**Aalto University
School of Economics**

The effect of smooth performance in firm value European evidence

Finance

Master's thesis

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2012

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Spring 2012
Finance

Approved in the Department of Finance ___ / ___20___ and awarded the grade

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THE EFFECT OF SMOOTH PERFORMANCE IN FIRM VALUE – EUROPEAN EVIDENCE

PURPOSE OF THE STUDY

The purpose of this study is to analyze the valuation effect of cash flow and earnings volatility. In addition, I aim to find out how investors value earnings smoothing done using discretionary accruals. My study also aims to provide clarifying evidence to the discrepancy between the predicted valuation effect of financial performance volatility by CAPM and the call option nature of equity. I also analyze the validity of corporate diversification as a source of smoother financial performance and how this smoother financial performance affects firm value.

DATA

Data set consists of European companies with non-missing observations for share price as well as quarterly cash flow and earnings between 2000 and 2010. Total number of companies in my sample is 778 resulting in total 2,211 firm year observations.

RESULTS

The findings of my study show that volatile financial performance results in a discount in company value. Both cash flow and earnings volatility seem to have a negative effect on firm value, with the effect being stronger and more significant for earnings volatility. My results thus support focus of attention on earnings figures, which is widely adapted by investors and media. In addition my results suggest that investors prefer active earnings smoothing done by the management, especially with accruals.

My results also clarify the discrepancy between CAPM and the call option nature of equity. Based on my findings, there is a strong negative relation between leverage and firm value, even after controlling for cash flow volatility. This suggests that benefits from volatility to the call option nature of equity are outweighed by the costs of potential financial distress. The findings of my study also suggest that corporate diversification doesn't work as an effective hedge for providing smoother cash flow. Even though companies would benefit from smoother financial performance due to diversification, the widely reported diversification discount exceeds the benefits and the total value effect is negative.

KEYWORDS

Cash flow volatility, Earnings smoothing, Risk management, Corporate diversification

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TASAISEN TULOKSEN VAIKUTUS YRITYKSEN ARVOON – EUROOPPALAISTA NÄYTTÖÄ

TUTKIELMAN TAVOITE

Tämän työn tarkoituksen on analysoida kassavirran ja tuloksen volatiliteetin vaikutusta yrityksen arvoon. Lisäksi, pyrin tuomaan selventävää näyttöä siihen miten sijoittajat arvostavat tuloksen tasoittamista harkinnanvaraisten siirtoerien hyväksikäytöllä. Tutkielmani pyrkii myös selventämään ristiriitaa, joka vallitsee CAPM:n ja oman pääoman osto-optioluonteen välillä, kun arvioidaan tuloksen volatiliteetin vaikutusta yrityksen arvoon. Tutkin myös miten yrityksen toiminta useammalla toimialalla toimii tasaisemman tuloksen lähteenä ja mikä vaikuts tällä tasaisemmalla tuloskehittyksellä on yrityksen arvoon.

AINEISTO

Aineistoni koostuu Eurooppalaisista yrityksistä, joista on sekä osakkeen hintatietoja että kvartaalitason kassavirta ja tulostietoja vuosina 2000 – 2010. Aineistossani on yhteensä 778 yritystä, joista muodostuu 2,211 yritysvuotta.

TULOKSET

Tutkielmani tulokset osoittavat, että volatiliteetti yrityksen tuloksessa johtaa alennukseen yrityksen arvossa. Sekä kassavirran että tuloksen volatiliteetti näyttää madaltavan yrityksen arvoa, mutta vaikutus on vahvempi ja tilastollisesti merkitsevämpi tuloksen volatiliteetin kohdalla. Tulokseni täten tukevat huomion kiinnittämistä yrityksen tulokseen, mikä on yleisesti sijoittajien ja median hyväksymä tapa. Lisäksi, tulokseni antavat ymmärtää, että sijoittajat pitävät aktiivisesta tuloksen tasoittamisesta, erityisesti siirtoerien avulla.

Tulokseni myös selventävät ristiriitaa CAPM:n ja oman pääoman osto-optio luonteen välillä. Havaintojeni mukaan, yrityksen velkaisuudella on voimakas negatiivinen vaikutus yrityksen arvoon, myös sen jälkeen kun kassavirran volatiliteetti on otettu huomioon. Tämän johdosta voidaan ajatella, että volatiliteetin tuomat hyödyt oman pääoman osto-optioluonteelle ovat pienemmät kuin mahdollisen taloudellisen ahdingon tuomat haitat yritykselle.Tulokseni myös antavat olettaa, että monitoimialaisuus ei toimi tehokkaana keinona tasaisemmalle tuloskehitykselle. Vaikka yritykset hyötyisivät tasaisemmasta tuloksesta, monitoimialaisuuden tuoma arvonalennus itsessään ylittää saavutetut hyödyt.

AVAINSANAT

Kassan virran volatiliteetti, Tuloksen tasoitus, Riskien hallinta, Yrityksen monitoimialaisuus

Table of contents

Figures

Tables

1. Introduction

1.1. Background

Earnings smoothing covers all the actions that reduce the volatility of reported earnings compared to the earnings that would have occurred without these actions (Allayannis, Simko 2009). The phenomenon has been discussed widely in the recent academic research (e.g. Allayannis, Simko 2009, Rountree, Weston & Allayannis 2008, Gaio, Raposo 2011). There are several reasons for managers to smooth earnings but they generally come back to showing a smooth story to investors and to the public. This could be for example due to management's own financial incentives (Grant, Markarian & Parbonetti 2009) or more informative earnings (Allayannis, Simko 2009). Literature also shows that earnings are one of the most followed financial attributes of the company, which gives even more reasons for managers to window dress the company to the public (Graham, Harvey & Rajgopal 2005).

When managers smooth earnings they present a smoother view for the public when compared to the underlying business development. When things get rocky, a company probably doesn't want to show it to the public but does everything in its power to make the earnings to fall close to the consensus estimates. Minton & Schrand (1999) provide empirical evidence on this, suggesting that companies with higher cash flow volatility need to adapt by foregoing investments. Graham et al. (2005) support this by reporting that a vast majority of CFO's prefer a smoother earnings path. On the other hand, Froot et al. (1993) develop a theoretical framework suggesting that companies should use risk management to smooth earnings if external financing is more expensive than internally generated funds.

One could argue that the volatility of earnings and the smoothing of them has become even more of a hot topic recently. Financial crisis affected companies in 2007-2008 suddenly and very rapidly. Due to global capital markets and globalisation of businesses, changes in the business environment might affect companies significantly between reporting periods. Business agility has certainly been a trendy tropic in management literature for a long time but when the business can change in the matter of weeks, managers might be tempted to smooth the story so that it would seem that they can adapt to the changing environment. Especially now, when there is a lot of uncertainty in the markets and fear of another recession

shortly after the previous one, no-one wants to have a negative shock in the financial performance.

While companies might smooth their earnings in several ways, earnings smoothing isn't necessarily something done in the moonlight. It can also be the approach that the CEO has to the business. By only taking 95% of the positive NPV projects, the CEO can forego the most risky ones and generate smoother performance (Graham, Harvey & Rajgopal 2005, Roychowdhury 2006). By doing this, he or she would definitely be leaving some sugar on the table when you look it from diversified shareholders' perspective.

One answer to volatile earnings and cash flows could be operational diversification. Large conglomerates that operate on several businesses have more internal operational hedge and thus should report smoother earnings if the segments are not highly correlated. The potential benefits from diversification would thus be increased debt capacity and lower taxes, among others (Berger, Ofek 1995, Dimitrov, Tice 2006). Corporate diversification could thus increase firm value indirectly if smoother earnings are valued by investors. One extreme example of this is the well known earnings management culture of General Electric, a company that operates in numerous different businesses. The company's CFO Dennis Dammerman has himself stated that:

> *"We're a very complex, diverse company that no one from the outside looking in can reasonably be expected to understand in complete detail; so our story to the investing world is, we have a lot of diverse businesses, and when you put them all together they produce consistent, reliable earnings growth." (CNN Money, 1997)*

Especially in 1960s and 1970s the conglomerates were in general thought to be more efficient due to for example efficient internal capital markets. The view on corporate diversification has changed in the western world since then and there is a large amount of scientific research on conglomerates that report a *diversification discount* (e.g. Berger, Ofek 1995, Lang, Stulz 1994, Comment, Jarrell 1995). Although operational diversification could provide smoother financial performance and higher debt capacity the general view is that operational inefficiency, agency problems and over investment among others result in a lower value for conglomerates than focused peers.

1.2. Purpose of this study and main results

The purpose of this study is to empirically analyse the relation of cash flow and earnings volatility and firm value. Cash flow is a very important part of earnings and by examining both earnings and cash flow volatility we get deeper insight on possible smoothing methods. The most obvious smoothing, done by using discretionary accruals would affect a company's earnings but would not affect cash flow, which takes into account the changes in balance sheet items. By identifying the different smoothing methods and evaluating their effects on firm value we get better understanding why managers perform smoothing and what is the perceived goal. We also get insight on valuation effects of different types of risk, namely cash flow and earnings volatility.

The study follows a recent study conducted by Rountree, Weston and Allayannis (2008). Their aim is to find out whether investors prefer stocks with smoother financial performance. Rountree et al (2008) show that smoother cash flow and smoother earnings are different by nature since reported earnings can be smoothed with accruals and are subject to "measurement error and potential manipulation". I also aim to examine the effects of different smoothing methods by examining the valuation effect of smoother earnings and smoother cash flows. Rountree et al. (2008) found out that investors prefer stocks with smoother earnings and they report a 0.15% decrease in firm value from a 1% increase in cash flow volatility. Their results also show that only managerial efforts to smooth earnings that affect the underlying cash flow have the beneficial effect on firm value. Rountree et al. (2008) also briefly comment the discrepancy between the predicted value effect of cash flow volatility of the traditional CAPM by Sharpe (1964) and Lintner (1965) and of contingent claims analysis by Merton (1974). My study also aims to provide clarifying evidence for this discrepancy.

I also expand the setting of Rountree et. al (2008) by examining the value effect of cash flow volatility and earnings volatility on diversified companies. Previous literature shows that conglomerates are valued at a discount even though they produce smoother financial performance compared to the segments alone. This forms and interesting discrepancy, in addition to the one described above, where corporate diversification could have a positive and negative value effect. My study aims to provide insight on this controversy by using the research setting of Rountree et. al (2008) also with focus on corporate diversification.

The empirical results of my study show that both cash flow volatility and earnings volatility are associated with a discount in firm value. The effect is relatively weak suggesting only approx. 0.03% or 0.04% decrease in firm value with a 1% increase in cash flow or earnings volatility respectively. The larger effect from earnings volatility supports the focus of attention on earnings, reported by Graham et al. (2005) in their study. My results are statistically significant after controlling for size, profitability, growth and leverage. In general, my findings are consistent with the results of Rountree et al. (2008) with the exception that they found a stronger effect for cash flow volatility than for earnings volatility. My results contrast the findings of Rountree et al. (2008) also in the sense that based on my results, investors prefer earnings smoothing through accruals. This is in line with the findings of Tucker & Zarowin (2006) and Allayannis & Simko (2009) who suggest that earnings smoothing can provide more efficient communication and yield a premium in valuation.

The empirical results of my study also show that leverage has a strong negative relation with firm value, even after controlling for cash flow volatility. This is in line with the notion of Grass (2010) that the call-option nature of equity developed by Merton (1974) applies only in certain special situations and is not strong enough to explain economic phenomena on an aggregate level. In addition, I find evidence that corporate diversification is not a perfect hedge for providing smoother performance, since the corporate diversification discount reported by e.g. Lang & Stulz (1994), Berger & Ofek (1995) and Comment & Jarrell (1995) seems to outweigh the benefits received from smoother financial performance.

1.3. Limitations of the study

The limitations of my study are mostly data related. I have a geographical focus on Europe and my methodology puts strict restrictions on the dataset with my risk measures requiring quarterly observations for cash flow and earnings. This limits the number of available companies in the sample and possibly makes the statistical explanation power of my empirical tests weaker. A small sample with strict observation requirements in a period of three to four years could also lead into a survivorship bias. One could assume that companies that try to manipulate their earnings or cash flow due to poor performance don't survive over the period and are thus left out from the sample. This is also noted by Shin & Stulz (2000), who use similar risk measures to the ones I use in my study. McInnis (2010) who also studies earnings

smoothing and uses four-year-ahead earnings data notes that excluding the companies with missing observations might lead to survivorship bias. Consequently, the effect of cash flow volatility may be understated.

In addition to the data related issues on earnings and cash-flow volatilities, another limiting aspect is the measurement of diversification when estimating the valuation effect of cash flow volatility on conglomerates. I have used segments based on sales disclosed by the company and an internal Herfindahl index, which have been used in the related literature (Lang, Stulz 1994, Comment, Jarrell 1995). There are studies suggesting that the corporate diversification discount might not be from actual diversification but more likely explained by self selection or a measurement error (Campa, Kedia 2002, Graham, Lemmon & Wolf 2002). Taking this into consideration, my diversification measures follow more the early research focusing on the actual discount and thus my results could proxy for the nature of the diversified companies rather than the actual effect diversification.

My results could also proxy for the use of other financial performance smoothing measures such as derivatives for hedging. Rountree et al. (2008) controlled this by collecting data on voluntary disclosure about use of derivatives. This data is not easily available for European companies and thus I have not been able to control for that myself. In addition, my study has some methodological limitations. Grass (2010) points out that the call option nature of equity should probably not be analyzed with linear models which I have done. Also, the effect of corporate diversification on cash flow and firm value could be modelled with a more sophisticated instrumental variable than the interaction variable that I have used.

1.4. Structure of the study

The remaining of the study is structured as follows. In Section 2, I discuss the existing theoretical and empirical literature on cash flow volatility, risk management, asset valuation and corporate diversification. In section 3, I present the hypotheses and in Section 4 describe the data and introduce the methodologies. In Section 5, I present the empirical results and analysis. Finally, in Section 7 I present my concluding remarks.

2. Relevant theories and literature

In this chapter I discuss the relevant literature and build a theoretical framework for the empirical analysis of my study. I introduce studies and key empirical findings from literature. The first section discusses the relevant earnings smoothing literature with focus on motivation for managers to smooth earnings and the possible sources for earnings smoothing. In the second section I briefly discuss corporate risk management literature, since successful corporate risk management should also produce smoother earnings, similarly to earnings management. The third section of this chapter briefly introduces literature on corporate diversification. This is relevant since conglomerates presumably report smoother earnings than the segments would report on a stand-alone basis. Finally, I briefly discuss how cash flow volatility would affect firm value according to the existing asset pricing literature.

2.1. Earnings smoothing

Earnings smoothing is something that companies do – directly with earnings management or indirectly through their business decisions. Every company chooses a certain risk level for their operations and thus defines the range that their earnings will fluctuate in. This could be for example a certain geographical focus of a certain product portfolio. Within that range, companies can move freely by every-day business decisions, by for example investing in less risky projects and when they move for lower earnings volatility, it can be considered as earnings smoothing. Grant, Markarian and Parbonetti (2009) define earnings smoothing as "-- a mechanism used to avoid the undesirable consequences of risk on reported earnings --". This definition covers all the actions that companies take or decide not to take for smoother earnings.

Similarly Allayannis & Simko (2009) define earnings smoothing as "reduction of volatility in reported earnings that would otherwise exist in the absence of some action". In their study Allayannis & Simko (2009) also report that the vast majority of companies smooth their earnings through the use of discretionary accruals. They also find a significant positive value effect related to earnings smoothing, which is concentrated on firms with low analyst following. The authors thus point that active earnings smoothing done by companies can be beneficial if information is otherwise limited, which is consistent with the theory of Tucker &

Zarowin (2006) that earnings smoothing can make communication more efficient. Naturally, there are also personal motives for earnings smoothing, which Allayannis & Simko (2009) also point out. All in all, their study provides evidence that companies actively smooth earnings.

