-à-vis other companies in the same industry. In the light of NPV the value of a share is only calculated in respect to other companies with the same risk profile. When the subject company gains more profit while being just as risky, the NPV value of the company, and thus its share price will rise. By including shares and share options in compensation packages, an incentive is built in which is expected to pressure the manager in outperforming competitors, increasing the value of the firm, thus benefiting all shareholders.

Another reason to pay out in shares lies in the field of Agency Theory; payout in shares aligns the interests of the manager (higher share price) with the interest of the company (higher value and profits, thus leading to higher share prices). See e.g. Jensen & Meckling (1976) and Fama (1980).

This importance of share prices for both managers themselves, as well as the effect it has on employees (by aligning interests, which creates more value), might be a very important incentive for managers to set up a professional risk management department to stabilize incomes and thus increase share prices.

Maybe even more important than the risk management process itself, is to actively *show* investors and other stakeholders that the company is professionally managing its risk and thus is a stable investment. This can increase the price of shares and be advantageous to the managers. However, other aspects of risk management also have to be taken into account.

Other reasons to engage in risk management

Besides the factor of risk determining the price of shares, other reasons exist for risk management. These reasons have more to do with influencing the net income of the company, thereby changing the values of NPV calculations in a different way

According to the Miller-Modigliani theorem (Modigliani & Miller, 1958) the structure of the company has no effect on the cash flows and thus the value of the company, even when more debt is taken onto the balance (see also Stiglitz, 1974). However, according to the Pecking Order theory (see e.g. Myers & Majluf, 1984; Myers 1984), taking on more debt can be advantageous to the firm. There is a higher tax deductibility of the interest paid, debt can be cheaper than issuing equity, and by issuing debt the current shareholders (of which management can be part) profit by taking a call option in the company's profits, by shifting risks to the debt holder.

Another reason why the Miller-Modigliani theorem is not always valid is because a company can face the risk of default; cash flows and profits are lowered or endangered when being in distress; and a company has a higher chance to come into distress with high leverage. Thus the structure of the company again does have an effect on the value of the company. This is one of the reasons to actively engage in risk management, to both gain the advantages of debt financing (lower costs; high tax deductibility, higher share prices due to a less risky company) and to minimize the disadvantages (lower chance on default and default costs).

Risk management also makes it possible that more accurate planning is put into place, which again can increase the net cash flows of the company. One very good example is lessening the expected tax liabilities of the company (see e.g Smith & Stulz, 1985; Ross, 1997). Furthermore, hedging can help firms plan for their capital needs and strategy (Lewent & Kearney, 1990), improve executive compensation contracts and help decision making in allocating capital.

Nocco and Stulz (2006) explain that enterprise risk management increases the market value of the company by hedging against adverse cash flows. The effect is that in hard economic times projects still can be executed, without making high costs to alter strategy. Furthermore, sometimes companies can hedge better than other parties, thereby creating value when keeping things in own hand. This last conclusion was also drawn by MacMinn (1987).

Bartram (2000) states that hedging could increase shareholder value by reducing agency costs, which eliminates underinvestment and asset substitution problems. Second, transaction costs are lowered by reducing bankruptcy risks. Third tax advantages come into play again.

All these are reasons to both engage in risk management and also to make sure that investors *know* the company's has a professional risk management department.

As said before, the value of shares is very important to managers. Therefore, from the literature as described above it can be expected that in times of lower share prices or other lower performance (which influences share prices), management has an incentive to comfort shareholders by assuring them that the company controls its risks, that it knows what it is doing, and that the company is a stable investment. Research by Gates (2006) hints at this advantage of communicating risk management policy towards rating agencies and shareholders.

This study investigates whether this hypothesis as drawn from earlier scientific work turns out to be true in the real world.

Methodology and data

In this paper, the aim is to determine whether a relationship exists between company performance and risk management publication. For this, linear regression is applied. By using different dependent and independent variables, these different variations can be researched, thereby increasing the robustness of results and contributing to a deeper understanding of various relations.

For clarity reasons, the year of company performance will be called year *t*, while the company is referred to as company *i*.

Hypothesis statement

To summarize the theories posed before, as well as to give the research a clear direction, a number of hypotheses is stated based on expectations from theory, which then can be tested so as they are rejected or not rejected. Also, these individual parts of the research can be referred to by using the hypotheses stated below.

H1: *The financial performance of a company has a significant negative impact on the amount of publications regarding the company's risk management*

H2: *This impact is stronger in the period 2007-2008, compared to the period 2005-2006.*

Sample data

This research not only tries to determine the nature of the relationship between the dependent and independent variables as presented above, but also takes into fact the reference period of the data.

As noted in the introduction, the credit crisis of 2007-2010 may have stressed companies to actively engage in risk management, or at least maintain an image of controlling the risks that are present within the company. Also, because the concept of risk management has become more well-known because of the crisis it is expected that in the period before the crisis the relationship between performance and risk management publication is different. Therefore two sample periods will be used to quantify this expected difference.

One period is the years *t* from 2005-2006, the other period is 2007-2008. The year 2009 is not taken into account because the year *t+1* is not ended yet; this could give a distorted view of effect on publications in year *t+1*. So, two 2-year periods are taken, giving 4 years in total.

Data is taken from Compustat, from the database "North America Annual updates – Fundamentals annual". For each year, the same 50 public companies will be researched, which are randomly chosen from this database. This gives a sample total of 100 per period, and 200 for the total period from 2005 to 2008.

For the data about number of publications, the database of Lexis Nexis also is used. Furthermore, annual reports of the companies are used to assess the information on risk management posed in these annual reports.

With regard to the data: in the general regression spanning all 4 years from 2005-2008, each year must yield an observation for the company. If this is not possible, the data is not taken into account. Furthermore a necessity is that the company ends its book year on December 31st of each year.

Dependent variables

The dependent variables act as proxies for the degree in which companies publicize about their risk management procedures and policies, or in how far they suggest such policies. Almaz et al (2010) already showed that the definition of risk management is a tricky one; no unanimous definition exists on which types of risk and what kind of policies are included. Therefore, several variables will be used as dependent variable.

Percentage of the annual report dedicated to risk management

The first dependent variable is defined by the percentage of the annual report of a company that is dedicated to emphasize the risk management policies conducted by the company. This percentage is expected to be related to the performance of that book year (*t*)

Use of the word "risk" in the annual report

The second dependent variable is also derived from Almaz et al. (2010). In their research, they used the number of times the word "risk" had been used in the annual report of the company. No significant relationship was found between this variable and firm performance, but in this research the variable will be tested again. To account for the number of pages in the report, the amount of words is divided by the number of pages to get the ratio words/page.

Amount of risk-related publications

The third dependent variable is a proxy for the external publications, in which the company itself presents information about risk management practices. A great care has to be taken in the fact that the company itself is informing about risk management, as to ensure that the publication is influenced by the company's publication policy. In research conducted by Almaz et al. (2010), no significant relationship was found between a company's performance and the amount of publications in *that same year* (*t*) about risk management. This paper however, shall study the publications brought out in the year *after* performance *(t+1).* Another difference is that this study only deals with company-induced information, not all information. Thus, this will serve as a second dependent variable.

