Corporate Fraud and its Consequences: An Empirical Study

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Biographical Note

Paulina Kurant holds a Bachelor's degree in Finance and Accounting by the University of Warsaw, Poland, where her final work was a study on the *Financial manipulation – earnings management*. On the last year of the course, she applied for an Erasmus Programme scholarship and spent one year in Portugal. Paulina has continued her interest for fraud to Master level, researching the fraud consequences while studying for a Master in Finance at the University of Porto, Portugal.

Abstract

This study examines the consequences of fraudulent misreporting of SEC enforcement actions' target companies and its impact on their industry competitors.

Using recent data (2006-2012) for U.S. market, the research concentrates on changes of firms' returns and risk. Changes in returns are measured following a standard event methodology – abnormal returns; changes in risk are measured using the change in three different risk measures: total risk, systematic risk and residual risk.

The research documents that cumulative abnormal return results vary depending on the method of calculation used. Using value-weighted index and raw returns CARs are negative for fraud companies but positive for peers. When the equally-weighted index and risk measures are introduced, CARs for both groups are positive. Results are subject to considerable variability.

In addition, results show that fraud disclosure causes an increase in total risk and residual risk but a decrease in systematic risk. Division of the sample into quintiles gives much higher significance.

Key-words: fraudulent misreporting, spillover effect, misreporting

JEL-Codes: G32, G38, K22, K42

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1. Introduction

Corporate fraud is a problem for companies, regardless of size, sector or region where they operate in. However, the real consequences of fraudulent activities are still not well explored. Recent studies in the area concentrate on accused company's[1] value loss rather than on risk changes. The effect of fraud disclosure on the industry peers is not the main concern of the researchers. This study examines the consequences of fraudulent misreporting of SEC enforcement actions' target companies and its impact on their industry competitors. Using recent data (2006-2012) for U.S. market, the research concentrates on changes of firms' value and risk caused by fraud allegations.

Fraud is a serious problem of a modern business. Association of Certified Fraud Examiners (ACFE) every two years publishes a report on Occupational Fraud and Abuse. In 2012 ACFE analyzed 1388 fraud cases. The report states that one-fifth of the cases caused losses bigger than $1 million. The costliest ones are the financial statement frauds, causing a median loss of $1 million. Moreover, a typical organization loses on average 5% of its revenues to fraud each year and nearly half of the victim organizations never recover any perpetrator´s takings. Moreover, corporate frauds occur all over the world. In the previously mentioned report of ACFE, frauds occurred in almost 100 countries, what illustrates the scale of those illegal practices.

The goal of this dissertation is to discover the real consequences of corporate fraud on two levels. First, the consequence of fraud in the company's value, measured by short-term return, is investigated. Second, the risk change in the profile of the companies, after the initial disclosure of fraud, is analyzed. Moreover, not only the consequences of (corporate) fraud to accused companies are investigated, but also the consequences to the firm´s industry competitors. In the next paragraphs the basis intuition of the research is explained.

The fraud committing and fraud detection levels differ from industry to industry, e.g. "fraudulent misreporting will be concentrated in high growth industries"

[1] Accused company is often referred as fraud company in this work

(Qiu and Slezak, 2008) and is more common in particular time series, e.g. “fraud is most likely to occur in relatively good times, and the link between fraud and good times becomes stronger as monitoring costs decrease” (Povel et al.,2007). That is why it could be perceived as a systematic risk for the investor. If it is true, the rational investor is going to require a risk premium for bearing this type of risk.

If investors ask for a higher risk premium, on one hand the beta of the accused companies increase and so the cost of equity increases. On the other hand, it decreases the debt rating of the company and so it increases the cost of debt in the bond market and the bank financing interest rates. In any case the cost of capital will increase.

A different option suggested in the literature is the decrease of betas, explained by the cessation of the firm’s illegal activities. Destabilization of the company was intentional and disclosure of fraud puts end on it by introducing some necessary changes in the policy of the company. The last option implies a non-significant change in beta what is explained solely by fine paid (Cloninger and Waller, 2000).

The impact of the initial disclosure on the rivals and specifically on their cost of capital is yet not well explored. Applying a similar methodology as the one mentioned above, this dissertation will test if competitors benefit or lose from fraud occurrence within the industry.

Fraud can negatively affect industry peers. Disclosure of negative information can force new (and lower) valuation of companies within the sector. Literature refers to it as information spillover effect. On the contrary, competitors could benefit from fraud by customers outflow from the accused company, what is called industry competition effect. The magnitude of these two effects determines the overall effect of fraud on rival companies.

The rest of the paper is organized as follows. In Chapter 2 the main literature in the subject is presented, including fraud definition, relation of fraud and risk, characteristics of company committing fraud and its consequences. Chapter 3 discusses the methodology of this study, which is implemented in Chapter 4. Chapter 5 concludes and gives ideas for further research.

2. Literature review

In this section the main related studies are presented. Firstly, corporate fraud is defined. Afterwards, fraudulent actions are related to risk. Then the characteristics of the companies that are more prone to fraud commitment are described. Lastly, the consequences of misrepresentation are shown, with the division into those affecting directly accused company, and those affecting industries they operate in.

2.1 Fraud definition

The literature defines fraud in different ways. Though those definitions differ between each other, joint core in all of them can be found: fraud incorporates dishonest actions of some agent.