2.1.1. Motivation

On a personal level, managers have myriad motives to produce smoother earnings. Graham et al. (2005) report reputation and career concerns stated by managers themselves as motivations to provide smoother earnings. Employee bonuses are not among the key motivators for executives to smooth earnings. Graham et al. (2005) mention that it might be that managers are not willing to admit that they smooth earnings to get a larger compensation, but naturally if the company produces very volatile earnings the management will not be able to maximize their income from bonuses. To mitigate this, earnings smoothing offers personal risk hedging due to option compensation for the CEO (Grant, Markarian & Parbonetti 2009). When a CEO of a company knows his short-term and long-term goals and bonus thresholds, it would be rational to try to aim for those levels. On some occasions this can lead to sub-optimal behaviour by the CEO. If her bonuses have already vested, she has no incentive to forego risky projects to maximise the value of the company but to make sure the current course of business continues and that the bonus stay in the money.

Supporting this, Grant et al. (2009) find strong evidence for the hypotheses that risk-related compensation schemes and earnings smoothing are correlated. This is highly reasonable and gives valuable scientific evidence for the topic. One can assume that when CEO's compensation is linked to for example earnings, the CEO has a large incentive to manipulate or smooth the earnings figures. One counter argument to that could be that CEOs only aim for the highest possible performance. Anyhow, also positive earnings shocks would be harmful for the CEO's personal career since the volatility is not favoured by institutional investors, volatility makes forecasting more difficult and thirdly, it would not increase the CEO's personal credibility if he or she can't produce a smooth earnings path.

In addition to personal motivations of the management, companies have other aspects encouraging for earnings smoothing. Tucker & Zarowin (2006) studied the relation between

income smoothing and informativeness of future earnings. They categorize managements' use of reporting discretion in two classes: garbling and efficient communication. The first category includes actions taken by management, which decrease the information quality. The motivation behind this might be related to e.g. management's personal motives, like discussed above. The second category, which includes earnings smoothing for more efficient communication, improves the informativeness of earnings. According to Tucker & Zarowin (2006) these two categories lead to opposite predictions on how earnings smoothing affects the informativeness of future earnings. If income smoothing is mainly garbling, then it adds noise to income information and also makes historical financial information less informative on future earnings. On the other hand, if the income smoothing is used for efficient communication and more informative earnings, then smoothed earnings would provide more information also on future earnings. I elaborate on different smoothing methods and sources in section 2.1.2.

The key finding of Tucker and Zarowin (2006) is that companies with higher income smoothing have also higher information of future earnings in their current stock price. Their findings thus provide evidence to the garbling vs. efficient communication balance. Their empirical evidence suggests that managers use earnings smoothing to provide more information to the investors. Allayannis & Simko (2009) also provide supporting evidence to the efficient communication theory. They report a significant value premium on companies that smooth earnings, which is concentrated among firms with low analyst following. While it might be surprising that managers personal motives don't outweigh the goal to provide more informative earnings, the practical evidence supports it. This can be explained if managers' personal incentives in general are well in line with the company's incentives. When managers benefit more from benefits achieved by the company from efficient communication, managers don't garble but provide more informative earnings with earnings smoothing. Allayannis & Simko (2009) leave room also for personal motivation, since they find that the premium from income smoothing is mitigated by high analyst following. In other words, even though earnings smoothing doesn't increase information, the companies still do it, which can only be explained by personal motivation of the management.

Dichev & Tang (2008) report supporting evidence to the widely held managerial belief that earnings volatility is negatively related to earnings predictability. Based on their findings, smoother earnings improve both short and long-term predictability of earnings, up to 5 years

ahead. In addition, they state that based on volatility information one can identify systematic errors in analyst forecasts. Based on Dichev & Tang's (2008) reasoning, this suggests that analysts don't fully understand the implications of earnings volatility on predictability of future earnings. Dichev & Tang's (2008) empirical results also support the rationale discussed above. If one can find systematic errors on analyst forecasts on stocks with volatile earnings, one could argue that these stocks are difficult for analysts to handle. On aggregate level this could lead to analysts avoiding these stocks, since inaccurate forecasts might harm an analyst's career.

The analyst following based on smoothed earnings might be one motivational factor, which is not pointed out in the studies mentioned above. It would mean that smoother earnings provide a double benefit for a company: investors like stocks that provide smooth earnings and analysts like stocks that can be forecasted accurately. This would probably turn out to be an iterative process if a stock is liked by analysts, it will become more known by investors and increase in trading volume. This again would make the stock more interesting for analysts to follow since the stock is traded a lot. The rationale here is quite straightforward and stems from the better predictability of earnings. It provides another reason why companies would be motivated to smooth earnings.

Graham et al. (2005) provide insight on motivations based on an extensive survey done on managers. They point out three main motivations for smoother earnings. Firstly, managers think that smoother earnings lower the perceived risk of the company by investors. Secondly, they provide better negotiation position with customers and suppliers by assuring them that the business is stable and thus possibly providing better terms of trade. The third major motivation, according to the surveyed CFOs is that smoother earnings convey higher growth prospects to investors. In their study Graham et al. (2005) also discuss other sources of motivation to smooth earnings, such as reputation of the management team and personal career concerns. The message from the managers is consistent that they are very concentrated on meeting their financial benchmarks. Earnings smoothing is a good way for a company's management to increase the likelihood of meeting short term benchmarks. Negative shocks can be hidden with earnings management and positive shocks in financial performance can be distributed on a longer period so that the performance will be smooth also even in the future even though there would be some drawbacks.

Although smooth earnings give benefits to the management and to the company, there is a reason for the company to keep earnings management and smoothing within limits. Gaio & Raposo (2011) for example report a significant and positive relation between earnings quality and firm value. They also state that the effect is even stronger for companies that rely on external financing. This suggests that both equity and debt capital markets penalize a company for earnings smoothing that garbles information. Even though managers might be tempted to smooth earnings for their personal or company's benefit, they have to be wary of their earnings quality. The cost of weaker earnings starts to outweigh the benefits from smoother earnings when external investors start to require a premium from the risk associated to poor information. In a way, this acts as an upper bound for the amount of earnings smoothing companies should do to achieve the benefits from smoother earnings. Results of Gaio & Raposo (2011) provide supporting empirical evidence to the theory of garbling vs. efficient communication of Tucker & Zarowin (2006).

2.1.2. Smoothing sources

Managers have multiple ways of managing a company's earnings. The CEO, the CFO and rest of the management team have strong control over financial reporting and can affect how the financial performance of the company is represented to the public. Naturally these actions are strictly controlled by numerous accounting and corporate governance laws and guidelines but there is still some room for personal judgement and interpretation. For clarity, I divide the possible actions roughly in three categories below.

The first category includes all the methods that include fraudulent or illegal actions. These might include manipulation of bookkeeping in many ways such as imaginative billing, cost items circulated outside the company's books or misguiding valuation of assets or liabilities. Fortunately, this kind of operation is relatively marginal and is out of the scope of this study. It would presumably be relatively difficult to obtain a statistically meaningful dataset of companies that have fraudulently smoothed since supervisory authorities are doing all in their power to get these kinds of companies out of the market.

The second category of smoothing covers actions based on accounting technicalities and discretionary accruals. Although reporting standards are strict and aim for high comparability

and low manipulation possibilities, there is always some room to manoeuvre in. The function of external financial reporting is to represent a true and fair view of the company's operations and financial position but the management can use personal judgment and make interpretations also within legal boundaries. The earnings smoothing from source two has motivated a large amount of scientific research to help identifying earnings management. The model developed by Jones (1991) has motivated a large amount of research to identify if a company has managed their earnings with accruals.

The third category includes decisions that managers can take to steer the business towards smoother paths. For example if the CEO of a company has in the money executive options and the options are close to maturity he might be more risk averse. The CEO could for example have an opportunity of pursuing an investment case that has some sort of down-side risk in addition to the potential benefits. The manager here might be tempted to avoid this business venture since it could harm the valuable options that the manager has. Grant et al. (2009) provide empirical evidence on CEO incentives and income smoothing but the smoothing could also outside the company's financials and through managers decisions.

The last source of earnings smoothing is not necessarily seen in as negative light as the first two. The CEO of a company is chosen by the shareholders and she then defines the course of the business. It might very well be that the shareholders prefer a manager that chooses a steady path for the company. For example, Roychowdhury (2006) provides evidence that managers avoid risky business decisions due to preference on smoother earnings. The methods that he finds more common are discounts to temporarily increase sales, overproduction to report lower cost of goods sold and reduction of discretionary expenditures to improve margins. These are well within legal boundaries and work as small adjustments that the management can decide to make before reporting its financials.

Graham et al. (2005) also surprisingly found out that most earnings management is done via real actions, instead of manipulating accounting. Based on their survey, they report that managers candidly admit that they forego positive NPV projects to meet short-term earnings benchmarks and to keep the earnings path smooth. This is rather counterintuitive, since it destroys economic value and might be really expensive to the company. Accounting manipulation on the other hand, which would presumably have very low costs immediately but could be disastrous to the company or to the management personally, if revealed later to

the public. Graham et al. (2005) suggest that the tendency to smooth earnings with real actions instead of accounting manipulation could be due to the stigma of attached to accounting fraud after the Enron scandal and Sarbanes-Oxley-act.

2.2. Corporate risk management

Smoother earnings and cash flow can also come from risk management on a company's operations. This is the second theoretical concept in this study which provides smoother financial performance for companies, in addition to earnings management and corporate diversification. If the company is able to manage its operational risks it would certainly also have smoother financial performance. Successful risk management would presumably affect a company's financial statements similarly to earnings management from the third source and corporate diversification. The difficulty with corporate risk management is that it is really difficult to identify and measure externally. One good risk management measures is the use of derivatives for risk management[1]. Unfortunately I haven't been able to gather any information on the use of derivatives by the companies in the data set and thus I'm not able to directly contribute to the risk management literature in that field.

Even though it is difficult to analyze how much a company has put effort into risk management, this study is still tightly linked to the topic. Corporate risk management is a significant source of smoother performance for companies due to the benefits it provides. The lack of data in the use of corporate risk managements means that I will not be able to measure or analyze the magnitude of the effect of risk management in firm value. Anyhow, I will be able provide insight on how investors value successful risk management. This is due to the fact that successful risk management and earnings smoothing should have similar effect on the volatility of the financial performance. In other words, I will not be able to comment for example how use of derivates of money spent in risk management affects value but my results will contribute to the risk management literature by measuring the effect of successful risk management efforts.

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[1] Allayannis and Weston (2001) and Rountree et al. (2008) for example have used derivatives usage as a measure of risk management.

2.2.1. Value of risk management

Risk management literature generally suggests that risk management is value enhancing and something that companies should spend an effort on. Even though the Modigliani-Miller paradigm suggests that companies should not do any hedging, since the investors can hedge their own portfolios, there might several reasons for companies to engage in hedging. Froot et al. (1993) discuss the different risk management and hedging strategies companies should use. They illustrate how smoother financial performance is valuable for companies when external financing is more expensive than the internally generated sources of funds. In other words, well managed risks should increase the company's value and thus be beneficial to shareholders.

Froot et al. (1993) generate a theoretical framework for analyzing corporate risk management policies. The underlying idea is that if external sources of finance are more expensive than the internally generated funds, then companies would benefit from hedging. Hedging reduces the volatility of a company's cash flow and thus reduces the risk of cash shortfalls. Froot et al. (1993) discuss a wide range of practical implications that risk hedging has. Albeit being theoretical, the implications that the authors delineate have motivated a large amount of literature studying the benefits of corporate risk management. Also, even more importantly Froot et al. discuss a general framework that can be used to guide hedging strategies instead of analyzing special situations.

Allayannis & Weston (2001) provide empirical evidence on the value of risk management. They show that companies with currency risk exposure that use foreign currency derivatives for hedging are rewarded with a higher market valuation. Their evidence is significant and suggests a 4.87% premium to firms with no hedging. This is strongly against the theoretical Modigliani-Miller paradigm that suggests that hedging doesn't increase company value. The results are even amplified when Allayannis & Weston (2001) report an increase in value when firms started to use hedging and a decrease in value when companies quit hedging. Froot et al. (1993) provide great theoretical discussion on different hedging strategies, but the empirical results from Allayannis & Weston (2001) is even harder to dismiss. Successful risk management can be valuable for companies in practice.

2.2.2. Access to capital

Myers & Majluf (1984) introduce the pecking order theory, which is widely acknowledged in financial literature. It acts as backbone for capital structure decisions and thus also relates to the value of risk management. According to the pecking order theory, companies prioritize financing on the principle of least effort. This means that companies prefer internally generated funds over debt and debt over equity (Myers & Majluf 1984). Risk management, among other things, aims to reduce cash flow volatility. Cash flow volatility has a huge effect on a firm's capital structure decisions. Shortage on cash flow may defer capital expenditure or delay debt repayments, which would be very critical for companies with no spare internal funds available.

Minton & Schrand (1999) show that cash flow volatility is associated with lower levels of capital expenditure, R&D costs and advertising expenses. This provides evidence that companies don't use external capital markets seamlessly to cover volatility in its own cash flow but rather forego investments, if they don't have the sufficient capital available. Minton & Schrand's (1999) results also suggest that risk management is valuable. Even though companies would have the option to balance negative shocks in their operational cash flow with external financing, they don't do it in practice. Further on, the authors point out that cash flow volatility has a double effect on decreasing investment activity. In the same time cash flow volatility decreases investments directly and makes external financing more expensive, further discouraging the use of it.

Minton & Schrand (1999) conclude that their result don't suggest that companies should eliminate cash flow volatility in general, but take it into consideration when deciding on the scope of risk management. The contribution from this study is thus twofold: it provides evidence that companies rather forego investments than enter the capital markets and in the same time pinpoints the meaning of cash flow volatility. By preparing for cash flow volatility and analysing its possible effects, companies can plan risk management to mitigate underinvestment costs (Froot, Scharfstein & Stein 1993) .

Cash flow volatility would be extremely unwanted for companies that are reliant on external capital. Depending on the access to external capital the company would have stronger incentives to smooth earnings. From practical point of view it is easier for example to

negotiate with possible financiers if you can show a smooth earnings path in the history. High volatility in earnings and cash flow means higher risk for financiers. McInnis (2010) provides empirical evidence slightly against this rationale. Even though one could assume that smooth earnings would lead to lower cost of equity capital, McInnis (2010) finds no relation between smooth earnings and average stock returns. This suggests that investors are not compensated from the higher risk that earnings volatility provides. McInnis (2010) explains the relation of smooth earnings and lower cost of equity capital with optimistic analysts' long-term forecasts. Optimistic forecast yield too high target prices for stocks with volatile earnings, which translates into high cost of equity capital for volatile stock. Anyhow, smooth earnings don't provide lower costs and the illusion is explained by optimism in estimates for volatile stocks.

2.3. Corporate diversification

As a third source for smoother earnings I analyze the effect of corporate diversification. This forms the third category of smoother financial performance in addition to earnings management and corporate risk management. Conglomerates have inherently smoother cash flows since they operate in several business segments. This provides a natural operational hedge for the company if the risks between the different businesses are correlated. One could expect that corporate diversification affects company's financial performance similarly to corporate risk management and earnings smoothing from the third category described above. The only difference in corporate diversification is that information about the level of diversification is available due to the segmental reporting. IAS and IFRS reporting standards require companies to report their segmental earnings and thus corporate diversification is an interesting source of smoother financial performance since it can be analyzed separately.

The view on corporate diversification has changed in the history. Conglomerates were really popular in the 1960s. It was thought that companies operating several businesses could organize and manage them better than the segments separately. The low interest rates and good economic outlook led companies to acquiring smaller companies from different segments. The general view was that the internal capital markets are better informed and more efficient than the external capital markets. This changed largely during 1980s which led into the leverage buy out boom. The conglomerates were seen to be more valuable as separate entities. Financial investors used high leverage to buy the diversified giants and broke them

up and sold the pieces. Despite the negative attitude towards corporate diversification, there are still a large amount of well diversified companies. Thus the effect of diversification might not be only negative, which can also be seen from related literature.