Table 1. Overview of the dependent variables

Variable	**Definition**
$Perc_{i,t}$	Percentage of annual report of company *i* of year *t* dedicated to risk management
$Publ_{i,t+1}$	Amount of publications, induced by company *i* action, in the year *t+1* in Lexis Nexis related to the risk management of the company
$Words_{i,t}$	Number of times the word "risk" is found per page in company *i*'s annual report of year *t*

To avoid using long terms and symbols, these variables will hereafter be named Percentage, Publications and Words.

Independent variables

The independent variables are to be proxies for the performance of a company. Since different performance indicators exist, and not one is a favorite beforehand, several measures will be used

Return on Assets

Return on Assets is defined as net income divided by total assets. It deals with the efficiency in which assets (or investments) were used to generate profits. Also, when profits are comparably low to the investment, the firm's financial performance can be said to have been bad. The ratio essence of this performance indicator makes it possible to compare companies and thus profitability. ROA is calculated by dividing the profit of company *i* in year t by the total assets of company *i* at the end of year t.

Tobin's Q

Tobin's Q is defined as the total market value of equity plus the book value of debt divided by the book value of equity plus the book value of debt. In other words: market capitalization plus book value of debt divided by total assets.

This variable is a market indicator of firm profitability, both for the current year as the years to come. Because of the market-like properties inherent in the ratio, it is expected to be of great value to market parties and investors.

(see e.g. Huselid, 1995; Gerhardt & Milkovich, 1988; Roberts & Dowling, 2002 for other researchers using these variables)

Other variables besides Return on Assets and Tobin's Q have also been taken into account (Profit Margin, P/E ratio), but because of high expected collinearity these are not used in the first hand. However, the data for these variables is collected so when the analysis shows that the other variables are not significant or unusable, these can still be put into the regression.

Table 2. Overview of the independent variables

Variable	**Definition**
$ROA_{i,t}$	The ROA of company *i* in year *t*
$TobinsQ_{i,t}$	Tobin's Q of company *i* at the end of year *t*
$P/Eratio_{i,t}$	The price of company *i*'s share at the end of year *t* divided by the earnings per share of company *i* in year *t*
$ProfitMargin_{i,t}$	The net profit of company *i* in year *t* divided by the company's total revenues in year *t*

Control variables

To give a better indication as to the effect of the independent variables on the publication about risk management, control variables are added which can also explain changes in risk management publications.

A first approach has been a research on the Internet to find out whether compliance rules with regard to risk management has been changed during the years 2005-2008. This could have an effect on the amount of publication with regard to risk management. Most of the results had to do with risk management disclosure in the healthcare industry. However, some more information could be found.

In July 2009, the SEC has proposed new rules to force companies to give more disclosure as to its risk management practices (Business Insurance, 2009). Furthermore, of great importance for public companies is the Sarbanes-Oxley act of 2002, which imposes top-down risk assessment procedures. These are used to audit the internal control of the company. However, both policies do not have an immediate impact on possible differences in the way risk management is disclosed in the period of research.

Because little data was found about changes in rules with regard to risk management, the assumption is made that there has been no major change, and thus this can't be used as a control variable.

A second possible control variable has to do with the amount of risk management procedures present in a company. As Almaz et al. (2010) already posed, it is hard to define, identify and quantify a company's risk management. However, some less precise proxies could be used.

When a company engages in more (bank)debt, the risk of defaulting increases. Therefore, both the lender and the borrower can find great value in better risk management. Also, when the amount of debt increases this can also be enforced more easily by the lenders. The change in debt is therefore used as control variable for the existence of risk management, which can (or will) lead to more publication on risk management. Furthermore, to attract more debt at good terms, a company also should show an image of "being in control" to possible future lenders.

Another control variable which is used is the change in receivables. When a company sees a gain in accounts receivables on the balance sheet, the risk that part of this will not be received becomes bigger. Furthermore, less spare cash is left, so that unforeseen changes in revenues or costs can have a profound impact on the company. Therefore, more sophisticated risk management systems should be acquired or developed to stay in control. See e.g. Stulz (1995) for an example of the importance of risk management with regard to receivables.

The last control variable is the size of the company. The size of the company is expected to have a positive influence on the number of publications on risk management. This has a few reasons:

1. Bigger companies often deal with bigger risks, therefore having reasons to engage in risk management. Besides this, the company also has more money for a risk management department. This bigger risk management department will influence (or may be a necessity for) the number of publications.

   (see e.g. Bodnar, Hayt & Marston, 1998; Nance, Smith & Smithson, 1993; Dolde, 1993; Geczy, Minton & Schrand, 1997)

2. Big companies in general have more money to publicize, are expected to have more professional PR routines, and are of greater importance to the market, therefore expected to be of more interest to shareholders and therefore publishing more in general.

Table 3. Overview of control variables

Variable	Definition
$\Delta Debt_{i,t}$	The percentage yearly change between year *t-1* and *t* of the total debt of company *i* at the end of these years
$\Delta Receivables_{i,t}$	The percentage yearly change between year *t-1* and *t* of account receivables of company *i* at the end of these years
$TotalAssets_{i,t}$	The total value of assets of company *i* at the end of year *t*

Regression formula's

Initially, the relationship between the independent and dependent variables is studied by conducting a simple linear regression. The regression formulas in its general form is:

$$Dependent\ variable = \beta_0 + \beta_1 * IndependentVariable_{i,t} + \beta_2 * ControlVariable_{i,t} + \varepsilon_{i,t}$$

Where *t* is the reference year, *i* is the company, β_0 is the intercept, β_x is the variable coefficient, and ε is the residue. For both independent variables and the control variables multiple different variables are possible in one formula.

These formula's are studied both for all observations for both periods, as well as for both periods independently. Furthermore, the regression shows which of the different performance indicators, if any, have the most effect on publication policy.

An overview of the different models which will be composed is shown here:

Table 4. Overview of the different regression models.

#	Dependent	Independent	Control	Period
1a	$Perc_{i,t}$	$ROA_{i,t}$ + $TobinsQ_{i,t}$	$\Delta Debt_{i,t}$ + $\Delta Receivables_{i,t}$ + $TotalAssets_{i,t}$	2005-2006
1b	$Words_{i,t}$	$ROA_{i,t}$ + $TobinsQ_{i,t}$	$\Delta Debt_{i,t}$ + $\Delta Receivables_{i,t}$ + $TotalAssets_{i,t}$	2005-2006
1c	$Publ_{i,t+1}$	$ROA_{i,t}$ + $TobinsQ_{i,t}$	$\Delta Debt_{i,t}$ + $\Delta Receivables_{i,t}$ + $TotalAssets_{i,t}$	2005-2006
2a	$Perc_{i,t}$	$ROA_{i,t}$ + $TobinsQ_{i,t}$	$\Delta Debt_{i,t}$ + $\Delta Receivables_{i,t}$ + $TotalAssets_{i,t}$	2007-2008
2b	$Words_{i,t}$	$ROA_{i,t}$ + $TobinsQ_{i,t}$	$\Delta Debt_{i,t}$ + $\Delta Receivables_{i,t}$ + $TotalAssets_{i,t}$	2007-2008
2c	$Publ_{i,t+1}$	$ROA_{i,t}$ + $TobinsQ_{i,t}$	$\Delta Debt_{i,t}$ + $\Delta Receivables_{i,t}$ + $TotalAssets_{i,t}$	2007-2008
3a	$Perc_{i,t}$	$ROA_{i,t}$ + $TobinsQ_{i,t}$	$\Delta Debt_{i,t}$ + $\Delta Receivables_{i,t}$ + $TotalAssets_{i,t}$	2005-2008
3b	$Words_{i,t}$	$ROA_{i,t}$ + $TobinsQ_{i,t}$	$\Delta Debt_{i,t}$ + $\Delta Receivables_{i,t}$ + $TotalAssets_{i,t}$	2005-2008
3c	$Publ_{i,t+1}$	$ROA_{i,t}$ + $TobinsQ_{i,t}$	$\Delta Debt_{i,t}$ + $\Delta Receivables_{i,t}$ + $TotalAssets_{i,t}$	2005-2008

Choices in researching the dependent variables

To make clear some of the choices that are made to determine whether a publication of the company can be used in the study, the following summary of choices made is presented:

- Companies that have been taken over during the period were not taken into account.