The effect of corporate diversification has been studied a lot in the past decades. When the atmosphere towards conglomerates turned negative it also created numerous research papers which reported a discount on corporate diversification. Jensen (1986), Comment and Jarrell (1995) Shin and Stulz (1994) as well as Berger and Ofek (1995) all report a *diversification discount* on corporations operating in multiple segments. The literature has been rather inconclusive the actual reason behind the discount. A couple of year later, Campa and Kedia (2002) as well as Graham, Lemmon and Wolf (2002) suggest that the diversification itself might not be value decreasing and the diversification discount could be result of a measurement or self selection bias.

One of the first, well recognized, studies discussing a decrease in value due to diversification is the Jensen's (1986) paper where he argues that managers with excess cash flow and unused borrowing power undertake investments that are value decreasing. Although the paper is not per se a study on diversification discount and it is well recognized for its agency problem discussion, it provides a theoretical background for the logic why conglomerates could have a discount. If conglomerates are born through value decreasing investments then the new entity supposedly should be valued at a discount. This overinvestment problem should also be applicable to separate business divisions within a conglomerate. If the segments have excess cash flow and the conglomerate leaves room for the segment managers to make value decreasing investments, then the conglomerate should be less valuable than the segments as standalone entities, when they would have lower agency problems.

The negative relation between corporate diversification and firm value was reported by Comment and Jarrell (1995) and Lang and Stulz (1994). The aforementioned authors report a negative relation between abnormal stock returns and diversification during 1978-89. Lang and Stulz (1994) also report the diversification discount but they focused on Tobin's Q instead of abnormal returns. Both of these studies used a wide variety of corporate diversification measures from number of segments to Herfindahl-Hirschman indexes. Anyhow these two studies explicitly explain the source of the value loss. Corporate

diversification literature widely agrees that diversified companies are valued at a discount but it is still inconclusive regarding the reason behind it.

The diversification discount was also studied by Berger and Ofek (1995) who reported a 13-15% discount on conglomerates when the sum of the divisions' value is compared to the total company value. They find that the major source of the diversification is the overinvestment done by conglomerates. The loss on value is lower, however, for companies that operate in related industries. This is in contradiction when to the idea of smoother performance and risk hedges increasing company value (Allayannis and Weston 2001, Rountree et al. 2008). Conglomerates operating in related businesses would presumably not have as smooth earnings as conglomerates operating in non-related business segments. Berger and Ofek (1995) also find evidence that suggesting subsidization of poorly performing segments as a source of a value loss. The cross subsidization is rational in the group level to avoid taxes but harms the incentives for profitable segments to make profit since it will be given to loss-making segments. The unprofitable segments couldn't even exist as a standalone and when they are grouped with profitable segments the conglomerate company is valued at a discount.

According to Berger and Ofek (1995) the positive effects of diversification for corporations include: "greater operational efficiency, less incentive to forego positive NPV projects, greater debt capacity and lower taxes". On the other hand, the potential costs include increased discretionary resources to undertake value-decreasing investments, cross-subsidies that allow poor segments to drain resources from better-performing segments and misalignment of incentives between central and divisional managers, according to them. Berger and Ofek (1995) conclude that the potential benefits are outweighed by the costs of diversification.

There are also other benefits to corporate diversification identified by more recent papers. Di mitrov and Tice (2006) studied whether corporate diversification affects a company's access to credit and financial performance. They report that diversified companies have smoother cash flow and thus have higher debt capacity, which has been identified also in previous research. Dimitrov and Tice (2006) study companies over a business cycle and find out that during recessions focused firms that are dependent on their banks suffer a larger sales growth drop and increase in their inventory than their comparable segments of conglomerates. Their findings support the view that diversified companies are more stable, which is also valued by

banks. Diversified companies have better access to debt and can distribute the funds efficient internally. This is especially valuable during recessions when focused firms face difficulties and are threatened by financial distress. Conglomerates can arrange financing as a group and then make capital allocation decisions internally. Diversification thus is a very important source of financial stability and findings of Dimitrov and Tice (2006) support the view that diversification acts as an operational hedge for the company.

There have been also several papers in corporate diversification literature suggesting that corporate diversification is not as value destructive that the initial diversification discount research suggested. Campa & Kedia (2002) argue that the earlier research has missed some key characteristics of the companies that choose to diversify. These factors support authors' view that corporate diversification might not be value destructive as such. For example a company facing a technological change might try to adapt to the situation by diversifying (Campa, Kedia 2002). The company facing the technological change would most likely be poorly positioned to the current market environment and thus be valued at a discount. In this case, the diversification might be value enhancing to the company but the new diversified company would be valued at a discount. Campa & Kedia (2002) also identify other systematic patterns in diversification strategies and after controlling for them they report a significantly weaker diversification discount, which in some cases even turns into a premium.

Another paper suggesting that the diversification discount can be partly explained by the characteristics of the diversified companies has been written by Graham, Lemmon and Wolf (2002). They point out that the diversification literature implicitly assumes that standalone companies are comparable for divisions of conglomerates, which might lead to a measurement error. Graham et al. (2002) study M&A transactions and find that units that are combined into firms are priced at a discount, which leads into a negative effect on the excess value of the combined business as measured using the standard diversification discount methodology. Consistent with this they find out that excess value is not reduced when a firm diversifies without mergers or acquisitions. The findings of Graham et al. (2002) contribute to the literature suggesting that the diversification would not be value destructive as such and could be at least partially explained by a measurement error in previous literature.

Burch & Nanda (2003) use spinoffs and conclude that the diversification discount at least partially reflects a value loss due to the diversified nature of the firm itself. By using data

from spinoffs they are able to examine the excess value of the diversified company pre and post spinoff. With this approach, the spun off division has its own capital market valuation, which divisions under conglomerates don't have. Burch & Nanda (2003) build a strong case arguing that diversification decreases value instead of just being a measurement error like Campa & Kedia (2002) and Graham et al. (2002) suggest. Burch & Nanda's (2003) results oppose the field of literature explaining the diversification discount by methodological issues even though their approach shows improvements in excess value when companies reduce diversification.

All in all, the corporate diversification literature agrees that diversified companies are valued at a discount but it is inconclusive on the reason. It might be that companies buy companies at a discount which leads to a discounted conglomerate, discounted industries form conglomerates or that diversification just decreases value. The literature also agrees that there are some benefits to corporate diversification. Although the benefits might be only minor (tax saving 0.1% of sales Berger & Ofek (1995)), the diversification provides financial stability and operational hedge. Thus diversification is an interesting source of risk management and smoother performance companies. Based on Rountree et al. (2008) findings the stability would increase firm value, but the widely agreed diversification discount decreases value. These two opposite factors form an interesting theoretical setting, which is tested in my empirical tests in section 5.2.

2.4. Valuation aspects of volatile performance

When the purpose of this study is to examine the volatility of earnings and cash flow to firm value it is important to identify what previous literature predicts. Although the actual valuation theories are not in the focus of my thesis and I don't aim to provide any new evidence on them, they provide an interesting angle to my theoretical framework. The interesting angle comes from the volatility of cash flows and earnings and its treatment in valuation. The traditional asset valuation methods interpret volatility as risk, which decreases value (Sharpe 1964, Lintner 1965). Another view developed by Merton (1974) describes equity as a call option to a firm's assets. When applying option valuation model developed by Black & Scholes (1973), the volatility of the underlying assets increase the value of the option. This would suggest that larger volatility would increase the value of equity. The

discrepancy between these two predictions forms an interesting setting to my theoretical framework. In this section I elaborate this discrepancy by discussing the two opposite theories.

2.4.1. Cash flow volatility in valuation

The cornerstone of capital pricing lies on capital asset pricing model (CAPM) of William Sharpe(1964) and John Lintner(1965). The model they developed resulted in a Nobel Prize for Sharpe in 1990 and has worked as the base for modern portfolio theory and valuation. CAPM, in all its simplicity, is the valuation model that every other valuation model is benchmarked against. Although, my study doesn't contribute to the valuation literature, CAPM acts in a way as a backbone for my study, since I'm studying the valuation effect of cash flow volatility. The widely know CAPM-formula is:

$$r_a = r_f + \beta_a * (r_m - r_f)$$

, where r_a is the return of the asset and r_m is the return of the stock market and β_a is calculated with the following formula:

$$\beta_a = \frac{Cov(r_a, r_m)}{Var(r_m)}$$

The asset pricing formula is very intuitive and widely acknowledged in the literature. The formula covers the systematic risk (r_m-r_f) and the unsystematic risk factor (β_a). Even though the model doesn't include a direct measure of cash flow or earnings volatility, it is reflected in the beta of a company. The nominator of the beta-equation is a product of assets volatility and correlation coefficient to the market returns. This implies that if we have two stocks with same correlation to the market return, the one with higher return volatility should have higher discount rate and thus lower value. Even though the model doesn't apply cash flow or earnings volatility the connection between them and stock return volatility is presumably very tight. So, according to CAPM, higher systematic risk and unsystematic risk should directly lower firm value.

2.4.2. Equity option nature

While the valuation implication of cash flow volatility is straightforward and intuitive according to CAPM, the call option nature of equity provides a new angle to the topic. In his paper Merton (1974) discusses a company's credit risk and a method for pricing its liabilities using put-call parity, a traditional option valuation framework. He characterized the company's equity as a call option to its assets. With the option pricing formula developed earlier by Black & Scholes (1973), the model developed by Merton (1974) suggests that option valuation could be applied to the valuation of the company's equity. Following the two papers mentioned above, shareholders of the company hold a long call option, since the equity is a residual claim on the value of the firm. On the other hand, debt holders hold a short put and a risk free asset. In this setting the downside risk and upside potential are distributed asymmetrically between equity and debt holders. The contributions from these studies provided new insight to the valuation of risky debt and equity, which has motivated a large number of studies in the field known as contingent claims analysis. The key idea in contingent claims analysis is to analyze the value of corporate securities based on simple option contracts, like discussed above for equity.

In relation to the contingent claims analysis literature, Jensen & Meckling (1976) introduce the asset substitution problem in their well recognized paper discussing managerial behaviour, agency costs and ownership structure. By applying contingent claims analysis, shareholders can be thought to own a long call option to the firm's asset they would benefit from increasing the overall risk of the company, since that would give them a possibility to achieve high firm values in the future. In contrast, debt holders don't benefit from the increased risk, if the debt terms are already fixed. This would only increase the probability of default and reduce the value of their risk-free asset. By replacing the assets with more risky ones, the management would transfer value from debt holders to equity holders. If the shareholders could not credibly commit to not increase the risk of the firm's assets, the debt holders would instead require a higher premium (Jensen 1986, Jensen, Meckling 1976).

Based on this logic, the increased cash flow and earnings volatility would thus benefit equity holders of the company, which against the findings of Rountree et al. (2008). They pointed out that the benefits according to the Merton's equity call option model are outweighed by the

costs from more volatile earnings. Anyhow, this forms an interesting theoretical discrepancy, which is in the very core of my study. The finance literature has these two opposite predictions of the valuation effect of financial performance volatility, which I will be able to test in my empirical tests. In this sense, my study also contributes to the agency problem theory, if shareholders would benefit overall with the increased volatility of the financial performance of the firm.

Corporate diversification and equity option nature has also been studied by Gunnar Grass (2010). In his study, Grass uses contingent claims analysis in trying to explain the corporate diversification discount. The study has high theoretical relevance to my study since he examines how corporate diversification affects the option value of equity. In my theoretical framework, I have discussed studies that suggest that smoother financial performance increases value (Rountree, Weston & Allayannis 2008, Froot, Scharfstein & Stein 1993) and corporate diversification smoothens performance (Dimitrov, Tice 2006). Also, in this section I have discussed Merton's (1974) theory on the option value of equity, which would suggest that smoother financial performance decreases value. Grass' paper acts as a link between the corporate diversification literature and the theory of call option nature of equity, which are both in the very core of my theoretical framework.

Grass' (2010) paper is motivated by a study done by Mansi & Reeb (2002), who suggest that corporate diversification found in earlier studies by e.g. Berger and Ofek (1995), can be explained by the asset substitution problem. Mansi & Reeb (2002) hypothesize that wealth is transferred from equity holders to debt holders, when the overall riskiness of the company decreases, which increases the value of debt securities. They use the contingent claims analysis framework and find empirical evidence supporting their hypothesis. One of their main arguments is that, based on their analysis all-equity firms do not exhibit a diversification. This would suggest that the debt securities have a significant role in the diversification discount. Their rationale is that the corporate diversification discount is the decrease in equity value, when the risk level decreases and debt value increases.

Grass (2010) criticises the conclusion of Mansi and Reeb (2002). He states that their empirical analysis has several limitations. Mansi and Reeb (2002) fail to quantify how much conglomeration reduces firm risk and their analysis is purely based on linear regression analysis. Grass (2010) points out that option pricing should not be based on linear models and

uses contingent claims analysis to measure the valuation effects. He made three key findings in his study. Firstly, the effects of conglomeration on firm risk are highly related to firm size. Small conglomerates have an asset risk of 6.6% lower than their stand-alone counterparts but the effect is virtually zero on large conglomerates and their stand-alone counterparts. Secondly, the average expected wealth transfers is only 0.63%, suggesting that the conclusions of Mansi and Reeb (2002) would not hold and that the wealth transfer is not the key explaining factor in explaining the diversification. Thirdly, Grass (2010) also points out that his paper contributes to the corporate finance literature by showing that his low magnitude results in wealth transfer cautions against using changes in risk levels as a qualitative argument explaining broad economic phenomena. Grass (2010) also comments the contingent claims analysis in general, stating that it can be relevant in some special cases but is unlikely to explain economic phenomena on an aggregate level.

3. Hypotheses

Based on previous literature, I form the hypotheses for my study. As appears in the literary review different theories predict different effects on cash flow volatility. I summarize the predictions and introduce the hypotheses that I use in my thesis.

Based on Rountree et al. (2008) I expect to find a negative relation between volatile earnings and firm value. This would also be in line with the benefits that firms get from smoother earnings: higher analyst following, preference of institutional investors and lower perceived borrowing costs.

> **H1**: *There is a negative relation between earnings volatility and firm value.*

Since cash flow is an important component of earnings and is a key component for a company's growth, I expect to find a negative relation between cash flow variance and firm value.

> **H2**: *There is a negative relation between cash flow volatility and firm value.*

Graham et al. (2005) report that CFO's are almost solely focusing on smooth earnings while Rountree et al. (2008) that cash-flow volatility is reflected more in the firm value. This implies that smoothing done by adjusting accruals doesn't increase firm value and only actions that provide smoother business increase firm value. Thus, based on previous empirical findings, I expect to find no value enhancement on smoothing done by adjusting accruals.

> **H3**: *Earnings smoothing from accruals doesn't increase firm value.*

Smooth earnings are also the goal for many risk management activities in a company. This would be especially crucial for a company facing possible financial distress. Increased volatility for this kind of a company's cash flow could move it closer to the financial worries it tries to avoid. With high leverage, a company's equity is a call option to its assets with the debt acting as an exercise price (Merton 1974). While the call option would benefit from increased volatility according to the Black-Scholes model (Black, Scholes 1973), Rountree at al. (2008) report a decrease in firm value with increase in cash flow volatility. This forms an

interesting discrepancy between theories in previous research in the field. Since the company would need to be highly levered for the option to be really valuable, I expect to find a negative relation between leverage and firm value on aggregate level. In addition, Grass (2010) argues that the call option value of equity is a concept that applies in special situations but it is not enough to explain economic phenomena.