Annual reports

- In the study annual reports are taken, which contain elements of the 10-K fillings. This means that these reports contain elements regarding the risks the company is facing, information about financial instruments and derivatives, and insurance. These are used for the dependent variables.
- If this data is not present in the annual report, a search is made for a separate "financial report", which often only contains the SEC 10-K filling. This one is then used.
- The number of pages devoted to risk management is counted in 0,5 pages. This because a more precise measure is difficult, and also because of the subjective perception of valuing the annual report's information on risk management.

LexisNexis

- In LexisNexis, a search is done by using the search term "company name" (as presented in the data from CompuStat, including "inc", "co" or "corp"), *and* "risk". Then these results are investigated. When a company also has an abbreviated name which is often used (e.g. AMD is

Advanced Micro Devices), this abbreviated name is not searched for again, both to maintain equality among observations and for practical reasons.

- When more than 200 results were presented, a further narrowing done is done by the search term “risk management”. This for practical (time) reasons.
- Different hits about the same publication event are equalized to 1 publication
- In case of e.g. medical and tobacco companies, which often face with risks in the area of the products they produce or deliver, these observations are not taken into account when not dealing with the company’s risk management as such.
- It is possible that publications about risk management were present, which were not found by the search term “risk”. However, for practical reasons, only the “risk” search term is used and investigated.
- One company (American International Group, AIG) was bailed out by government during the crisis and is therefore a special case. However, this sample *is* taken into the regression.

Results and analysis

In this chapter, the results of the research are presented. First a research will be done for correlation among variables. If variables are too much correlated, some of them will be omitted as to maintain unbiased results. After this the decriptives of variables are given, followed by the results of the regression, after which more analysis and regressions are presented. Afterwards the difference between the two periods of research are tested to see if hypothesis 2 can be rejected; the analysis ends with a glance at the assumptions necessary for linear regression.

Correlations

A table with correlations between the variables is shown. The period of reference is 2005-2008, so all observations are taken into account. Below the correlation the significance can be found. Correlations in bold are significant.

Table 5 Pearson correlations between variables

	$Perc_{i,t}$	$Words_{i,t}$	$Publ_{i,t+1}$	$ROA_{i,t}$	$TobinsQ_{i,t}$	$ProfitMargin_{i,t}$	$P/Eratio_{i,t}$	$\Delta Debt_{i,t}$	$\Delta Receivables_{i,t}$	$TotalAssets_{i,t}$
$Perc_{i,t}$	X									
$Words_{i,t}$	**0,371 ** 0,000**	X								
$Publ_{i,t+1}$	-0,085 0,231	**0,320 ** 0,000**	X							
$ROA_{i,t}$	-0,072 0,310	-0,061 0,395	-0,065 0,358	X						
$TobinsQ_{i,t}$	-0,013 0,851	-0,133 0,060	-0,091 0,198	**0,571 ** 0,000**	X					
$ProfitMargin_{i,t}$	-0,049 0,493	0,038 0,592	0,020 0,779	0,018 0,802	0,028 0,698	X				
$P/Eratio_{i,t}$	0,002 0,980	-0,066 0,350	0,007 0,926	-0,001 0,989	0,051 0,473	0,116 0,101	X			
$\Delta Debt_{i,t}$	0,011 0,878	-0,065 0,357	0,007 0,927	-0,006 0,936	-0,011 0,874	-0,014 0,843	-0,100 0,159	X		
$\Delta Receivables_{i,t}$	-0,019 0,788	-0,083 0,241	-0,005 0,940	0,046 0,522	0,064 0,369	-0,019 0,891	-0,064 0,366	**0,637 ** 0,000**	X	
$TotalAssets_{i,t}$	-0,014 0,846	**0,361 ** 0,000**	**0,566 ** 0,000**	-0,118 0,095	-0,126 0,076	0,008 0,913	-0,006 0,930	-0,040 0,574	-0,043 0,547	X

Legend: * = significant at 5%, ** = significant at 1%. Significance is two-tail tested.

Correlations between groups

Between the dependent variables, Words and Percentage are significantly correlated (1%), as might be expected. Also, Publications and Words are highly correlated (1%). However, Percentage and Publications are not.

Between the independent variables and the dependent variables, only Total Assets is correlated, both with Words and Publications (both at 1%). It is expected that this comes back in the results of the regression.

Among the independent variables, two are correlated; Tobin's Q and ROA. Because these are correlated at a significance of 1%, these two variables are not used together. When controlling for the other 3 possible control variables, these are not correlated significantly. Therefore ROA is omitted, and a choice of three explaining independent variables is made for the regression: Tobin's Q, Profit Margin and P/E ratio.

Between control variables, the Change in Receivables and Change in Debt are highly correlated at 1%. Therefore, the Change in Receivables is omitted; of the two it has the least correlation with the dependent variables, and therefore is deleted.

Descriptive Statistics

After two variables are omitted, the descriptives (Minimum, Mean, Maximum and Standard Deviation) are given for each variable in each period.

Table 6. Group statistic for the regression variables

	Period					
	2005-2006		**2007-2008**		**2005-2008**	
	Mean/Min /Max	**St. Dev.**	**Mean/Min /Max**	**St. Dev.**	**Mean/Min /Max**	**St. Dev.**
$Perc_{i,t}$	**0,066** / 0,008 / 0,204	0,035	**0,072** / 0,005 / 0,183	0,037	**0,069** / 0,005 / 0,204	0,037
$Words_{i,t}$	**0,617** / 0,161 / 2,410	0,421	**0,675** / 0,129 / 2,665	0,450	**0,646** / 0,129 / 2,665	0,436
$Publ_{i,t+1}$	**0,36** / 0 / 8	1,133	**0,43** / 0 / 10	1,402	**0,40** / 0 / 10	1,272
$TobinsQ_{i,t}$	**1,731** / 0,900 / 4,025	0,765	**1,486** / 0,467 / 4,361	0,770	**1,608** / 0,467 / 4,361	0,774
$ProfitMargin_{i,t}$	**-0,011** / -6,94 / 0,37	0,711	**0,109** / -1,10 / 0,72	0,184	**0,048** / -6,94 / 0,72	0,521
$P/Eratio_{i,t}$	**9,743** / -167,15 / 101,54	29,665	**14,582** / -45,94 / 40,85	0,770	**12,162** / -167,15 / 101,54	22,599
$\Delta Debt_{i,t}$	**0,216** / -0,41 / 7,56	0,853	**0,149** / -0,52 / 8,18	0,845	**0,182** / -0,52 / 8,18	0,847
$TotalAssets_{i,t}$	**34.720.207,38** / 28.194 / 979.414.000	130.700	**37.158.982,72** / 30.145 / 1060.505.000	137.600	**35.939.595,05** / 28.194 /1060.505.000	133.800

Total Assets are in thousands of dollars. N = 100 for the periods 2005-2006 and 2007-2008; N is 200 for the period 2005-2008. $Perc_{i,t}$, $ProfitMargin_{i,t}$, *and* $\Delta Debt_{i,t}$ *are measured in % / 100. (thus e.g. 0,2 is 20%).*

Linear regression

The result of the regression can be found in the table below; significant variables are in bold.