> **H4**: *There is a negative relation between leverage and firm value, even after controlling for cash flow volatility.*

Conglomerates have smoother earnings and cash flows, if they operate in several uncorrelated business segments. This acts as a sort of a operational hedge and reduces volatility of the sum of the parts and provides for example increased debt capacity (Dimitrov, Tice 2006) . On the other hand, previous research on corporate diversification has shown that diversified businesses are valued at a discount (e.g. Berger & Ofek 1994, Lang Stulz 1994, Comment & Jarrell 1995). This forms an interesting discrepancy between Rountree et. al's (2008) results that smooth cash flows are valued by investors and the corporate diversification discount showed by many studies in the field. I assume that the corporate diversification discount exceeds the benefits from smoother cash flows.

> **H5**: *Corporate diversification discount exceeds the benefits obtained from smoother cash flows.*

4. Data and methodology

In this chapter I introduce the data and measures used to estimate earnings and cash flow volatilities effect on firm value. I first describe the data used in the study. In the second section I describe the risk measures used in the empirical tests. The third section introduces the control variables used in my analysis and the fourth section describes the methodology used in the empirical tests

4.1. Sample construction

The data sample consists of European companies with non-missing observations for market data and accounting data during 2000-2010. I use three observation points in the data sample: 2000, 2003 and 2007. In these observation points there are variables that represent a snapshot from the firm's performance in the current fiscal year's end and then there are variables that are calculated from the following four year period. For example Tobin's Q is calculated with the figures from the current fiscal year, but the risk measures are calculated with the observations from the following four years. This is a method used also previously in similar studies (Rountree, Weston & Allayannis 2008, Shin, Stulz 2000).

Rountree et al. (2008) used a time period of 1987-2002. They also divided the data into three periods: 1988-1992, 1993-1997, 1998-2002, so that they could examine the volatility effects in different economic cycles. The first period (1987) was a recessionary period, the second (1992) was a recovery period and the last was a boom (1997). I have selected the years 2000-2010 with the same logic, but with the focus on next economic cycles. During that period stock markets experienced a downturn (2000-2003), a long and steady growth period (2004-2007), a dramatic drop (2008) and a recovery (2009-2010). This is clearly visible from the development of key stock indices, represented below in Figure 1.
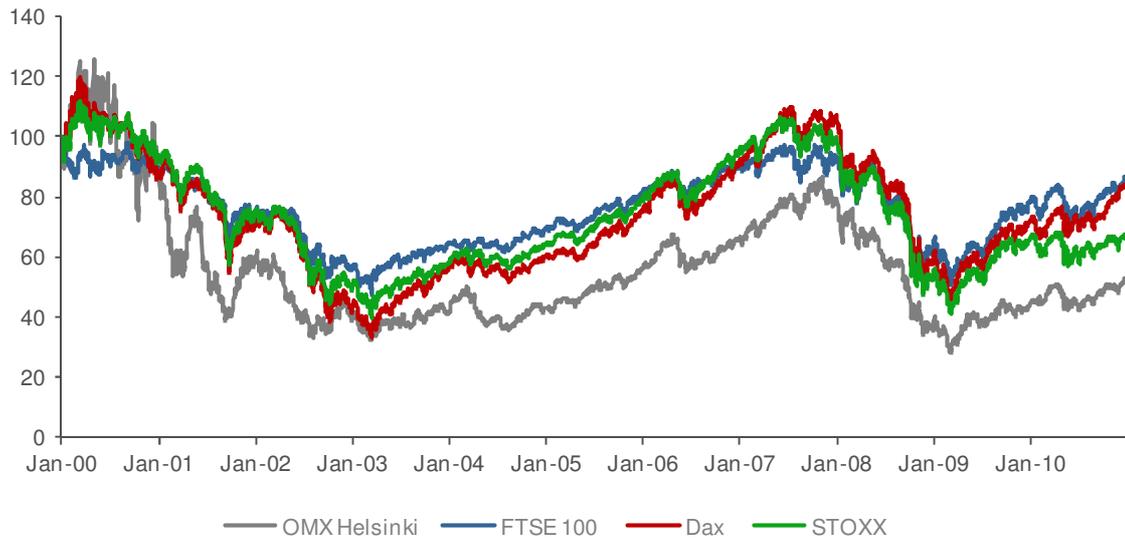
Figure 1: Stock market indices (Indexed, 2000=100)

The figure shows the development of large European stock indices during the sample period.

During 2000-2003 there was certainly a downturn in the stock markets after the dot-com bubble burst in the financial markets and most of the key indices lost nearly half of their value when compared to the peak in the early 2000. During 2003-2007 there was a great bull market when the large European stock markets almost doubled in value, almost reaching the peak 2000 values. During fall 2007 the financial crisis struck and the stock markets quickly plummeted reaching close to 2003 levels within a year and a half. The low point was reached by the beginning of 2009 and after that there was a slow recovery in the stock markets which has recently been shadowed by European debt crisis. The selected period for the dataset should provide interesting insight into the valuation implications of cash flow and earnings volatility during different economic trends and market sentiments. It would also provide additional empirical evidence on Rountree et al. (2008) by focusing on the next cycle.

For analysing the effect of earnings and cash flow volatility to firm value, I need variables which represent these attributes. The key variables thus would be cash flow per share (CFPS) and earnings per share (EPS) together with the variables for Tobin's Q. Tobin's Q is calculated with total assets, equity book value and equity market value. For more thorough tests, I also need other P&L and balance sheet items, such as: total asset, total debt and total equity. The selection of the variables is highly motivated by the methods used by Rountree et al. (2008) but the relevance of my control variables have also been shown in other related

literature[2]. Tobin's Q has been widely used in literature and similar studies[3]. It works as a good proxy for firm value although having some limitations.

I also study the effects of corporate diversification on the cash flow volatility and firm valuation. For this I need additional variables for corporate diversification. I have used the number of segments of the company and an internal Herfindahl-Hirschmann index calculated from segmental sales information[4]. These methods have been used in previous corporate diversification literature (Lang, Stulz 1994, Comment, Jarrell 1995). Thomson Worldscope provides segmental sales information for up to ten segments and I have calculated the number of segments from this information. The Herfindahl-Hirschman index is the sum of the squared internal "market share" of each segment. If a company, for example, has 10 segments and they all account for 10% of the sales the HH-index is 0.1. The index falls as corporate diversification increases. The variables used in the statistical analysis are described in more detail later on in section 4.3.

I gathered my data from Thomson Reuter's Worldscope and Datastream databases. The data gathering process started with all European companies, which totalled up to 13,875 in Worldscope database. This group was further narrowed down, when all the companies in the financial sector were excluded and all the companies with sales less than EUR 500,000 between 2001 and 2010. While the latter restriction might sound hard and limits the number of companies to only 2,671 in total for the period, I think that listed companies with sales below the limit are not comparable in their operative smoothness. If they are for example lottery stocks, then the CFPS and EPS volatilities are definitely not comparable and thus for example "perfect foresight for risk measures would not be plausible". Also, these could be some sort of listed holding companies, which do not have actual operations and once again, there are no actual operations to manage and no earnings figures to smooth.

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[2] For example Myers (1977) and Smith and Watts (1992) report that growth opportunities have an effect on firm value. These factors are studied with similar variables for growth and profitability in Shin and Stulz (2000) and Allayannis and Weston (2001)

[3] The use of Tobin's Q as a proxy for firm value is widely used in financial literature. For example Land and Stulz (1994) use it in corporate diversification research, Allayannis and Simko (2009) and Gaio and Raposo (2011) use it earnings management literature and Shin and Stulz (2000) and Allayannis and Weston (2001 use it corporate risk management literature. These are only examples from relevant literature but Tobin's Q has been widely used in other fields of financial literature as well.

[4] The Herfindahl-Hirschman index is widely used mainly in antitrust law for defining market share but the internal application has been used in corporate diversification literature.

In Continental Europe, equity has not been the most common source of financing and thus the external reporting standards have only recently developed to the level detail that they currently hold. Also, due to this historical reason I had to narrow my data sample period for 2001-2010. The lower limit on sales size has a great effect on the size of the sample. If I would have required the companies to be over the EUR 500,000 sales limit during e.g. 1996-2010, the amount of companies in the sample would have been only around 1,600. With my other strict restriction on the sample, this would probably have narrowed the sample group to be so small that I would have not been able to get any meaningful results out of the empirical tests.

Another aspect limiting the sample of available companies is the mandatory disclosure requirement of the cash flow statement. Before 1994 international accounting standards didn't require companies to disclose their statement of cash flows. This changed in the January of 1994 when IAS 7 came into effect. After that, the observations for annual cash flows grow in number but there is an obvious adaptation period for quarterly disclosure on cash flow, based on my findings. Although the disclosure of cash flow had been mandatory for a couple of years, only on the change of the millennium Worldscope starts to have observations of quarterly or semi-annual observations of cash flows. I also find an increasing trend with the cash flow per share observations meaning that the information increased on the market. The increasing trend in reported cash flow could have influence how the market values cash flow volatility. This is analyzed in section 5.1.2 and further information on this can be found in Appendix 1.

The setting is different in the U.S, where cash flow statement disclosure has been mandatory since 1987. This also explains why Rountree et al. (2008) were able to have their first observation period in 1987. The earlier mandatory disclosure requirement can partially be explained by the longer tradition of equity capital markets in the U.S.. In this sense the U.S. sample provides a more meaningful setting for the study.

With the 2,671 companies available after the sales requirement, I narrow the group further since I need at least semi-annual observations for cash flow per share. I start the filtering with cash flow per share, since I believe it is the rarest financial item that I need for my thesis. Also, it is one of the key variables in the thesis and thus I want to make sure that the companies included in the sample have reported their cash flows. Due to the late introduction

of IAS 7 the disclosure of cash flow is not very common in the beginning of my sample period. This narrows the group of eligible companies even further, since I need cash flow observations for my risk measures. Ideally, I would have quarterly cash flow observations for all of the companies in all of the sub samples but with this requirement my sample would have only been 80 companies. Naturally, this would make my empirical tests almost meaningless. To mitigate this, I satisfy with semi-annual cash flow per share observation. This means that I have included all the companies that have at least six observations in the first and last sub-periods and eight observations in the 2004-2007 period, which is one year longer. The requirement of semi-annual observations narrows down the sample to 778 companies in total, on which I performed the empirical tests.

As such the sample is definitely not perfect. I still have missing observations for other variables. I mitigate this by for example coding value 0 for missing profitability and leverage observations. If I would have narrowed by sample further down I would have risked the meaningfulness of my empirical tests even further. Also, I have made some manual corrections to the data. The most important of these is the adjustment for Great Britain stock. For the calculation of equity market value I used the amount of shares outstanding multiplied by the year's end share price. British stocks' price is given in pence from the Worldscope database and I have divided the prices by 100 to make them comparable with other items in Tobin's Q calculation.

The Table 1, Panel A below reports the summary statistics of the data sample of 778 companies. Many of my variables are skewed and have high standard deviations. The dataset is not perfect and possibly forms the largest limitation of my study. To mitigate problems with the dataset, I have winsorised all of the variables at 5% and 95% tails. Naturally, the winsorising helped me to get rid of significant outliers and thus the dataset should provide more meaningful results in the empirical analysis. This is especially crucial since OLS-regression is my main method in empirical tests and it is vulnerable to significant outliers. On the other hand, one could argue that winsorising at 5% tails reduces the informativeness of results since the outliers also tell about the value effect of cash flow and earnings volatility. In this case, there were a small number of extremely high volatility observations instead of high skewness. To reduce the effect of these individual observations, I have used winsorising and think that the overall informativeness of my results is thus better.

My sample firms have a mean (median) value of assets of €4,945 (€443) million and a mean equity value of €3,884 (€393 million. The average return on assets is 4.2% (5.2%) and the average debt-to-assets is 20.3% (19.3%). I measure a company's growth by sales growth and capital expenditure per sales. The mean sales growth between the observation period and the previous period is 14.4% and the median 8.5%. Capex-to-sales mean is 5.6% and the median is 3.7%, representing a less skewed variable for growth. The mean Tobin's Q is 1.71 (1.35) with relatively low standard deviation of 0.95, when compared to e.g. Rountree et al.'s (2008) 1.60 and Shin & Stulz's (2000) 2.16. In the Panel A I also report the summary statistics of the corporate diversification measures. The companies in my sample have on average 3.2 segments and have an average Herfindahl-Hirschman index of 0.55, meaning that my sample consists of mainly diversified firms.

When comparing the summary statistics of my control variables to similar studies done previously, I find that mean and median values are close to the values reported by them (Allayannis, Simko 2009, Rountree, Weston & Allayannis 2008, Allayannis et al. 2001). Anyhow, like for Tobin's Q, all the other control variables except for sales growth in my sample have also lower standard deviation than what has been reported in these comparable studies. This might suggest that winsorising has manipulated the data set too much. Naturally, winsorising decreases standard deviation and loses information from the tails, but I think that winsorising has been beneficial for my study. There were significantly large individual outliers in my sample, which skewed the dataset. After winsorising the summary statistics are in line with previous studies, which should provide comparable results to earlier research, although losing information from observations in the extreme ends.

In Panel B of Table 1 are represented the summary statistics of my key risk measures. The construction of systematic and idiosyncratic risk measures is discussed more in the section 4.2. In addition to them, I use cash flow volatility and earnings volatility as a measure of risk. The volatilities are calculated on quarterly or semi-annual observations, based on the availability of the information. The mean (median) quarterly earnings per share is 1.55 (0.59) with a standard deviation of 3.0. The corresponsive figures for cash flow per share are 3.46 (1.06) and 5.7.

These figures are slightly different from Rountree et al. (2008), who studied the same variables. I have significantly smaller risk measures and larger earnings and cash flow per

share figures than Rountree et al. (2008). Although the standard deviations are only slightly larger than in previous research, I have larger mean and median earnings and cash flow figures. Rountree et al. (2008) standard deviation of approx. 3.6 and 2.5 times the mean for earnings and cash flow per share respectively. The standard deviations in my sample are 1.9 and 1.6 times mean for earnings per share and cash flow per share respectively, which also tells about larger than normal mean figures. The situation here would certainly be better if I would have restricted the sample to only companies with quarterly observations available, but that would have diminished my sample to only 80 companies.

Table 1: Summary statistics
This table presents descriptive statistics for our sample of firms. The sample contains all firms with available annual and quarterly data on Thomson Worldscope and Datastream during 2000, 2003 and 2007. The final sample consists of 696 firms in 2000, 753 firms in 2003 and 762 firms in 2007 for a total of 2,211 observations. All variables are defined in section 4.3. All the variables are winsorised at 5% and 95% levels.

	Mean	St.dev.	25%	Median	75%
Panel A: Descriptive variables					
Total assets (€m)	4945.5	10087.62	91.8	442.6	3220.7
Market cap (€m)	3884.4	8078.282	77.7	392.6	2541.1
Return on assets	0.042	0.086	0.014	0.052	0.090
Debt-to-assets	0.203	0.155	0.058	0.193	0.319
sales growth	0.144	0.250	-0.007	0.085	0.221
CAPEX-to-sales	0.056	0.054	0.019	0.037	0.221
Tobin's Q	1.706	0.952	1.074	1.348	1.960
Herfindal-Hirschmann index	0.545	0.295	0.347	0.518	0.766
Number of segments	3.156	1.994	2.0	3.0	4.0
Panel B: Measures of risk					
Systematic risk	0.001	0.001	0.000	0.000	0.001
Idiosyncratic risk	0.003	0.003	0.001	0.002	0.004
Earnings per share (EPS)	1.550	3.011	0.030	0.592	2.210
Volatility of EPS	0.785	1.103	0.329	0.329	0.893
Cash flow per share (CFPS)	3.459	5.687	0.123	1.056	3.921
Volatility of CFPS	1.175	1.973	0.123	0.386	1.109
Total earnings	214.8	491.2	0.6	12.6	119.6
Total cash flow	456.8	996.2	4.2	32.4	277.4

4.2. Risk measures

Naturally firm value is always dependent on the risk level of the company. When I want to study the value effect of cash flow and earnings volatility I also need to control for other

possible risk sources. It is important to identify the sources of risk for thorough empirical analysis. Of course, past estimates of risk should already be priced in the Tobin's Q at time t. Thus, I should not focus on past risk levels even though there would be correlation between past and future risk. Firm value at time t should reflect more the expectation of future risk of the company.