Table 7 Linear regression results

	Model								
	1a	**1b**	**1c**	**2a**	**2b**	**2c**	**3a**	**3b**	**3c**
Depen-dent	$Perc_{i,t}$	$Words_{i,t}$	$Pub-l_{i,t+1}$	$Perc_{i,t}$	$Words_{i,t}$	$Pub-l_{i,t+1}$	$Perc_{i,t}$	$Words_{i,t}$	$Publ_{i,t+1}$
Period	05-06	05-06	05-06	07-08	07-08	07-08	05-08	05-08	05-08
N	100	100	100	100	100	100	200	200	200
F-value	0,438 (0,821)	4,170 *** (0,002)	12,761 *** (0,000)	0,635 (0,674)	3,081 ** (0,013)	7,021 *** (0,000)	0,113 (0,989)	6,705 *** (0,000)	18,410 *** (0,000)
R^2	0,023	0,182	0,404	0,033	0,141	0,272	0,003	0,147	0,322
Adj. R^2	-0,029	0,138	0,373	-0,019	0,095	0,233	-0,023	0,125	0,304
Constant	**0,061 *** (0,000)**	**0,763 *** (0,000)**	0,147 (0,534)	**0,076 *** (0,000)**	**0,616 *** (0,000)**	0,261 (0,406)	**0,070 *** (0,000)**	**0,705 *** (0,000)**	0,239 (0,190)
β:									
$TobinsQ_{i,t}$	0,002 (0,706)	-0,087 (0,103)	0,147 (0,534)	-0,002 (0,700)	-0,012 (0,834)	-0,058 (0,721)	-0,001 (0,845)	-0,050 (0,190)	-0,035 (0,724)
$Profit-Margin_{i,t}$	-0,003 (0,545)	0,043 (0,441)	-0,001 (0,996)	-0,033 (0,138)	-0,076 (0,760)	-0,140 (0,845)	-0,003 (0,497)	0,038 (0,499)	0,037 (0,800)
$P/Eratio_{i,t}$	0,000 (0,999)	-0,002 (0,122)	0,000 (0,959)	0,000 (0,542)	0,003 (0,461)	0,005 (0,641)	0,000 (0,900)	-0,001 (0,292)	0,001 (0,836)
$\Delta Debt_{i,t}$	0,005 (0,202)	-0,054 (0,250)	0,102 (0,342)	-0,005 (0,274)	-0,012 (0,816)	-0,013 (0,929)	0,000 (0,838)	-0,030 (0,377)	0,045 (0,611)
$TotalAs-sets_{i,t}$	0,000 (0,820)	**0,000 *** (0,001)**	**0,000 *** (0,000)**	0,000 (0,997)	**0,000 *** (0,000)**	**0,000 *** (0,000)**	0,000 (0,886)	**0,000 *** (0,000)**	**0,000 *** (0,000)**

*Legend: * = significant at 10%, ** = significant at 5%, *** = significant at 1%; coefficients are unstandardized*

The first interesting thing, which proves to be very obvious, is the fact that only the models which have the amount of Words in the annual report and the number of Publications as dependent variable are significant, both at the 1% level (except model 2b at 5%). The percentage of the annual report devoted to risk management is in none of the models explained by the variables.

However, the only variable that proves to be significant, is a control variable (Total Assets; significant at 1% in all models). This means that the assumption that the size of the company directly influences the amount of publications is true for the amount of publications and the amount of words on risk in the annual report. Also, the sign of the relationship is as expected; a positive sign means that the bigger a company is, the more publications it will issue.

Another model with interesting results is model 1b; for the period 2005-2006 both Tobin's Q (10,3%) and the P/E ratio (12,2%) are close to 10% significance in their impact on the amount of Words in the annual report. Also, they both have a negative coefficient (respectively -0,157 and -0,148), which is exactly as predicted: lower market value (both measured with Tobin's Q and the P/E ratio) leads to more attention to risks in the annual report that comes a few months later. However, for the period 2007-2008, the period of the crisis, this impact of performance on publications is insignificant at all levels. This would suggest a rejection of hypothesis 2. The only interesting variable in this period is Profit Margin in model 2a, explaining Percentage. Here the significance is close to 10%, and a negative sign is present, as expected; lower profits means more risk publications.

With regard to the P/E ratio, the natural logarithm of this variable might prove to be a better predictor than the P/E ratio itself, given the nature of it as a ratio. However, because some observations of P/E are negative, the natural logarithm of this value has no value, and less observations can be made. Therefore this other possibility is not taken into account. When taking a quick glance at such a regression however (for all 4 years), the outcome of the model doesn't change; only Total Assets is a significant variable and only models 3b and 3c are significant.

Natural logarithm of Total Assets

When the Total Assets also are transformed to its natural logarithm, it is expected that that the variable is even more significant, given the exponential effect of the variable. Therefore, all the regressions are done again.

Table 8 Regression results with $Ln(TotalAssets_{i,t})$ replacing $TotalAssets_{i,t}$