Similarly to Rountree et al. (2008) and Shin and Stulz (2000) I use 'perfect foresight' introduced by the latter authors for all of the risk measures in my study. I estimate systematic risk and idiosyncratic risk using a one factor market model with the largest European stock market indices as proxies for the market. Please see Appendix 2 for the matched country codes and stock indices of the companies. Systematic risk is calculated as the product of beta squared and variance of the logged returns of the market proxy. The perfect foresight measures are constructed so that the observation at time t uses risk measure calculated on quarterly observations at t+1..3. For example for observations in 2000 I have used weekly observations for the company and the market proxy during 2001-2003[5]. Idiosyncratic risk is the variance of the residual of the market model estimated above. Panel B of Table 1 shows the summary statistics of the used risk measures. The mean systematic risk is 0.001 and the mean idiosyncratic risk is 0.003. These results are in line with the risk measures reported in earlier studies, although they are at a significantly lower level.

In addition to the risk measures estimated with the single factor market model, I also use volatility of earnings, cash flow and accruals as a measure of risk. These are also calculated utilizing the 'perfect foresight' by estimating the volatility for period t based on observations from the future. For example, for 2003 I have calculated the volatility of available earnings per share observations in 2004-2007. This might result in some sort of inaccuracy since some of the companies report their cash flow and earnings quarterly and some semi-annually. Anyhow, this is the best estimate for future volatility and it provides statistically meaningful results as shown in section 5. Cash flow, earnings and accrual volatilities are all scaled by shares and obtained directly from the Thomson Worldscope database, without any adjustment for extraordinary items.

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[5] Rountree et al. (2008) use monthly observations with a five year period while Shin and Stulz (2000) use daily observations with a one year period. I have used weekly observations to compensate with shorter periods that I have in my sample. I also performed the test with monthly observations, but statistical significance (p-value) and explanation power (R^2) were significantly better with weekly observations.

The average (median) volatility of cash flow per share is 1.18 (0.39) and average earnings per share 0.79 (0.33). The summary statistics show skewness, which is mitigated by taking the natural logarithm of the risk measures in empirical tests. This is elaborated more in the next section when I discuss the used methodology. When looking at volatility of EPS and CFPS, which have been calculated from quarterly or semi-annual observations the situation is slightly better than for the other control variables, discussed earlier. These are the volatilities used in my empirical tests and they are well in line with Rountree et al.'s (2008) reported figures of 0.96 (0.33) and 0.72 (0.19). The standard deviations of these volatility measures are even smaller in my data set when compared to Rountree et al.'s (2008) figures. This can partially be explained by the winsorising I have performed on the variables.

Table 2 below reports the correlations between the used risk measures. On a univariate basis, Tobin's Q is positively correlated with both systematic risk and idiosyncratic risk. Rountree et al. (2008) made the same finding and explained it with large firms generally having less volatile equity returns and lower value. Overall, all of the risk measures are positively correlated with each other. The positive correlation is not surprising since they are mostly products of each other. The correlation is especially strong between systematic risk and idiosyncratic risk (0.27) as well as between volatility of EPS and volatility of cash flow per share (0.75).

Rountree et al. (2008) found also a strong positive correlation between earnings and cash flow volatility (0.82) and reasoned that Graham, Harvey and Rajgopal's (2005) reported managerial focus on earnings is justified if the measures have a very strong positive correlation. Based on this logic, investors would not have to adapt to following cash flow after the new reporting standards in late 1990s. When investors and managers focus mainly on EPS, they also get information of the course of business on cash flow basis if these two measures are highly correlated with each other. Rountree et al. also reported a strong positive correlation between systematic risk and idiosyncratic risk (0.48). Although my correlation coefficient is slightly smaller between these risk measures (0.27) it is still strong and positive and thus in line with previous research.

Table 2: Correlation table
This table presents Pearson correlations among our main risk variables utilized in subsequent tests as well as our proxy for firm value, Tobin's Q. All variables are defined in section 4.3. P-values are reported in parentheses. All the variables are winsorised at 5% and 95% levels

	Tobin's Q	EPS	CFPS	Total assets	System. Risk	Idiosync. risk	Volatility of EPS
Earnings (EPS)	-0.061 (0.004)	1.0					
Cash flow (CFPS)	-0.147 (0.000)	0.780 (0.000)	1.0				
Total assets	-0.106 (0.000)	0.349 (0.000)	0.344 (0.000)	1.0			
Systematic risk	0.216 (0.000)	0.034 (0.112)	0.030 (0.151)	0.166 (0.000)	1.0		
Idiosyncratic risk	0.143 (0.000)	-0.284 (0.000)	-0.205 (0.000)	-0.252 (0.000)	0.269 (0.000)	1.0	
Volatility of EPS	-0.173 (0.000)	0.470 (0.000)	0.632 (0.000)	0.203 (0.000)	0.047 (0.028)	0.013 (0.537)	1.0
Volatility of CFPS	-0.133 (0.000)	0.409 (0.000)	0.630 (0.000)	0.175 (0.000)	-0.007 (0.749)	0.035 (0.102)	0.750 (0.000)

Naturally, the small sample size affects the statistical significance of some of my correlation estimates. Even though, the correlations between some of the risk measures are not statistically significant, they are mostly consistent with the findings of Rountree et al. (2008). The main differences in the correlation coefficients between the key risk measures are between idiosyncratic risk and volatility of EPS. They report correlation coefficient of 0.18, while my estimate is 0.01. My estimate is not statistically significant and thus doesn't provide contradictory evidence on the correlation between the two variables. Like mentioned above, they also reported a

4.3. Methodology

In this section I describe the methodology I used in the study to test my hypotheses. I discuss both univariate tests and multivariate OLS regressions that I have performed. I start first by discussing the univariate methodology that I have used for testing the effect of cash flow volatility on firm value. I introduce the control variables used my tests for cash flow volatility and corporate diversification. I then introduce the multivariate regression model and discuss the additional control variables used in the regressions.

Univariate tests in section 5.1.1 focus on cash flow volatility and control variables for size, leverage, absolute cash flow level and earnings volatility. I begin the test with calculating mean and median Tobin's Q for each cash flow and earnings volatility quintile. In the following univariate tests I have divided the companies into quintiles based on different variables. The variables used in the univariate tests are the following.

Cash flow: Thomson Worldscope item *Cashflow,* which represents funds from operations. The item represents the sum of net income an all non-cash charges or credits totalling up to the cash flow of the company.

Cash flow volatility: Cash flow volatility is the standard deviation of quarterly or semi-annual cash flow per share observations from Thomson Worldscope database. The volatility is calculated applying a perfect foresight following Shin and Stulz (2000).

Debt-to-assets: Thomson Worldscope item *Total Debt % Total Assets* which is calculated as follows (*Short Term Debt & Current Portion of Long Term Debt Lon Term Debt) / Total Assets.*

Earnings volatility: Earnings volatility is the standard deviation of quarterly or semi-annual cash flow per share observations from Thomson Worldscope database. The volatility is also calculated applying a perfect foresight similarly to cash flow volatility, following Shin and Stulz (2000).

Tobin's Q: Tobin's Q is very widely used as a proxy for firm value in financial literature. I have calculated the Tobin's Q with *total assets – book value of equity + market value of equity* in the nominator and *total assets* in the denominator. This should free me from the issue of finding the actual amount of shares outstanding when I have used book value of common equity and number of common shares outstanding times the year end close price as market value.

Total assets: Thomson Worldscope item *Total Assets* which represents the sum of total current assets, long term receivables, investments in unconsolidated subsidiaries, other investments, net property plan and equipment and other assets.

Using the variables described above, I have then constructed tables showing mean Tobin's Q for each cash flow volatility and control variable quintile. This way I'm able to compare how valuation is changed by increase in the either variable quintiles. The main output from these tables is the differences between the highest and lowest quintiles of each variable, which is calculated in the table. This method is highly motivated by the univariate test performed by Rountree et al. (2008).

In the second part of the univariate tests I also examine the effect of corporate diversification. I start by showing the mean and median cash flow volatilities based on how many segments the company operates in and based on the Herfindahl-Hirschman index classes. I then proceed to analyze cash flow volatility's valuation effect as in the first univariate tests with the cash flow volatility quintiles. I examine the value effect of cash flow volatility with corporate diversification measures, which are calculated in the following manner.

Number of segments: I use Thomson Worldscope's segmental sales reporting items. The database reports segmental sales for up to ten segments. I check all ten segments for each company and calculate on how many segments the company reports sales. Some don't have segmental disclosure, so they have 0 segments based on this analysis. These companies are excluded from my analysis.

Herfindahl-Hirschman Index (HHI): An application for the HHI, which is widely used in antitrust law. Internal HHI calculated as the sum of the segments 'market shares' of the company's total sales. For example, if the company has two segments with sales split 50/50, the internal HHI is 0.5^2+0.5^2=0.5. This method has been used in corporate diversification literature[6]

Multivariate tests would comprise various OLS regression test examining the relation of cash flow volatility and firm value. Regression models take into account factors that are relevant based on previous research. My regression models are highly motivated by the models introduced by Rountree et al. (2008). I also elaborate the models and introduce a new

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[6] For example Comment and Jarrell (1994) and Lang and Stulz (1994) used an internal HHI application when they studied diversification discounts on companies.

corporate diversification variable in the second part, where I control for corporate diversification.

All of my univariate tests are OLS-regressions with the natural logarithm of Tobin's Q on the left hand side. The right hand side will comprise several independent variables and control variable depending on the model used. The basic form of the regression model would thus be:

$$ln\left(Tobin's\ Q_{ij}\right) = a + \delta_j ln(CV_i) + \delta_j CV_i$$

Where Tobin' Q for firm j in period i is calculated as described above, a is constant, δs are the correlation coefficients and CVs are the used control variables in the model. The control variables used in the models are the ones described above, in addition to the following:

Accrual volatility: Standard deviation of quarterly or semi-annual accruals. Similarly to Rountree et al. (2008), I estimate the accruals as *earnings per share – cash flow per share*. The volatility of this is calculated using the 'perfect foresight' similarly to cash flow and earnings volatility.

Capex-to-sales: Obtained from Thomson Worldscope and represents the *capital expenditure / net sales* in the reporting period. Capital expenditure represents the funds used to investments in other than acquisitions.

R&D-to-sales: Obtained from Thomson Worldscope, which represents the *R&D expense / net revenues*. R&D expenses include "-- all direct and indirect costs related to creation and development of new processes, techniques, applications and products --", according to Worldscope item descriptions.

Idiosyncratic risk: Computed as the variance of the residual risk, calculated using the single factor market model with the matched stock market indices as a proxy for market returns.

Return on assets: Thomson Worldscope item *Return on assets* which represents the ratio between *(net income + interest expense) / total assets.*

Sales growth: Thomson Worldscope item that is calculated as the growth between previous period and current period.

Systematic risk: Constructed as beta squared multiplied by the market variance. Beta and the market variance are calculated from the future 3-4 years using the matched stock market indices. This method follows the 'perfect foresight' used by Shin and Stulz (2000) and Rountree et al. (2008).

In addition to examining the valuation effect of cash flow volatility I also study earnings volatility and accrual volatility in my multivariate test. Even though cash flow volatility would theoretically provide a more efficient measure of firm related risk, companies tend to focus more on EPS and the bottom line (Graham, Harvey & Rajgopal 2005). The rationale follows Rountree et al. (2008) assuming that earnings volatility is the sum of cash flow volatility, accrual volatility and covariance of cash flow and accruals. When earnings volatility is decomposed to the latter three factors, I can study how they contribute to the valuation effect.

In addition , I use correlation between cash flow and accruals as a measure of active earnings management done by the company. This follows Leuz, Nanda, Wysocki (2003) who point out that the more negative the correlation between cash flow and accruals the more the company does earnings smoothing. This means that accruals are used to smooth negative shocks in the firm performance and thus earnings are not a realistic measure of the firm's performance. Further on, this would mean that earnings volatility itself would not be truthful measure of corporate risk and thus me need to analyze the effects of its components separately.

I take the natural logarithm of Tobin's Q, risk measures, total assets and accrual volatility in my models. This eases the interpretation of the results, due to the significant skewness of my variables. This naturally converts the interpretation of all logged independent variables to elasticities. The transformations do not have a qualitative impact on the results and are done only to make the models more efficient and easier to interpret. The multivariate regression analysis is performed with various settings. The different settings are reported as separate models in different columns in the result tables.

In section 5.2.2, where I report the multivariate results on models that control for corporate diversification, I use a dummy variable, which has takes the value of 1 if the company has two or more segments and is 0 otherwise. This way, the companies that don't report segmental sales and have 0 as the number of segments, will be included in the category "non-diversified firm (dummy variable value 0), which forms a certain measurement error. This method anyhow has been used in previous diversification research (Lang, Stulz 1994, Comment, Jarrell 1995). While this method for corporate diversification is rather simple, I perform more detailed analysis on corporate diversification in my univariate tests. I also performed multivariate regression analyzes with other corporate diversification measures but they did not yield as statistically meaningful results. Thus, the diversification indicator is the only reported diversification measure in the multivariate results.

In addition to the above described control variable measuring corporate diversification, I have incorporated an interaction variable in my section 5.2.2 multivariate tests. A situation, where diversification affects cash flow volatility, which affects firm value, would need an instrumental variable for capturing this effect. Instead of developing a sophisticated instrumental variable I have constructed the interaction variable by multiplying the number of segments by the cash flow volatility of a company. This way we are able to get an indication how diversification works as an hedge for cash flow volatility (Dimitrov, Tice 2006) and how this smoother performance would affect firm value (Rountree, Weston & Allayannis 2008). A more sophisticated instrumental variable could probably have captured the effect in a more detailed way but the interaction variable works as a rougher proxy. This naturally leaves room for further research in the field and on this topic.

5. Empirical results

This part of the study represents the empirical findings and results of this study. In the first part I focus on cash flow volatility, earnings volatility and firm value. I first analyze the effect of cash flow volatility to firm value with different control variables based on univariate tests and then proceed to show the results of multivariate tests. In the multivariate tests I also study the effect of earnings and accrual volatility to firm value with various control variables. The second part of this chapter represents results with corporate diversification as an additional control variable. This section is structured in a similar way so that I first analyze the univariate tests on corporate diversification, cash flow volatility and firm value and proceed to the multivariate tests. The multivariate tests replicate similar test to the first section but include also control variables for corporate diversification

5.1. Cash flow volatility, earnings volatility and firm value

5.1.1. Univariate tests

The first part of the results section focuses on cash flow volatility, earnings volatility and firm value. The tests follow the same setting that Rountree et al. (2008) used in their study. This section focuses on cash flow volatility and earnings volatility, providing evidence for hypotheses one to four. The analysis revolves around univariate tests where I have divided the sample into quintiles based on cash flow volatility, earnings volatility and different control variables. Results of these tests are reported in Table 3 below.

From Table 3 we can see that firm value, measured by Tobin's Q is negatively related to both cash flow and earnings volatility. It can be seen from the first Panel A, which reports the mean and median Tobin's Q for different cash flow and earnings volatility quintiles. The effect is present in both results in mean and median Tobin's Q figures, throughout the different volatility quintiles. Even though the effect is not present between all of the quintiles, the overall difference between the highest and lowest quintile is distinctive and statistically significant in both measures. This is in line with Rountree et al. (2008) findings, although they reported even stronger and consistent effect between each quintile. The results from Panel A

Table 3: Cash flow & earnings volatility, univariate results
This table presents univariate results, focusing on cash flow volatility, earnings volatility and firm value. I have grouped companies into quintiles based on their earnings and cash flow volatility. Panel A reports mean and median Tobin's Q for earnings and cash flow volatility quintiles arranged from low to high. Panels B-D present further univariate results where companies have been divided into quintiles based on size, leverage, and cash flow level. Panel E presents results sorting on both cash flow and earnings volatility.