	Model								
	1a	**1b**	**1c**	**2a**	**2b**	**2c**	**3a**	**3b**	**3c**
Depen-dent	$Perc_{i,t}$	$Words_{i,t}$	$Pub\text{-}l_{i,t+1}$	$Perc_{i,t}$	$Words_{i,t}$	$Pub\text{-}l_{i,t+1}$	$Perc_{i,t}$	$Words_{i,t}$	$Publ_{i,t+1}$
Period	05-06	05-06	05-06	07-08	07-08	07-08	05-08	05-08	05-08
N	100	100	100	100	100	100	200	200	200
F-value	0,714 (0,614)	6,074 *** (0,000)	3,693 *** (0,004)	0,848 (0,519)	5,524 *** (0,000)	4,719 *** (0,001)	0,521 (0,760)	11,175 *** (0,000)	8,824 *** (0,000)
R^2	0,037	0,244	0,164	0,043	0,227	0,201	0,013	0,224	0,176
Adj. R^2	-0,015	0,204	0,120	-0,008	0,186	0,158	-0,012	0,204	0,155
Constant	0,029 (0,302)	-0,437 (0,147)	**-2,690 *** (0,002)**	**0,049 * (0,093)**	**-0,809 *** (0,010)**	**-3,779 *** (0,000)**	**0,043 ** (0,032)**	**-0,598 *** (0,005)**	**-3,117 *** (0,000)**
β:									
$TobinsQ_{i,t}$	0,003 (0,517)	-0,069 (0,176)	-0,033 (0,820)	-0,002 (0,686)	-0,036 (0,497)	-0,160 (0,347)	0,000 (0,977)	-0,049 (0,170)	-0,085 (0,433)
$Profit\text{-}Margin_{i,t}$	-0,003 (0,597)	0,065 (0,232)	0,097 (0,522)	-0,033 (0,139)	-0,051 (0,829)	-0,051 (0,945)	-0,003 (0,550)	0,063 (0,237)	0,112 (0,484)
$P/Eratio_{i,t}$	0,000 (0,931)	-0,002 (0,214)	0,001 (0,691)	0,000 (0,464)	0,005 (0,198)	0,010 (0,388)	0,000 (0,811)	-0,001 (0,556)	0,002 (0,529)
$\Delta Debt_{i,t}$	0,006 (0,155)	-0,038 (0,397)	0,121 (0,343)	-0,005 (0,283)	-0,013 (0,797)	-0,025 (0,869)	0,001 (0,802)	-0,022 (0,498)	0,052 (0,597)
$Ln(TotalAssets_{i,t})$	0,002 (0,239)	**0,079 *** (0,000)**	**0,049 *** (0,000)**	0,002 (0,313)	**0,096 *** (0,000)**	**0,280 *** (0,000)**	0,002 (0,152)	**0,087 *** (0,000)**	**0,236 *** (0,000)**

*Legend: * = significant at 10%, ** = significant at 5%, *** = significant at 1%; Coefficients are unstandardized*

No differences in the significance of the models as a whole exists when transforming $TotalAssets_{i,t}$ in $Ln(TotalAssets_{i,t})$ When doing a further analysis, models 1a, 1b, 2a, 2b, 3a, and 3b improve with this variable, while models 1c, 2c and 3c perform worse. Thus, the tendency is that the a- and b models improve (Percentage, Words); thus the variables that are derived from the annual report. The c-models are worse (Publications). This shows that the Total Assets as a whole has a very strong influence on the amount of Publications; this effect gets less when using the natural logarithm.

In this model, three variables are not significant but get close to 10% significance; these are Change in Debt (model 1a, effect on Percentage), the Profit Margin (model 2b, effect on Words) and Total Assets (model 3a, effect on Percentage). Here the signs are as expected according to hypothesis 1; Change in Debt and Total Assets have a positive impact on publications, while the profit margin is negatively related.

Omission of Total Assets

Because Ln(Total Assets) has such a huge impact on the model, the regression is done again, but now the Ln(Total Assets) control variable is omitted. This brings the following results:

Table 9 Regression results without $Ln(TotalAssets_{i,t})$ or $TotalAssets_{i,t}$

	Model								
	1a	**1b**	**1c**	**2a**	**2b**	**2c**	**3a**	**3b**	**3c**
Depen-dent	$Perc_{i,t}$	$Words_{i,t}$	$Pub-l_{i,t+1}$	$Perc_{i,t}$	$Words_{i,t}$	$Pub-l_{i,t+1}$	$Perc_{i,t}$	$Words_{i,t}$	$Publ_{i,t+1}$
Period	05-06	05-06	05-06	07-08	07-08	07-08	05-08	05-08	05-08
N	100	100	100	100	100	100	200	200	200
F-value	0,539 (0,707)	2,015 * (0,099)	0,324 (0,861)	0,802 (0,527)	0,175 (0,951)	0,182 (0,947)	0,132 (0,971)	1,462 (0,215)	0,442 (0,778)
R^2	0,022	0,078	0,013	0,033	0,007	0,008	0,003	0,029	0,009
Adj. R^2	-0,019	0,039	-0,028	-0,008	-0,034	-0,034	-0,018	0,009	-0,011
Constant	**0,061 *** (0,000)**	**0,850 *** (0,000)**	**0,605 ** (0,041)**	**0,076 *** (0,000)**	**0,697 *** (0,000)**	**0,618 * (0,086)**	**0,070 *** (0,000)**	**0,787 *** (0,000)**	**0,628 *** (0,004)**
β:									
$TobinsQ_{i,t}$	0,002 (0,674)	**-0,115 ** (0,038)**	-0,151 (0,325)	-0,002 (0,697)	-0,032 (0,593)	-0,148 (0,433)	-0,001 (0,863)	**-0,074 * (0,063)**	-0,152 (0,197)
$Profit-Margin_{i,t}$	-0,003 (0,540)	0,047 (0,425)	0,053 (0,748)	-0,033 (0,136)	-0,065 (0,807)	-0,092 (0,912)	-0,003 (0,495)	0,041 (0,490)	0,052 (0,765)
$P/Eratio_{i,t}$	0,000 (0,997)	-0,002 (0,148)	0,000 (0,937)	0,000 (0,540)	0,002 (0,558)	0,003 (0,799)	0,000 (0,899)	-0,001 (0,310)	0,001 (0,896)
$\Delta Debt_{i,t}$	0,006 (0,195)	-0,062 (0,212)	0,061 (0,655)	-0,005 (0,271)	-0,019 (0,727)	-0,045 (0,793)	0,000 (0,879)	-0,038 (0,301)	0,010 (0,925)

*Legend: * = significant at 10%, ** = significant at 5%, *** = significant at 1%; Coefficients are unstandardized*

The results are interesting; of the 6 models, one now is significant (1b, 10%); in this model Tobin's Q explains Words (at 5% significance), with a negative sign as expected: a lower market value of the company leads to more publications. Also in model 3b Tobin's Q is significant at 10%, with a negative sign, but the model as a whole isn't.

Of further interest are the P/E Ratio in model 1b and The Profit Margin in model 2a; both are close to 10% significance, and both have a negative sign as is expected from hypothesis 1. However, in this case hypothesis 2 might have to be rejected because in models 2a, 2b and 2c no significant variables are present, while in model 1b there is; thus in the period *before* the crisis the influence of Tobin's Q on publications was higher than during the crisis.

Use of time dummies

To test for the effect of the years, time dummies are added to the regression model with Ln(Total Assets) as shown above. The time dummies have the value 1 if the observation takes place in the corresponding year. Thus, e.g. a dummy Dummy2006 is made in which the performances of year 2006 are grouped. The first year of the period has no dummy. Thus, in 2005-2006 there is only a dummy for 2006, in 2007-2008 only a dummy for 2008, and in 2005-2008 a dummy for the years 2006,2007 and 2008. The first year of the period then can be seen as the "neutral" state, and the coefficients of the other years' dummies show the relative effect of that year compared to the first year.

Results of the regression are shown on the next page.