Panel A:	Cash flow volatiltiy						
	Smallest	2	3	4	Largest	Difference (1st-5th)	P-value
Mean Tobin's Q	2.358	2.009	2.157	1.644	1.675	0.683	0.000
Median Tobin's Q	1.501	1.497	1.417	1.304	1.188	0.313	0.000

	Earnings volatility quintile						
	Smallest	2	3	4	Largest	Difference (1st-5th)	P-value
Mean Tobin's Q	2.455	2.088	2.057	1.743	1.493	0.963	0.000
Median Tobin's Q	1.581	1.499	1.344	1.341	1.196	0.385	0.000

	Size quintile						
Panel B: Average Tobin's Q	Smallest	2	3	4	Largest	Difference (1st-5th)	P-value
Low Cash flow volatility	2.990	1.946	2.068	1.958	1.812	1.178	0.000
2	2.208	1.862	2.057	1.891	1.970	0.237	0.000
3	2.685	2.344	2.242	1.857	1.731	0.954	0.000
4	2.246	1.560	1.728	1.522	1.532	0.713	0.000
High Cash flow volatility	3.737	1.982	1.493	1.388	1.331	2.406	0.000
Difference (low-high)	-0.747	-0.036	0.575	0.570	0.481		
P-value	0.000	0.000	0.000	0.000	0.000		

	Debt to total assets quintile						
Panel C: Average Tobin's Q	Low	2	3	4	High	Difference (1st-5th)	P-value
Low Cash flow volatility	2.41	3.46	1.85	1.73	1.83	0.583	0.000
2	2.44	2.16	1.76	1.68	1.88	0.556	0.007
3	3.55	2.26	1.79	1.55	1.49	2.062	0.000
4	2.12	1.73	1.56	1.46	1.54	0.578	0.000
High Cash flow volatility	2.56	2.58	1.45	1.30	1.20	1.367	0.000
Difference (low-high)	-0.151	0.879	0.408	0.432	0.633		
P-value	0.000	0.000	0.000	0.000	0.000		

	Cash flow level quintile						
Panel D: Average Tobin's Q	Low	2	3	4	High	Difference (1st-5th)	P-value
Low Cash flow volatility	2.90	1.98	2.32	2.04	2.09	0.809	0.000
2	2.28	1.72	2.04	1.95	2.12	0.161	0.000
3	2.64	2.07	2.41	1.96	1.80	0.842	0.000
4	1.87	1.71	1.66	1.60	1.55	0.325	0.000
High Cash flow volatility	3.22	1.59	1.35	1.38	1.42	1.798	0.000
Difference (low-high)	-0.318	0.387	0.978	0.659	0.672		
P-Value	0.000	0.000	0.000	0.000	0.000		

	Earnings volatility quintile						
Panel E: Average Tobin's Q	Low	2	3	4	High	Difference (1st-5th)	P-value
Low Cash flow volatility	2.48	2.08	2.23	1.44	1.26	1.220	0.000
2	2.27	2.07	1.72	1.77	1.30	0.975	0.000
3	3.07	2.07	2.04	2.09	2.73	0.345	0.004
4	1.54	2.11	1.67	1.63	1.46	0.080	0.290
High Cash flow volatility	1.35	2.69	4.35	1.63	1.39	-0.044	0.000
Difference (low-high)	1.133	-0.615	-2.120	-0.193	-0.131		
P-Value	0.000	0.000	0.000	0.000	0.000		

provide initial evidence that supports hypotheses one and two. The result also supports the traditional asset pricing view that higher volatility of earnings and cash flow means higher risk for the company which in turn means lower valuation (Sharpe 1964, Lintner 1965). Higher cash flow and earnings volatility would here mean a higher risk for the investors and thus lower valuation for the company.

The other univariate tests in Panels B-D, with various control variables show that many factors affect firm value. When dividing the sample into quintiles based on firm size, leverage and absolute cash flow level, we see that they all seem to be negatively related to firm value. Increase in each of the control variables translates into lower valuation. On the other hand Panels B-D also provide first evidence how cash flow volatility is valued after controlling for size, leverage and cash flow level. They provide somewhat mixed information on the effect of cash flow volatility. Based on my results, the highest cash flow volatility quintile has the highest mean Tobin's Q, for companies with smallest size, least leverage and lowest cash flow level. In first columns of Panels B-D the difference between lowest and highest cash flow volatility quintile is negative. This is against the results of Rountree et al. (2008) and rather counter-intuitive. It is most likely caused by the quality of my data, since the relation between cash flow volatility and firm value is negative throughout other control variable quintiles and also in the smallest quintiles if we calculate the difference between the lowest cash flow volatility quintile and second highest cash flow volatility quintile. In other words, there is something in my data set which affects only the group which is in the highest cash flow volatility quintile and lowest size, leverage and cash flow level quintile.

From Panel C in Table 3 we also get first indications of the effect of leverage to firm value, when controlling for cash flow volatility. The results are in line with the findings of Rountree et al. (2008) in line with hypothesis four. Leverage is significantly and negatively related to firm value. This suggests that the cost of volatile cash flows is larger than the benefit for the call option of equity, introduced by Merton (1974). The effect is also the second largest with the highest leverage quintile, although one could assume that with high leverage the benefits for the call option would be the largest. This suggests that companies with highest leverage should focus on keeping their financial performance smooth to avoid financial distress instead of trying to maximize the call option value of equity. My findings also suggest Grass' (2010) notion that contingent claims analysis and call option nature of equity is applicable in some special cases but is not strong enough to explain economic phenomena on an aggregate level.

Finally, Panel E reports the results from dividing the sample into quintiles based on both cash flow volatility and earnings volatility. The panel reports a significant increase in value for firm value in each earnings volatility quintile (column), when we move up in cash flow volatility quintiles. Conversely, firm value decreases in each cash flow volatility quintile (row), when we move up in earnings volatility quintiles. The results are exactly opposite to what Rountee et al. (2008) reported. They found out that within each cash flow volatility quintile the value either does not change or increases. Panel E gives first indications of opposite results from my study compared to the one conducted by Rountree et al. (2008). The interaction between cash flow volatility and earnings volatility is elaborated more in the next section.

Overall, the univariate results provide evidence supporting hypotheses one and two. Both cash flow and earnings volatility seem to have strong and significant negative relation to firm value. The effect is even stronger with companies with high leverage. This provides evidence also supporting hypothesis four and suggesting that the cost of potential financial distress is larger than the benefit from volatile earnings to the call option nature of equity. My findings from univariate tests are in line with similar test done by Rountree et al. (2008), although the effects are not so strong and consistent as they reported. In the next section I go deeper into the effects of cash flow and earnings volatility with other control variables in my multivariate tests.

5.1.2. Multivariate tests

The multivariate tests give more thorough insight on factors affecting firm value with cash-flow and earnings volatility. Table 4 in the following page presents the results of least squares (OLS) regression with the natural logarithm of Tobin's Q as the dependent variable and the variables on left as independent variables. In Column 1 I start with a model, which only has the control variables without any risk measures and then continue to other models by adding various control variables measuring risk. I have stated the predicted sign of the coefficient after the variable in the most left hand side column. The results are organized so that I report all of the results from my multivariate tests in this section Table 4 with adding various controls for risk in Columns 2-7.

The coefficients for the control variables in Column 1 are similar to what theory predicts and what has been reported in similar studies (Allayannis, Simko 2009, Rountree, Weston & Allayannis 2008, Allayannis et al. 2001). Consistently to what theory predicts size is negatively related to firm value suggesting that smaller companies have higher valuations. On the other hand, profitability and controls variables measuring growth are positively related to firm value, consisted with findings for e.g. Myers (1977) and Smith & Watts (1992). Effects of control variables are statistically significant and remain the same throughout the test in various models. The adjusted R^2 is also 0.26, which means that the model has a relatively good fit. R^2 of 1 would mean that the model would have a perfect fit and the variables would explain the log-Tobin's Q. When Rountree et al. (2008) report only a R^2 of 0.20 with the same model we can assume that the control variables I have should be valid also for other empirical tests.

Based on my multivariate results leverage has a strong and significant negative relation to firm value. Even though the negative effect is lowest when controlling for cash flow volatility (Column 3) the effect in general is so strong and significant that it provides very strong evidence supporting hypothesis four. The result is consistent with Allayannis & Simko (2009) and supports the general framework of risk management of Froot et al. (1993) and Minton & Schrand (1999). Even though equity would represent a call option to the firm's assets like Merton (1974) suggests the overall effect of leverage seems to be negative. The results are in line with Grass' (2010) notion that equity call option applies in some special situations but it is not strong enough to increase a company's value on an aggregate level. The potential costs of financial distress thus suggest lover leverage, based on my results.

Table 4: Cash flow volatility, earnings volatility and accrual volatility multivariate results

The table presents results from multivariate OLS-regressions of the natural logarithm of Tobin's Q, a proxy for firm value, on cash flow volatility along with measures capturing risk, size, growth opportunities and leverage. I have reported the predicted sign after t each control variable. All regressions include 2-digit SIC-controls and country controls. All variables are defined in the section 4.3. T-values are reported beneath the coefficient estimates in parentheses and are computed using robust regression. Next to the T-values I have also reported stars for statistical significance: * denotes statistical significance at 10% level, ** at 5% level and *** at 1% level.

Dependent variable: ln (Tobin's q)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln(Accrual volatility) -					-0.027		
					-(1.54)		
Corr. (Cash flow, accruals) +					-0.096	-0.105	-0.081
					-(3.85) ***	-(4.23) ***	-(3.37) ***
ln(Earnings volatility) -				-0.041			
				-(4.20) ***			
ln(Cash-flow volatility) -			-0.006		0.004	-0.020	
			-(0.70)		(0.23)	-(2.09) *	
ln(Systematic risk) +		0.057	0.056	0.054	0.056	0.056	0.057
		(9.24) ***	(9.02) ***	(8.92) ***	(9.04) ***	(9.04) ***	(9.31) ***
ln(Idiosyncratic risk) -		-0.010	-0.008	0.005	0.004	0.002	-0.005
		-(0.54)	-(0.44)	(0.25)	(0.23)	(0.12)	-(0.24)
ln(Total assets) -	-0.030	-0.047	-0.046	-0.037	-0.042	-0.044	-0.048
	-(4.58) ***	-(5.81) ***	-(5.30) ***	-(4.28) ***	-(4.70) ***	-(5.08) ***	-(5.90) ***
Return on assets +	1.258	1.348	1.347	1.327	1.303	1.310	1.321
	(6.52) ***	(6.71) ***	(6.71) ***	(6.67) ***	(6.58) ***	(6.60) ***	(6.62) ***
Sales growth +	0.524	0.492	0.491	0.490	0.496	0.493	0.495
	(7.75) ***	(7.39) ***	(7.33) ***	(7.36) ***	(7.49) ***	(7.41) ***	(7.48) ***
CAPEX-to-sales +	0.619	0.636	0.642	0.643	0.623	0.624	0.613
	(2.41) *	(2.55) *	(2.58) **	(2.60) **	(2.50) *	(2.51) *	(2.45) *
Debt-to-total assets -	-0.444	-0.376	-0.373	-0.379	-0.383	-0.385	-0.390
	-(5.39) ***	-(4.45) ***	-(4.44) ***	-(4.51) ***	-(4.58) ***	-(4.61) ***	-(4.65) ***
Constant	0.021	0.581	0.587	0.640	0.616	0.612	0.590
	(0.17)	(3.97) ***	(4.01) ***	(4.28) ***	(4.02) ***	(3.99) ***	(3.88) ***
Year indicator (2003)	-0.022	0.047	0.047	0.049	0.043	0.046	0.046
	-(0.79)	(1.59)	(1.60)	(1.69)	(1.48)	(1.59)	(1.58)
Year indicator (2007)	-0.029	-0.051	-0.051	-0.048	-0.056	-0.049	-0.050
	-(1.05)	-(1.91)	-(1.92)	-(1.79)	-(2.06) *	-(1.86)	-(1.86)
Adjusted R^2	0.258	0.258	0.228	0.265	0.265	0.264	0.262
N	2,211	2,211	2,212	2211	2211	2211	2211

In Column 3 of Table 4 cash-flow volatility is added as an explanatory variable in a similar way as market risk measures. This is done to test the second hypothesis, which assumes a negative relation on cash flow volatility and firm value even after controlling for other measure of risk and factors such as size, profitability and growth. From Column 3 we find a very weak and statistically not significant relation between cash flow and firm value. This is contrary to what Rountree et al. (2008) who reported a statistically significant and stronger negative relation to the cash flow volatility than to other measures of risk. In addition, the explanatory power of their model increased after adding cash flow volatility as an explanatory variable while the R^2 of my model decreases from 0.258 to 0.228 after adding cash flow volatility. This is rather unfortunate but doesn't directly provide evidence against the second hypothesis.

For more detailed information on the effect of cash flow volatility to firm value I have divided the sample into sub-samples based on observation years. I have used the regression model from Column 3 of Table 4 separately on all the three observation periods. My sub periods include a period with a downward trend (2000), a long steady growing market (2003) and a market crash (2007). Although the results for the effect of cash flow volatility in Colum 3 of Table 4 were not statistically significant (t-value of -0.70) we can see that it is mostly due to the observations in year 2000. When analysing the observations separately, we can see that in 2003 and 2007 cash flow volatility is negatively related to firm value. Based on my tests there is a very minor negative effect on firm value from cash flow volatility. The coefficients suggest a 0.03% decrease in firm value from 1% increase in cash flow volatility. This effect is statistically significant for observations in 2003 and 2007 and the explanatory power of the model is relatively good with R^2 values of 0.181 and 0.221. Anyhow, the effect is smaller than for idiosyncratic risk, which is contradictory to the evidence provided by Rountree et al. (2008)

Table 5: Cash flow volatility on firm value, annually
The table presents results from annual regressions for the three observations years utilized in the empirical tests. The dependent variable is the natural logarithm of Tobin's Q, a proxy for firm value. All regressions include 2-digit SIC controls and all variables are defined in section 4.3. T-values are reported beneath the coefficient estimates in parentheses and are computed using robust regression. Next to the T-values I have also reported stars for statistical significance: * denotes statistical significance at 10% level, ** at 5% level and *** at 1% level.

Dependent variable: ln (Tobin's q)	2000	2003	2007
ln(Cash-flow volatility) -	0.000	-0.033	-0.033
	-(0.03)	-(2.85) **	-(2.14) *
ln(Systematic risk) +	0.091	0.026	0.033
	(5.92) ***	(3.29) **	(2.84) **
ln(Idiosyncratic risk) -	0.049	-0.078	-0.105
	(1.18)	-(2.09) *	-(4.28) ***
ln(Total assets) -	-0.051	-0.042	-0.053
	-(2.65) **	-(3.53) ***	-(4.15) ***
Return on assets +	1.796	1.023	1.509
	(4.16) ***	(3.47) ***	(4.31) ***
Sales growth +	0.542	0.283	0.387
	(4.69) ***	(2.13) *	(3.55) ***
CAPEX-to-sales +	0.992	-0.222	-0.014
	(2.23) *	-(0.48)	-(0.04)
Debt-to-total assets -	-0.568	-0.107	-0.121
	-(3.09) **	-(0.84)	-(0.84)
Constant	1.016	-0.013	0.038
	(3.85) ***	-(0.05)	(0.19)
Adjusted R^2	0.305	0.181	0.221
N	696	753	762

All in all, my results provide supporting evidence for hypothesis two. None of my empirical tests provide evidence for rejecting hypothesis two and Table 5 provides statistically significant evidence supporting it. My evidence is not so strong and consistent as Rountree et al. (2008) but still suggest that cash flow volatility is expensive for companies. The finding that volatile cash flows is also consistent with existing literature and supports the risk management framework of Froot et al. (1993) and also support the conclusions of Minton & Schrand (1999) that cash flow volatility is something that companies should take into account when defining their risk management policies. Minton & Schrand (1999) focus on companies having to forego positive NPV investments due to cash flow shortfalls but my evidence would suggest a more direct cost to volatile cash flow. Even though underinvestment due to negative shocks would probably lower a firm's value in the long run, my results suggest that there would also be a direct discount to firm value. My results also support the notion of Minton &

Schrand (1999) that even if companies would fill the shortfalls with external financing, it would be more costly due to the discount. All in all, my results thus provide supporting evidence to the value of risk management in general.