Table 10 Regression results using $Ln(TotalAssets_{i,t})$ and time dummies

	Model								
	1a	**1b**	**1c**	**2a**	**2b**	**2c**	**3a**	**3b**	**3c**
Dependent	$Perc_{i,t}$	$Words_{i,t}$	$Publ_{i,t+1}$	$Perc_{i,t}$	$Words_{i,t}$	$Publ_{i,t+1}$	$Perc_{i,t}$	$Words_{i,t}$	$Publ_{i,t+1}$
Period	05-06	05-06	05-06	07-08	07-08	07-08	05-08	05-08	05-08
N	100	100	100	100	100	100	200	200	200
F-value	0,663 (0,679)	5,033 *** (0,000)	3,047 *** (0,009)	1,212 (0,307)	4,770 *** (0,000)	4,167 *** (0,001)	1,109 (0,359)	7,117 *** (0,000)	5,258 *** (0,000)
R^2	0,041	0,245	0,164	0,073	0,235	0,212	0,044	0,230	0,180
Adj. R^2	-0,021	0,196	0,110	0,013	0,186	0,161	0,004	0,197	0,146
Constant	0,028 (0,333)	-0,446 (0,143)	**-2,682 *** (0,002)**	0,040 (0,166)	**-0,862 *** (0,007)**	**-3,585 *** (0,000)**	**0,034 * (0,088)**	**-0,638 *** (0,003)**	**-3,061 *** (0,000)**
β:									
$TobinsQ_{i,t}$	0,003 (0,528)	-0,070 (0,176)	-0,032 (0,823)	0,000 (0,968)	-0,025 (0,649)	-0,202 (0,247)	0,002 (0,633)	-0,041 (0,271)	-0,103 (0,356)
$Profit\text{-}Margin_{i,t}$	-0,002 (0,637)	0,066 (0,225)	0,096 (0,532)	-0,031 (0,150)	-0,044 (0,853)	-0,078 (0,917)	-0,004 (0,478)	0,061 (0,260)	0,114 (0,484)
$P/Eratio_{i,t}$	0,000 (0,925)	-0,002 (0,218)	0,001 (0,693)	0,000 (0,571)	0,004 (0,237)	0,012 (0,330)	0,000 (0,959)	-0,001 (0,508)	0,002 (0,510)
$\Delta Debt_{i,t}$	0,006 (0,163)	-0,039 (0,393)	0,122 (0,344)	-0,004 (0,370)	-0,007 (0,882)	-0,045 (0,774)	0,001 (0,665)	-0,019 (0,562)	0,044 (0,658)
$Ln(TotalAssets_{i,t})$	0,002 (0,249)	**0,079 *** (0,000)**	**0,202 *** (0,000)**	0,002 (0,313)	**0,096 *** (0,000)**	**0,281 *** (0,000)**	0,002 (0,154)	**0,087 *** (0,000)**	**0,235 *** (0,000)**
Dummy2006	0,005 (0,513)	0,025 (0,738)	-0,024 (0,913)	X	X	X	0,005 (0,509)	0,023 (0,766)	-0,020 (0,932)
Dummy2007	X	X	X	X	X	X	0,002 (0,763)	-0,002 (0,984)	0,095 (0,687)
Dummy2008	X	X	X	**0,013 * (0,090)**	0,084 (0,319)	-0,305 (0,253)	**0,017 ** (0,023)**	0,084 (0,296)	-0,149 (0,537)

*Legend: * = significant at 10%, ** = significant at 5%, *** = significant at 1%; Coefficients are unstandardized*

As can be seen above, again only the models b and c (Words and Publications) are significant, and again only Total Assets. However, for both 2a and 3a (Percentage), the year 2008 has a significant influence on the results for the Percentage annual report devoted to risk management, by having about 1% (absolute) difference with the year 2007 and almost 2% difference to the year 2005. This might hint at hypothesis 2, but this is only valid for Percentage.

Two other variables that come close to 10% significance is Profit Margin (15%) in model 2a (Percentage), the same as in the earlier models, and Total Assets (15%) in model 3a (Percentage). Both coefficient have a sign as expected from hypothesis 1.

Table 11 Regression results using time dummies, without Ln(TotalAssets$_{i,t}$)

	Model								
	1a	**1b**	**1c**	**2a**	**2b**	**2c**	**3a**	**3b**	**3c**
Dependent	*Perc$_{i,t}$*	*Words$_{i,t}$*	*Publ$_{i,t+1}$*	*Perc$_{i,t}$*	*Words$_{i,t}$*	*Publ$_{i,t+1}$*	*Perc$_{i,t}$*	*Words$_{i,t}$*	*Publ$_{i,t+1}$*
Period	05-06	05-06	05-06	07-08	07-08	07-08	05-08	05-08	05-08
N	100	100	100	100	100	100	200	200	200
F-value	0,525 (0,756)	1,637 (0,158)	0,257 (0,935)	1,247 (0,293)	0,307 (0,908)	0,351 (0,881)	0,970 (0,454)	1,014 (0,423)	0,410 (0,895)
R^2	0,027	0,080	0,013	0,062	0,016	0,018	0,034	0,036	0,015
Adj. R^2	-0,025	0,031	-0,039	0,012	-0,036	-0,034	-0,001	0,000	-0,021
Constant	**0,059 *** (0,000)**	**0,833 *** (0,000)**	**0,603 * (0,057)**	**0,068 *** (0,000)**	**0,641 *** (0,000)**	**0,814 ** (0,048)**	**0,061 *** (0,000)**	**0,735 *** (0,000)**	**0,640 ** (0,023)**
β:									
TobinsQ$_{i,t}$	0,002 (0,684)	**-0,116 ** (0,038)**	-0,151 (0,328)	0,000 (0,980)	-0,021 (0,740)	-0,189 (0,328)	0,001 (0,732)	-0,065 (0,115)	-0,168 (0,167)
Profit-Margin$_{i,t}$	-0,003 (0,582)	0,049 (0,408)	0,053 (0,749)	-0,032 (0,147)	-0,057 (0,830)	-0,118 (0,887)	-0,004 (0,426)	0,038 (0,528)	0,052 (0,770)
P/Eratio$_{i,t}$	0,000 (0,995)	-0,002 (0,152)	0,000 (0,937)	0,000 (0,656)	0,002 (0,623)	0,005 (0,724)	0,000 (0,950)	-0,002 (0,275)	0,001 (0,882)
ΔDebt$_{i,t}$	0,005 (0,204)	-0,062 (0,209)	0,061 (0,657)	-0,004 (0,357)	-0,014 (0,803)	-0,064 (0,712)	0,001 (0,738)	-0,035 (0,343)	0,002 (0,988)
Dummy2006	0,005 (0,490)	0,037 (0,662)	0,005 (0,983)	X	X	X	0,005 (0,492)	0,034 (0,698)	0,009 (0,973)
Dummy2007	X	X	X	X	X	X	0,003 (0,715)	0,023 (0,795)	0,161 (0,534)
Dummy2008	X	X	X	**0,013 * (0,088)**	0,086 (0,363)	-0,298 (0,314)	**0,017 ** (0,021)**	0,097 (0,277)	-0,113 (0,669)

*Legend: * = significant at 10%, ** = significant at 5%, *** = significant at 1%; Coefficients are unstandardized*

The results of this regression are quite similar to the earlier ones. However, none of the models has a F-value that is significant, although model 1b comes close to 10%.

Variables that seem to influence the dependents are the P/E ratio (model 1b, negative sign), the Profit Margin (model 2a, negative sign) and Tobin's Q (models 3b and c, negative sign). They seem to support hypothesis 1, although they are not significant.

Again, the year 2008 seems to be significantly different from 2007 and 2005 with regard to Percentage (see models 2a and 3a).