My results also provide empirical evidence supporting the results of Graham et al. (2005) and Roychowdhury (2006). Graham et al. (2005) report from their extensive survey, that financial executives aim for smoother financial performance by choosing actions that provide smoother financial performance. Roychowdhury (2006) reports supporting empirical evidence of managers smoothing financial performance through real activities such as temporary sales and overproduction. The results of these studies are slightly against the traditional Modigliani-Miller framework, where companies should not focus on these kinds of activities but aim to maximize the value of the company. Anyhow, my results with results reported by Rountree et al. (2008) suggest that cash flow volatility would yield a lower valuation for the company. When considering the empirical evidence, managers' concern for smooth financial performance might be valid after all. If there is discount to volatility, then in the long run the real activities done to avoid volatility might be value enhancing.

In Columns 4-7 of Table 4 I elaborate the empirical test by adding additional measures of risk. In these models I test how earnings volatility, cash flow volatility and accrual volatility are related to firm value. In Column 4 of Table 4 I perform a similar test to Column 3 but replace cash flow volatility with earnings volatility. Based on my results, earnings volatility has a larger negative effect (-0.041) on firm value, when compared to cash flow volatility (-0.006). Although both have only a small negative effect, this is interesting since Rountree et al. (2008) report the opposite. Based on their findings cash flow volatility has significantly larger negative effect (-0.15 vs. -0.069). In addition the result earnings volatility is statistically significant at 1% level and the R^2 is 0.265, which is larger than 0.229 reported by Rountree et al. (2008). Despite being against the empirical evidence reported in previous studies, my results still provide strong and significant evidence supporting hypothesis one.

Based on Column 4 earnings volatility is more harmful for companies than cash flow volatility. This is against the key conclusion of Rountree et al. (2008). They argue in favour of focusing on cash flow instead of earnings and report also a higher negative coefficient for cash flow volatility than for earnings volatility. This is more intuitive in the theoretical sense since cash flow should reflect the true performance of a company instead of earnings, which

can be manipulated with discretionary accruals, namely smoothing source two. My evidence thus supports the managerial view reported by Graham et al. (2005) that earnings figures are more important. This also supports the attention to EPS figures given by media, management and investors. Naturally, the earnings and cash flow figures are highly correlated with each other with a correlation coefficient of 0.75 but my results would support focusing on earnings figures, which can be adjusted with discretionary accruals. This would also support the findings of Allayannis & Simko (2009) who find out that earnings smoothing increases value.

In Column 5 I break earnings volatility to its components and add them to explanatory variables. Column 5 has a similar model to Column 3but also includes volatility of accruals and correlation of accruals and cash flow as explanatory variables. In columns 6 and 7 I try different combinations of the earnings volatility combinations. In Column 6 remove accrual volatility and in Column 7 have only correlation of cash flow and accruals in addition to the control variables and market risk measures. I find no statistically significant relation between firm value and accruals volatility, when cash flow and correlation are also included in the model in Column 5. The results anyhow suggest a weak negative coefficient for accrual volatility, but it is not significant. Rountree et al. (2008) reported a relatively strong negative and significant coefficient for accrual volatility, but my results don't provide strong supporting evidence to this. In Column 6 I find a weak negative relation between cash flow volatility and firm value (-0.02), which supports hypothesis two and findings from Table 5.

The most interesting finding from the Columns 5-7 is the relatively strong negative (-0.081 to 0.105) and significant relation between correlation of cash flow and accruals and firm value. Following Leuz, Nanda and Wysocki (2003) I have used the correlation between cash flow and accruals as a proxy for earnings via accruals. They point out that the more negative the correlation the more a firm is doing earnings smoothing. Negative correlation would mean that on bad years negative cash flow shocks would be smoothed with increasing accruals and vice versa. My results with a negative relation between the correlation coefficient and firm value is against the findings of Rountree et al. (2008) who report a very strong (0.217 to 0.344) positive relation to firm value. My results thus suggest that investors prefer smoothing through accruals.

The positive relation is slightly counter-intuitive, since earnings smoothing done with accruals would provide an altered view of the company's performance to the investors. Anyhow, the

results would support Tucker & Zarowin (2006) if one assumes that earnings smoothing makes the communication more efficient and increases the available information on companies. In addition, when reflecting to Gaio & Raposo (2011), who conclude that earnings quality is positively related to firm value, my results suggest that smoothing through accruals increases earnings quality. Gaio & Raposo (2011) use measures like persistence, predictability, smoothness and conservatism for earnings quality, which can be improved with the use of accruals. The result is also in line with Allayannis & Simko (2009) who provide empirical evidence on the benefits of earnings smoothing via accounting discretion, especially when other information is poor. Even though the positive value effect of correlation between accruals and cash flow is slightly counter-intuitive and against the findings of Rountree et al. (2008) there is prior evidence also supporting my results. The underlying rationale would be investors prefer that companies smooth their earnings with discretionary accruals since it makes communication more efficient and future earnings more predictable.

All in all, I find evidence that is contradictory in many ways to the results reported by Rountree et al. (2008). The main conclusion of them is that investors prefer smoother cash flow more than smoother earnings and that only smoother cash flow coming from smoother underlying business increases value. My evidence strongly supports that both cash flow and earnings are negatively valued, but the effect is larger and more significant for earnings volatility. This slightly against the theoretical rationale since cash flow should reflect the performance more directly. On the other hand Graham et al. (2005) report a strong managerial focus on earnings and EPS is often followed by investors. In addition, Allayannis & Simko (2009) report that earnings smoothing is beneficial for companies with low analyst following and Tucker & Zarowin (2006) suggest that earnings management improves informativeness. Thus, there is theoretical evidence suggesting that by using discretionary accruals and by smoothing earnings the company can provide more efficient communication. In this framework it would be reasonable that investors would prefer smoother earnings, if they are smoothed for more efficient communication.

Based on the univariate and multivariate tests I find supporting evidence for hypotheses one, two and four. In Table 4 Column 4 I find a strong and significant negative relation between earnings volatility and firm value, supporting hypothesis one. Also, consistently throughout my statistically significant results there is a negative relation to cash flow and firm value, which strongly supports hypothesis two. In other words, investors prefer smooth cash flow

and earnings with the effect being larger for earnings figures. The evidence supporting hypothesis four is consistent and strong throughout the tests, reported in Table 4. Leverage has a significant negative value effect suggesting that the benefits for the call-option nature of equity from volatile performance are outweighed by the costs of potential financial distress. In contradiction, my results support rejecting hypothesis three. When using the correlation between cash flow and accruals as a proxy for using accruals to smooth earnings, I find evidence against hypothesis three. This suggests that investors prefer companies smoothing earnings with accruals and supports rejecting hypothesis three.

5.2. Corporate diversification, smooth performance and firm value

In this section, I discuss the results of tests including control variables also for corporate diversification. The tests are mainly done for analyzing hypothesis five, which focuses on the balance between benefits from smoother financial performance and the costs from corporate diversification. Similarly to section 5.1, where I analyze results without diversification measures, I first represent results from univariate tests and then continue into results of multivariate tests.

5.2.1. Univariate tests

The univariate tests in this section are also motivated by the tests done by Rountree et al. (2008) but here I divide the sample into quintiles based on number of segments and an internal HH-index. The used variables are explained in the section 4.3 in more detail. The corporate diversification variables provide a new angle to Rountree et al. (2008), who explain smoother earnings only by earnings management and corporate risk management. I begin my univariate tests with analysing the mean and median cash flow volatilities for different levels of corporate diversification. These results are reported in Panel A of Table 6. The rest of the table comprises univariate tests, where I analyze median Tobin's Q for different cash flow volatility quintiles and corporate diversification levels. The tests are conducted in a similar way to Table 3, where I had control measures for size, profitability and leverage for testing hypotheses one, two and four but in Table 6 I have number of segments and HH-index classes reflecting the nature of hypothesis 5.

Panel A of Table 6 in the next page reports mean and median cash flow volatilities for companies sorted by the number of segments and Herfindahl-Hirschman index. The HH-index classes go from largest to smallest since the index decreases when the company is more diversified. When represented in this manner, the results of HH-index are easier to compare to number of segments, reported above. The Panel A gives a mixed message on the effect of corporate diversification to cash flow volatility and the results reported are not consisted throughout different measures. The mean cash flow volatility figures suggest that cash flow volatility reduces when the company is operating in more segments or has a lower Herfindal-Hirschman index. This is relatively intuitive since operational diversification should give an internal hedge for the company, if segments are not highly correlated with each other. This is also in line with the theoretical predictions and results of Dimitrov & Tice (2006).

The median figures on the other hand, suggest the opposite. The difference in cash flow volatility between one-segment and five-segment firms is negative. The effect is even stronger, when diversification is measured with the Herfindahl-Hirschman index. This is unexpected, since one could assume that the HH-index would be more accurate measure of diversification when compared to the number of segments. One natural explanation to the inconsistent result is the small sample size. When dividing the sample based on diversification, it could proxy for special characteristics of the companies in each diversification class. On the other hand, the segmental reporting might not reflect the true diversification of a company. Supporting this is the high variation between changes when moving from a lower number of segments to higher or from a higher HH-index to lower one. All in all, one could conclude from Panel A that it doesn't provide strong evidence on how cash flow volatility changes when companies get more segments or a lower internal Herfindahl Hirschmann index.

Table 6: Cash flow volatility, corporate diversification and firm value, univariate results
This table presents univariate results, focusing on cash flow volatility, corporate diversification and firm value. I have grouped companies into quintiles based on their cash flow volatility, number of segments and an internal Herfindahl-Hirschman index. Panel A reports mean and median Tobin's Q for cash flow volatility quintiles and corporate diversification measures, arranged from low to high. Panels B and C present univariate results based on cash flow volatility quintiles and these same corporate diversification measures.

Panel A: Cash flow volatility	Mean cash flow volatility	Median cash flow volatiltiy
1 segment	11.078	0.389
2	3.590	0.183
3	3.100	0.302
4	4.526	0.381
5 or more segments	9.678	0.486
Difference (1 segment - 5 or more segments)	1.400	-0.097
1.0 Herfindahl-Hirschsmann index	3.491	0.190
1.0<0.8	3.055	0.397
0.8<0.6	5.003	0.341
0.6<0.4	7.335	0.422
0.4<0.2	1.801	0.498
0.2<0.0 Herfindahl-Hirschsmann index	1.944	0.624
Difference (1.0 HHI - 0.2<0.0 HHI)	1.547	-0.434

Panel B: Average Tobin's Q	Number of segments					Difference (1st-5th)	P-value
	1	2	3	4	>=5		
Low Cash flow volatility	2.015	1.684	1.943	2.053	1.904	0.110	0.000
2	2.203	2.175	1.949	2.018	1.522	0.680	0.000
3	2.948	1.947	1.918	2.246	1.901	1.048	0.000
4	1.969	1.499	1.515	1.580	1.521	0.448	0.000
High Cash flow volatility	1.874	2.832	1.477	1.315	1.321	0.553	0.000
Difference (low-high)	0.140	-1.148	0.465	0.738	0.583		
P-Value	0.007	0.000	0.000	0.000	0.000		

Panel C: Average Tobin's Q	Herfindahl-Hirschmann index						Difference (1st-6th)	P-value
	1	1.0<0.8	0.8<0.6	0.6<0.4	0.4<0.2	0.2<0.0		
Low Cash flow volatility	2.014	1.979	1.901	1.961	1.710	1.459	0.554	0.000
2	2.176	2.277	2.504	1.729	1.678	1.309	0.867	0.000
3	2.946	2.574	1.837	1.690	2.111	2.593	0.353	0.000
4	1.922	1.633	1.422	1.629	1.437	1.663	0.259	0.000
High Cash flow volatility	1.874	1.387	1.379	2.087	1.301	1.008	0.866	0.000
Difference (low-high)	0.139	0.592	0.522	-0.126	0.409	0.451		
P-value	0.070	0.000	0.000	0.000	0.000	0.000		

Although the effect of corporate diversification is not consistent throughout different number of segment and different HHI-classes, there is strong evidence that when we move from focused firms (one segment or HHI of 1.0) to the first diversified category, the cash flow volatility reduces. This is present in all measures except for HH-index classes and median cash flow volatility. The effect is especially strong when using number of segments as a proxy for diversification. Mean cash flow volatility drops from 11.1 to 3.6 and median cash flow

volatility drops from 0.39 to 0.19. These results are in line with the findings of Dimitrov & Tice (2006). They also support the use of corporate diversification dummy, which gets value 1 if a company has two or more segments, in multivariate tests. Thus the univariate tests support using the diversification dummy, which has previously been used in related studies (Lang, Stulz 1994, Comment, Jarrell 1995).

When Panel A of Table 6 focuses on the cash flow volatility, Panels B and C tries to capture how mean Tobin's Q changes, when companies get more segments or have wider spread sales between segments. These tests thus provide more relevant information for testing hypothesis five, when Panel A is more of descriptive information about the nature of the companies. The key takeaway from Panels B and C is that diversification decreases mean Tobin's Q. This strongly supports the previous findings of the corporate diversification discount reported first by Lang & Stulz (1994), Berger & Ofek (1995) and Comment & Jarrell (1995) as well as more recently by Burch & Nanda (2003). Panels B and C show this effect consistently and almost monotonously. Within each cash flow volatility segment the mean Tobin's Q decreases when the company is more diversified.

When looking at the columns separately and analyzing how increased cash flow volatility affects company value within each diversification level, Panels B and C report that increased cash flow volatility is negatively valued. The effect is present in almost all of the measures and only companies with two segments benefit from higher volatility, according to Panel B. This is most likely a measurement error, similarly to errors in section 5.1.1. When comparing the mean Tobin's Q of first and second highest cash flow volatility quintiles. Even two-segment companies seem to get discounted from higher volatility. When analysing the columns independently, both corporate diversification measures seem to give supporting evidence to hypothesis two – regardless of how we divide the sample into quintiles or different classes, increased cash flow volatility seems to decrease company value. The results from Table 6 give preliminary results supporting hypothesis five and in the next section I provide further results for testing the hypothesis. In the next section I analyse the combined effect of corporate diversification and cash flow volatility to firm value with multivariate tests.

5.2.2. Multivariate tests

In this section I provide more thorough analysis of the effect of corporate diversification's effect on firm value. The multivariate tests done in this section are based on OLS-regression models with a similar setting that was used in section 5.1.2. The results are presented in Table 7, where I replicate the columns 4-7 of Table 4 and add a dummy variable indicating corporate diversification as well as an interaction variable as a proxy for corporate diversification effects on cash flow volatility. Similarly to Table 4, I have the natural logarithm of Tobin's Q as the dependent variable and the same control variables for size, profitability, growth and leverage.

In Column 1 of Table 7 I start with a regression model with earnings volatility as a measure of financial performance smoothness. In addition, to the variables used in Colum 4 of Table 4 I have included a dummy variable, which has value 1 if the company has one or more segments as well as an interaction variable between number of segments and earnings volatility. The volatility of earnings seems to have a similar effect (-0.034 vs -0.041) to firm value as reported in Column 4 of Table 4. While all of the control variables also produce similar results to Table 4, the key take away from the multivariate results is on the added diversification and interaction variables. The interaction variable between earnings volatility and number of segments suggests a weak negative effect on firm value. Unfortunately, the result is not statistically significant so it doesn't provide strong evidence, but it is still in line with hypothesis five. In addition, the corporate diversification dummy suggests a mild negative effect on firm value with a coefficient of -0.08, which is consistent with the general corporate diversification discount reported by among others Lang & Stulz (1994) and Berger & Ofek (1995).