When comparing this regression to the regression without time dummies, the effect of Tobin's Q in models 1b and 3b is not significant anymore. Thus Words seems to be determined in a great matter by the year.

Order of influence

To summarize the differences between the different regressions and the importance of variables, years and regression on the significance of models, the following list can be made for factors, from very important to less important:

(Ln)Total Assets *Control variable*

Total Asset is the only variable that explains Words and Publications in all years. Without Total Assets, only model 1b can be explained by other factors (by Tobin's Q). All other models are not significant without it. The sign is positive, indicating that bigger firms publish more. However, because Total Assets is a control variable, other variables should be investigated.

Tobin's Q *Explaining variable*

Model 1b in the regression without Total Assets is significant because of this variable. Also in model 3b this variable is significant although the model isn't. In other regressions (3 times: 1b, 3b and 3c) this variable also has a great (although not significant) effect. The sign is negative in every case, indicating proof for hypothesis 1. The influence is mainly on Words, and a little on Publications

Year *Control variable*

In the regressions with time dummies, the year 2008 is significantly different from other years, with a positive effect on Percentage (models a). This might indicate proof for hypothesis 2.

Profit Margin *Explaining variable*

In 5 regression models this variable comes close to 10% significance, with a negative sign as expected from hypothesis 1. In all cases this variable was of influence to Percentage, all in model 2a.

P/E ratio *Explaining variable*

In 3 regression models (all 3b, Words) this variable comes close to 10% significance, with a negative sign as expected from hypothesis 1.

Δ Debt *Control variable*

Only once (model 1a, Percentage, first regression with Ln(Total Assets) replacing Total Assets) this variable comes close to 10% significance. The sign is positive as expected.

Testing the difference between periods

To see whether there exists a difference between the two periods with regard to the coefficients for the independent variables, the confidence interval of these coefficients is taken (at 90%, so that significance is at 10%), to see whether the coefficient of the other period is within this interval or not. If not, the difference is significant. This applies to both periods; if one of the two coefficients is outside the interval of one of the periods, significance is assumed.

For this analysis, the model as shown in table 8 is used; so this model is without the time variables (to test purely for the difference between periods, not years), and with Ln(Total Assets)

Table 12 Variables and confidence intervals

Dependent	**Variable**	**2005-2006**		**2007-2008**		**Δ Sign.?**
		Co-efficient	**Confidence interval**	**Co-efficient**	**Confidence interval**	
Percentage	$TobinsQ_{i,t}$	0,003	-0,005 – 0,011	-0,002	-0,010 – 0,096	N
	$ProfitMargin_{i,t}$	-0,003	-0,011 – 0,006	-0,033	-0,069 – 0,004	Y
	$P/Eratio_{i,t}$	0,000	0,000 – 0,000	0,000	0,000 – 0,001	N
	$\Delta Debt_{i,t}$	0,006	-0,001 – 0,013	-0,005	-0,012 – 0,003	Y
	$Ln(TotalAssets_{i,t})$*	0,002	-0,001 – 0,005	0,002	-0,001 – 0,005	N
Words	$TobinsQ_{i,t}$	-0,069	-0,154 – 0,015	-0,036	-0,125 – 0,052	N
	$ProfitMargin_{i,t}$	0,065	-0,025 – 0,154	-0,051	-0,442 – 0,339	Y
	$P/Eratio_{i,t}$	-0,002	-0,004 – 0,001	0,005	-0,001 – 0,011	Y
	$\Delta Debt_{i,t}$	-0,038	-0,113 – 0,037	-0,013	-0,094 – 0,068	N
	$Ln(TotalAssets_{i,t})$*	0,079	0,050 – 0,108	0,096	0,065 – 0,127	N
Publications	$TobinsQ_{i,t}$	-0,033	-0,272 – 0,206	-0,160	-0,441 – 0,121	N
	$ProfitMargin_{i,t}$	0,097	-0,155 – 0,349	-0,051	-1,288 – 1,186	N
	$P/Eratio_{i,t}$	0,001	-0,005 – 0,008	0,010	-0,009 – 0,030	Y
	$\Delta Debt_{i,t}$	0,121	-0,090 – 0,333	-0,025	-0,282 – 0,231	N
	$Ln(TotalAssets_{i,t})$*	0,202	0,120 – 0,283	0,280	-0,282 – 0,231	N

Confidence interval is at 90% (10% significance)

The effect of the variable Profit Margin is significantly different over the periods 2005-2006 and 2007-2008 in Percentage and Words; Δ Debt is significantly different for Percentage and P/E Ratio in Words and Publications. However, only the explaining variables are investigated to test for hypothesis 2.

Profit Margin has a bigger negative influence on Percentage in the period 2007-2008; for Words the influence becomes negative in 2007-2008, compared to positive in 2005-2006. This supports hypothesis 1.

The P/E ratio changes into a positive influence on Words in 2007-2008, compared to a negative influence in the period before. Also, in 2007-2008 the positive relationship between P/E ratio and Publications becomes even bigger. Thus for this variable, hypothesis 1 should be rejected.

However, it should be taken into account whether a variable is significant to the model in one of the periods. If not, the difference is of no importance. Table 8 is checked to see which variable is significant, and an asterisk (*) is placed next to the variable in table 12. Because only Ln(Total Assets) is significant in the model of table 8, and because the difference between coefficients is not significant at 10%, it can be stated that in 2007-2008 the influence of the explaining variables was not different from 2005-2006. This rejects hypothesis 2.

The results of this test are different when another model is taken (e.g. the model without Ln(Total Assets) or Total Assets) but because this model is believed to be the best for testing, other results are not investigated.

A second attempt is to quantify the period in the model, by putting a period variable in place. In this case the value of the variable is 0 for 2005-2006, and 1 for 2007-2008. Again the same model for all 4 years is used (with Ln(Total Assets) and without time dummies). For Percentage, the period is insignificant as a variable at 10%; for Words and Publications the same is true. Again, this is proof for rejecting hypothesis 2, by indicating that the period is of no direct influence to the dependent variable.

Difference in the means of variables

Furthermore, a simple test is done to see whether the period determines the mean of the different variables .

When doing an ANOVA, Tobin's Q is significantly different over the periods at 5%; the difference in means is 0,25 with the lower value in 2007/2008. Profit Margin is almost significantly different at 10% with a difference of 0,12, going from negative to positive in 2007/2008. P/E ratio is different at 13% significance; the difference is 4,9 with the higher value in 2007/2008. An independent samples T-test yields the same results. All other variables do not have a different mean over the periods. Thus: Tobin's Q is lower, Profit Margin higher and the P/E ratio higher in 2007/2008. This would also suggest that Profit Margin is a big contributor to P/E ratio, which can be verified by taking a look at the correlation between these two variables (which is close to 10% significance).

Conclusion: both the direct influence of the period on the dependent variables, as the influence of the period on the relationship between independent and dependent variables is insignificant; therefore hypothesis 2 has to be rejected. Tobin's Q, Profit Margin and P/E ratio are different over the periods, but thus do not explain the change in dependent variables.

Tests for validity of the results

All variables should be tested for normality to gain in linear regression. To show in how far this is true, appendix II offers the results of testing for this.