When looking at columns 2-4 and analysing the results in general we can see that the coefficients for risk measures and control variables have similar coefficients to the ones reported in Table 4. In other words, the pattern of Column 1 of Table 7 continues in Columns 2-4, when talking about risk measures and control variables. The explanation power of the regression models in Table 7 than in Table 4. This suggests that the corporate diversification variables introduced in this section weaken the quality of the models but they are necessary for analysing hypothesis 5.

Table 7: Volatility in financial performance and corporate diversification, multivariate results
The table presents results from multivariate OLS-regressions of the natural logarithm of Tobin's Q, a proxy for firm value, on earnings volatility, cash flow volatility, accrual volatility and correlation of cash flow and accruals with a dummy variable for corporate diversification, which gets value 1, if the company has 2 or more segments. All regressions include 2-digit SIC-controls and country controls. All variables are defined in the section 4.3 T-values are reported beneath the coefficient estimates in parentheses and are computed using robust regression. Next to the T-values I have also reported stars for statistical significance: * denotes statistical significance at 10% level, ** at 5% level and *** at 1% level.

Dependent variable: ln (Tobin's q)	(1)	(2)	(3)	(4)
ln(Earnings volatility) -	-0.034			
	-(2.09) *			
ln(Cash-flow volatility) -		0.021	-0.002	
		(1.04)	-(0.15)	
ln(Accrual volatility) -		-0.027		
		-(1.53)		
Corr. (Cash flow, accruals) +		-0.108	-0.117	-0.116
		-(4.30) ***	-(4.74) ***	-(4.75) ***
ln(Systematic risk) +	0.056	0.058	0.058	0.058
	(8.94) ***	(9.03) ***	(9.04) ***	(9.10) ***
ln(Idiosyncratic risk) -	-0.011	-0.010	-0.012	-0.012
	-(0.53)	-(0.47)	-(0.58)	-(0.60)
Cash flow, interaction -		-0.007	-0.007	-0.008
		-(2.10) *	-(2.13) *	-(3.59) ***
EPS, interaction -	-0.004			
	-(0.95)			
Corporate diversification dummy -	-0.080	-0.091	-0.093	-0.095
	-(2.23) *	-(2.55) *	-(2.62) **	-(2.62) **
ln(Total assets) -	-0.036	-0.040	-0.043	-0.043
	-(3.95) ***	-(4.43) ***	-(4.78) ***	-(4.92) ***
Return on assets +	0.454	0.447	0.449	0.449
	(2.07) *	(2.08) *	(2.09) *	(2.09) *
Sales growth +	0.005	0.005	0.005	0.005
	(7.71) ***	(7.56) ***	(7.45) ***	(7.44) ***
CAPEX-to-sales +	0.005	0.010	0.008	0.008
	(0.15)	(0.28)	(0.24)	(0.22)
Debt-to-total assets -	-0.279	-0.290	-0.293	-0.293
	-(3.45) ***	-(3.60) ***	-(3.63) ***	-(3.64) ***
Constant	0.849	0.849	0.845	0.847
	(4.31) *	(4.11) *	(4.09) *	(4.08) *
Year indicator (2003)	-0.107	-0.113	-0.109	-0.109
	-(3.24) **	-(3.49) ***	-(3.35) ***	-(3.34) ***
Year indicator (2007)	-0.114	-0.123	-0.117	-0.116
	-(3.98) ***	-(4.29) ***	-(4.12) ***	-(4.12) ***
Adjusted R2	0.200	0.202	0.201	0.201
N	2,211	2,211	2,211	2,211

When the risk measures and the control variables capturing size, profitability, growth and leverage don't provide new information in these tests, I focus my analysis on the corporate

diversification dummy and the interaction variables between cash flow or earnings volatility and number of segments. Like mentioned above the earnings interaction suggests a weak negative value effect on Column one but the result is not statistically significant. In columns two and three the interaction variable between cash flow volatility and number of segments also suggest a small negative value effect. These results are significant at the 10% level. Column 4 provides the most robust result on the interaction at 1% significance level and the coefficient is of similar size as the previous coefficient estimates at -0.008. Even though the effect is not large throughout the tests it still provides supporting evidence for hypothesis 5.

In addition to the interaction variable I have also incorporated the traditional corporate diversification dummy variable, which takes value 1 when the company has two or more segments. In Columns 1-2 the corporate diversification is significant 10% level and in Column 3-4 the results are significant at 5% level. Throughout the tests the corporate diversification dummy suggests a decrease in firm value when the company operates in more than one segment. The coefficient in the tests focusing on cash flow volatility (Columns 2-4) is approx. -0.09.

All in all, I find supporting but weak evidence for hypothesis five. Even though there might be benefits from corporate diversification (Berger, Ofek 1995, Dimitrov, Tice 2006) my results suggest that the overall valuation effect is negative. In other words, the corporate diversification discount reported by several previous papers (e.g. Lang & Stulz 1994, Comment & Jarell 1995, Burch & Nanda 2003) has a larger negative effect than the benefits are from smoother cash flow, reported by Rountree et al. (2008). Even though diversification would work as a natural hedge for the company and mitigate problems raised by Froot et al. (1993) and Minton & Schrand (1999) in the risk management framework, the market discount from diversification would outweigh the benefits. In other words, the diversification discount is more expensive than the benefits from smoother financial performance.

In addition, the test aimed for testing hypothesis five; provide supporting evidence also for hypothesis one. When analysing cash flow volatility from numerous different angles, increase in cash flow volatility seems to mean a discount in value. The correlation coefficient between cash flow volatility and accruals is also strongly and significantly negative in Table 7, being against hypothesis three.

6. Conclusions

This study examines the effect of cash flow and earnings volatility to firm value. I identify three main sources for smoother financial performance. Firstly, a company's management can affect the smoothness of financial performance by earnings management through real actions or accounting discretion. Management can even forego positive NPV projects to represent a smoother earnings track for stakeholders (Roychowdhury 2006) or use discretionary accruals to smooth earnings (Allayannis, Simko 2009, McInnis 2010). Secondly, corporate risk management is a major source for smoother performance. Froot et al. (1993) developed a theoretical framework identifying the benefits from corporate risk management and smoother cash flow to avoid cash shortages. The third source of smoother performance that I identify in my study is corporate diversification. Dimitrov & Tice (2006) report a smoother performance and higher debt capacity for conglomerates.

The key findings of my empirical tests are gathered to a summary Table 7 on the following page. Consistent with Rountree et al. (2008) I find that volatile financial performance yields a discount in firm value. This supports the general theoretical framework of the benefits of corporate risk management, developed by Froot et al. (1993). Anyhow in contradiction to Rountree et al. (2008) I find stronger negative effect on earnings volatility, supporting the managerial view reported by Graham et al. (2005). Even though one could assume that cash flow represents the true performance of the company my results support the focus on earnings figures that is widely accepted by media and investors. I also find evidence suggesting that investors prefer earnings smoothing through the use of discretionary accruals. This result is opposite to what Rountree et al. (2008) but is consistent with the theoretical concept of earnings smoothing improving informativeness of earnings (Tucker, Zarowin 2006) and empirical findings of Allayannis & Simko (2009) suggesting a valuation premium for companies who smooth earnings.

I find that leverage has a strong and negative effect on firm value. This provides clarifying evidence to the discrepancy between CAPM by Sharpe (1964) & Lintner (1965) and the call option nature of equity by Merton (1974). The strong negative relation suggests that benefits from volatile earnings for the call option nature of equity are outweighed by the costs of potential financial distress. This is consistent with the findings of Rountree et al. (2008) as

well as the notion of Grass (2010) that the call option of equity is applicable in some situations but is not strong enough to explain economic phenomena on an aggregate level.

Table 8: Summary of results

Hypothesis	Expected relation Formulation of hypothesis	Empirical evidence Summary of key findings
H1	A negative relation between earnings volatility and firm value	**Strong support.** Throughout my univariate and multivariate results I find evidence suggesting that earnings volatility decreases firm balue.
H2	A negative relation between cash flow volatility and firm value	**Partial support.** Even though not perfectly consistent and not always statistically significant I find that cash flow volatility is negative related to firm value.
H3	Earnings smoothing by using discretionary accruals doesn't increase firm value	**Rejected.** Based on various multivariate tests I find evidence against the hypothesis. Based on my results investors prefer earnings smoothing through accruals.
H4	There is a negative relation between leverage and firm value, even after controlling for cash flow volatility	**Strong support.** Throughout my test I find consistent results suggesting that there is a negative relation between leverage on firm value.
H5	Corporate diversification discount exceeds the benefits from smoother cash flows	**Partial support.** I find weak negative effect of the combination of cash flow volatility and diversification. Based on my results diversification itself is negatively valued.

In addition to earnings management and corporate diversification provides smoother earnings but it is also accompanied with a *corporate diversification discount* (Berger, Ofek 1995, Lang, Stulz 1994, Comment, Jarrell 1995). I find partial evidence of diversification smoothing financial performance but strong supporting evidence that the overall valuation effect diversification negative. Even though smoother financial performance from diversification would increase value like Rountree et al. (2008) suggest the total value effect after the diversification discount is negative.

The main contribution of my study to the risk management framework introduced by Rountree et al. (2008) is the more contemporary dataset and a new geographical focus. My study is the first one to my knowledge to provide European evidence on the effect smooth performance on firm value. In part my results support the general idea of Rountree et al.

(2008) that volatility in financial performance yields a discount in value but I also provide contradictory evidence suggesting that the field has still room for future research. I also introduce a new angle to the theoretical framework developed by Rountree et al. (2008) by analyzing how corporate diversification affects the volatility of financial performance and what is the value effect of it in the setting. In addition, to the contribution in earnings management and corporate risk management literature I provide supporting evidence for the marginality of call-option nature of equity.

When analyzing the results of my study, a few important limitations need to be taken into account. Firstly, the dataset certainly has some limitations, which are also reflected in empirical results of my study. My strict data requirements narrow the sample to only 778 companies and 2,211 which is relatively small. Secondly, the selection of companies with non-missing observations could results in survivorship bias, discussed also by Shin & Stulz (2000) who used similar risk measures. Thirdly, the methodology of my study could be more sophisticated. Like Grass (2010) points out the contingent claims analysis framework introduced by Merton (1974) should not be analyzed with OLS-regression, since option valuation is not based on linearity. In addition, the methodology for analyzing the effect of corporate diversification could be more sophisticated. When diversification affects cash flow volatility and cash flow volatility affects firm value, the effect of corporate diversification could be analyzed more thoroughly with a sophisticated instrumental variable.

In future research, it would be interesting to see the corporate diversification angle studied more thoroughly. Previous research in the field has mainly focused on earnings management and corporate risk management as sources of smoother financial performance. My study introduces a new angle to the topic in the form of corporate diversification. Conglomerates should produce more stable earnings but are valued at a discount. This balance would be very interesting to study in the framework developed by Rountree et al. (2008) and with a more sophisticated methodology than in my study. In addition, the effect of cash flow volatility would be interesting to analyze in the contingent claims analysis framework developed by Merton (1974). Both my study and the study conducted by Rountree et al. (2008) touch the call-option nature of equity but fail to dig really deep into the topic. Thus it would be interesting to see a study

Appendix 1 – The cash flow per share observations

The figure below shows how annual reporting of cash flow is most common. The highest peaks occur on Q4, which means that the information is found on the companies' annual reports. The graph also shows that there are not many companies reporting cash flow on each quarter and companies mostly report semi-annual cash flow. This is illustrated by the two distinctive peaks on the line, which occur Q2 and Q4 each year. The graph also shows how the amount of companies reporting cash flow per share semi-annually, increases during the period. This is illustrated by the lower peaks reaching the higher peaks after 2008. The graph also shows an increasing trend in cash flow reporting by the companies, in general. The amount of observations increases steadily towards 2010. This can be interpreted as investors being more aware of cash flow figures and demanding companies to report them more often. There might be several reasons explaining the increased disclosure of cash flows, though. One reason could be for example the increasing amount of ICT-systems used by companies for management accounting and financial reporting. When the amount of available information increases, companies also disclose it more to the investors.

Cash flow per share observations
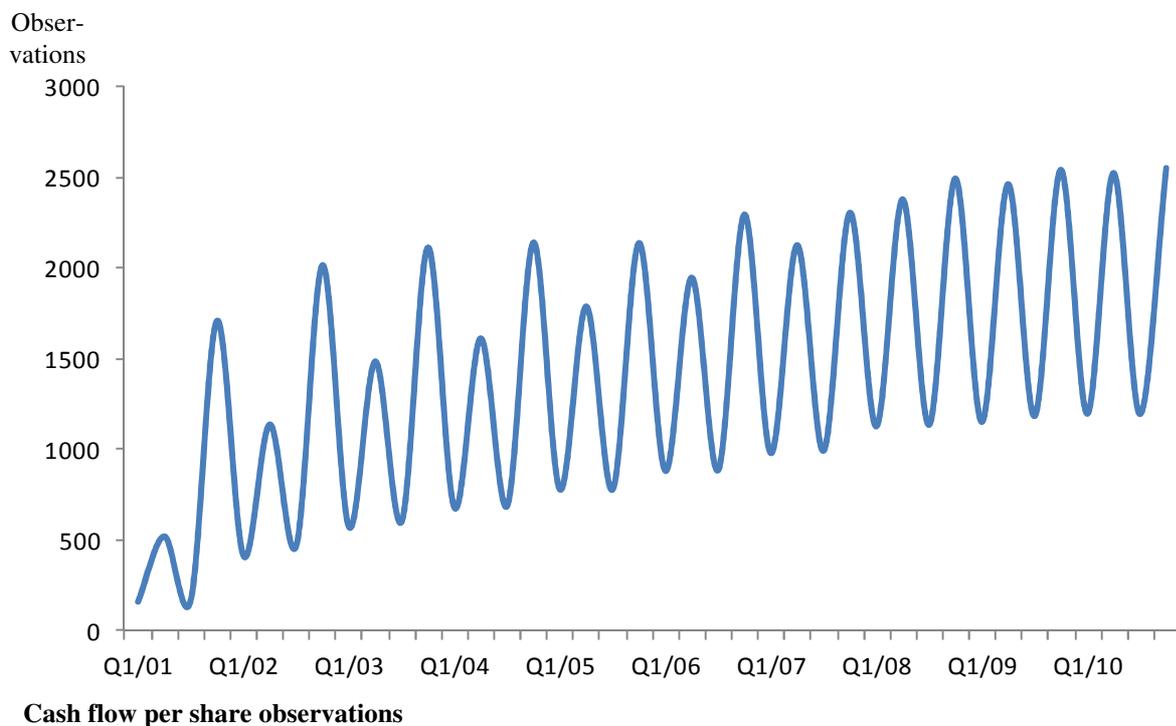
Appendix 2 – Stock market indices based on company's home country

The table below represents the matched country codes and stock market indices. The main principle was to match the companies with their home country's stock market index. This was anyhow not possible for all of the countries, since Thomson DataStream's ReturnIndex was not available for all of the indices. For the countries that I was not able to get its main stock index I used the closest geographically available index or a general index provided by MSCI, a leading provider of investment decision support tools with experience of over 40 years. I have used MSCI index for e.g. the Nordic countries and Turkey.

Country	Index
BEL	EURONEXT 100
CHE	EURONEXT 100
DEU	MDAX FRANKFURT
DNK	MSCI NORDIC
ESP	IBEX 35 DS-CALCULATED
FIN	OMX HELSINKI (OMXH)
FRA	EURONEXT 100
GBR	FTSE 100
GRC	EURONEXT 100
IRL	IRELAND SE GENERAL (ISEQ)
LUX	LUXEMBOURG SE GENERAL
NLD	EURONEXT 100
NOR	OSLO EXCHANGE ALL SHARE
POL	EURONEXT 100
SVK	EURONEXT 100
SWE	MSCI NORDIC
TUR	MSCI TURKEY

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