Furthermore, models should be tested on multicollinearity, homoscedasticity and normality of residuals. Results for these also can be found in appendix II. Fact is that most models have problems in heteroscedasticity and in normality of residuals. On the other hand the normality of variables is guaranteed and multicollinearity is rejected.

Discussion

As told earlier, there is vast evidence that hypothesis 2 has to be rejected: the period of the Credit Crisis (2007-2008) did not alter the way the independent variables influenced publications. Nor did it explain the number of publications directly.

Results on hypothesis 1 are more difficult to interpret, because of the dominance of Total Assets as control variable in all the different models. When this variable is in place, both the number of Words "risk" in the annual report and the number of Publications found in LexisNexis can be explained, in a significant model and with a significant variable.

When the Total Assets are omitted, Tobin's Q becomes of significance in explaining the amount of Words in 2005-2006 and in the 4-year period. However, only in the first two-year period the model is significant. In other regressions the variable also has a quite big influence on Words (and Publications), and in all cases the sign is negative, proving hypothesis 1.

Furthermore, Profit Margin and P/E ratio show influence (although not significant) on Percentage and Words respectively. In these cases the sign again is negative as expected, proving hypothesis 1.

The fact that Tobin's Q is the best explaining factor, and P/E ratio as influential, is interesting because these are a measure of the market value of the company. As said before, the share price is of high importance to both management and shareholders, and thus is expected to be of direct influence in risk management disclosure and publication policy in general. Furthermore, profit margin and P/E ratio are highly correlated (almost 10% significance), thus again giving evidence that in all the regressions the market value of the company is an important explaining factor, although long behind the influence of the size of the company.

A last remark which certainly has to be kept in sight is that some problems of homoscedasticity and normality of residuals (see Appendix II) arose, which might pose a threat to the results of the regressions.

Conclusions

This research tried to determine whether the performance of a company influences the amount of publications on risk management. Expected was that publications are used as a tool by management to avoid losses in share prices. By presenting an image of being "in control" of all the different risks the company faces, share prices can become stable or even higher, thus benefiting management, shareholders in general and stimulating workers to create value.

The best variable in explaining the disclosure on risk management is Tobin's Q, followed by Profit Margin and P/E ratio. When all of these variables are smaller (thus indicating worse performance), the number of Publications, the Percentage of the annual report devoted to risk management, and the amount of times the Word "Risk" is used per page in the annual report become higher. However, results found that in the period of the Credit Crisis, 2007-2008, this effect was not different from the 2 years before, the period 2005-2006.

It is also proven in the study that the biggest factor in the amount of publications on risk management and the frequency of the word "Risk" were not the performance variables, but the control variable Total Assets. The size of the company far outweighs other variables used. Further research can find out whether this result of the study is robust over more companies, industries or regions. The balance between size of the company and the company's performance as leading indicator to the number of risk management publications is tricky; is the effect of size really so much bigger than that of other factors? More control variables might prove otherwise.

Of other interest is the influence of the credit crisis, which showed to be not significant in the study. This contrary to hypothesis 2. More research about the (changing) relationship between performance and risk management publication during crises could be done to increase the knowledge on the subject.

Practical issues might explain the end results of the study. More data could be collected, to make the results of the study more robust. Furthermore, some of the data might be found by using better proxies, which can be measured more accurately (especially for the dependent variables). The Percentage variable in this case has been quite subjective; this might explain why the explaining variables are not significant with this dependent. Furthermore some problems have risen with heteroscedasticity and non-normality of residuals.

A lot of further study is possible in investigating the difficult relationship between performance, risk management and publications. This paper tried to contribute a small part of such research.

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Appendix I

List of companies from the samples

AMR Corp/DE	Apco Oil and Gas Intl Inc
Aaron's Inc	Arkansas Best Corp
Acmat Corp	Arrow Electronics Inc
Acme United Corp	Atco Ltd
Relm Wireless Corp	AGL Resources Inc
Adams Resources & Energy Inc	Avatar Holdings Inc
Advanced Micro Devices	Avery Dennison Corp
ASM International NV	Avon Products
Aetna INC	British American Tobacco Plc
Agnico Eagle Mines Ltd	Baker Hughes Inc
Alaska Air Group Inc	Baldor Electric Co
Algoma Central Corp	Baldwin & Lyons
Allegheny Energy Inc	Ball Corp
Honeywell International Inc	Constellation Energy Group Inc
Allic-Chalmers Energy Inc	Popular Inc
Alcoa Inc	Bank of Hawaii Corp
Hess Corp	BRE Properties
Us Airways Group Inc	C.R. Bard Inc
American Electric Power Co	Barnes Group Inc
American Express Co	Barrick Gold Corp
American International Group	Baxter International Inc
American National Insurance	Bel Fuse Inc
American Vanguard Corp	Verizon Communications Inc
Amgen Inc	BCE Inc
Analysts International Corp	Bemis Co Inc

Appendix II

Results from testing for assumptions on linear regression

Normality of variables

An important assumption of linear regression is the normality of the variables used. Thus, both dependent and independent, as well as the control variables, should have a fairly normal distribution.

For each variable the Kolmogorov-Smirnov test is executed, and the results of significance can be found below:

Table A.1 Variables and significance of the Kolmogorov-Smirnov test

Variable	**Significance**
$Perc_{i,t}$	0,005 ***
$Words_{i,t}$	0,000 ***
$Publ_{i,t+1}$	0,000 ***
$TobinsQ_{i,t}$	0,000 ***
$ProfitMargin_{i,t}$	0,000 ***
$P/Eratio_{i,t}$	0,000 ***
$\Delta Debt_{i,t}$	0,000 ***
$Ln(TotalAssets_{i,t})$	0,001 ***

*Legend: *** = significant at 1%*

As all Kolmogorov-Smirnov tests are significant at the 1 percent level, the assumption of normality is met.

Testing the outcomes of the model

The tests found below do not apply to separate variables, but to a model as a whole. Therefore, a choice is made which models of the regressions made is tested. The choice is the regression with Ln(Total Assets), for all 4 years, with time dummies (as found in table 10). For each model (a to c) the test results are shown below.

Multicollinearity

In the model with Percentage as dependent variable (a model), all variables have a VIF value of just over 1. This means that the problem of multicollinearity is not present. The time dummies have a VIF factor of about 1,5. For Words (b model) and Publications (c model) the same is true; the assumption that multicollinearity is not influencing the variables is met.

Homoscedasticity

Homoscedasticity is tested by visually analyzing the size of the residuals vis-à-vis the size of the dependent variable. If the residuals become larger or smaller if the value of the dependent changes, there is heteroscedasticity. In model a, the regression standardized residual becomes bigger if Percentage increases. Therefore heteroscedasticity poses a problem. The same is true for Words; most residuals tend to group at smaller values when the dependent's value is small; less residuals can be found at higher values for Words, but here again the residuals have the tendency to be bigger as well. The same effect of Words can be found at Publications. In short; heteroscedasticity seems to be a problem. Maybe a transformation of the dependent variables could change this effect.

Normality of residuals

Analysis is done by investigating the Normal P-P plot of Regression Standardized Residual in SPSS. For Percentage, the residuals seem to be normally distributed. However Words seems to have a bigger problem in its normality, by first having a higher than expected cumulative probability, followed by a lower value and later again higher than normal. (reverse S-shaped curve). For Publications this effect is even bigger.