Yu (2013) defined corporate securities fraud as a "firm's or its manager's misconduct behavior, which causes material value loss to shareholders or stakeholders (e.g., creditors, customers and suppliers) and which may trigger regulatory and/or legal enforcements". Author also underlined the overlap in definitions of corporate fraud and accounting fraud; accounting fraud is defined as an "intentional misstatement of financial reports, in violation of generally accepted accounting principles".

Murphy et al. (2009) used term misconduct for all forms of illegal business behavior including civil and criminal malfeasance. Karpoff and Lott (1993) followed similar path, but they also divided cases, basing on who is victimized party, meaning: frauds against stakeholders, government, financial reporting fraud and regulatory violations.

Several authors link corporate fraud to legal authority enforcement actions. Graham and Qiu (2008) simply defined corporate fraud as cases subject to fraud enforcement actions by the SEC. Their sample included cases in which violation of SEC's antifraud rule 10b-5 took place ("the intent to deceive, manipulate, or defraud with misstatements of material fact made in connection to financial condition, solvency and profitability"). Similar methodology was used in Karpoff et al. (2008) who also studied US market. Armour et al. (2011) named corporate fraud as violation of Financial Services Authority and London Stock Exchange rules.

In addition, ACFE emphasized that fraud is broader than the legal definition. Frauds can take different forms but all of them involve violation of trust. Repot of ACFE concentrated on occupational fraud that can be explained as "use of one's occupation for personal enrichment through the deliberate misuse or misapplication of the employing organization's resources or assets".

2.2 Fraud versus systematic risk

Risk of fraud can be perceived as a systematic risk for the investor. There are number of theories supporting this argument, providing evidence that frauds occur more often in particular time series or industries. If that is true, the rational investor is going to require a risk premium for bearing this kind of risk, increasing the cost of capital of the company.

Qiu and Slezak (2012) introduced the model of equity-based compensation and fraud with interdependence of managers' fraud commission strategy and regulators' investigation actions. They found that frauds occur more often in "new economy industries (e.g. high-tech industry) for which growth opportunities are higher or industries with complex operations and/or poor governance". They found also the exposure of fraud increases when they slump. However, the increase in growth opportunities implies higher probability of investigation and, as a consequence, the increase of frauds' detection that leads to a posterior decrease of the amount of committed frauds.

Wang and Winton (2012) found that frauds are more common in more competitive industries (basing on concentration measures)[2]. According to the study, those industries have lower product market sensitivity[3] and as a result higher propensity for committing fraud, what is consistent with findings of Gigler (1994). Additional factors are: use of industry benchmarking and lack of information creation on the firm level. Frauds can help to explain busts in competitive industries – post-boom poor

[2] Industry concentration measures used by the authors are: fitted HHI, Census HHI and Compustat HHI. Those indexes measure how concentrated the sales or assets are in an industry, what can be perceived as the amount of competition within industry.
[3] Companies operating in industries in which information regarding one firm has less effect on its peers' investment decisions

performance of the company is often present in the companies who used illegal practices during the boom. In addition, Wang and Winton (2012) proved that fraud incentives are more cyclical in competitive industries. This finding was confirmed in other studies, e.g. Wang et al. (2010).

Similar results regarding booms in the industry were obtained by Povel et al. (2007). The authors concluded that "even when investors are perfectly rational, firm's incentives to commit fraud are highest in relatively good times". Good times are times with better investment opportunities and when investors are rather optimistic. In good times investors do not have incentive to monitor firms with positive public information and that is why the propensity for crime tends to be higher. Corporate fraud peaks at the end of a boom because more companies decide to commit fraud in order to attract investors. Similar results were obtained by Hertzberg (2004) who claimed that managers use fraud techniques to enhance firm's short-time performance just during booms; good times.

Additionally, Kedia and Rajgopal (2011) found that propensity of American companies to restate their financial statements depends on SEC activity. This propensity decreases if firms are located geographically closer to the SEC offices, because SEC is more likely to investigate companies from this group. Firms are less fraud-prone in the areas with greater past SEC enforcement activity.

Finally, regarding systematic risk, Cloninger (1982) suggested that normal business risk born by company can be reduced by using illegal activities, such as fraud. It can be perceived as a special kind of hedge. The goals of fraud are the same as for the legal activity, i.e. the maximization of return, given the level of risk, or the minimization of risk, given the level of return. Reduction of systematic risk is done however at expense of increasing moral risk.

2.3 Characteristic of the company committing the fraud

Several studies investigate the causes of corporate fraud. The main conclusion is that fraud is determined by some company's characteristics, such as high leverage ratios, high performance-based managers' compensation, poor corporate governance quality, high growth and extensive financial needs.

The actual trend in the literature is to analyze the relationship between agency problem and fraud. Several authors document that compensation schemes play an important role in committing fraud. Goldman and Slezak (2006) showed a connection between equity-based compensation and misreporting. Compensation schemes make the managers work efficiently, but also make incentives for manipulating financial reports and inflate share prices. Qiu and Slezak (2012) provided the whole list of papers discussing this topic and show that they reach different conclusions on this topic. Agency costs and fraud are also connected through the corporate governance practices. Better corporate governance mechanisms are linked with smaller probability of fraud. Given that market for corporate control is highly competitive, managers can manipulate earnings in order to prevent being fired. Moreover, the more independent members the board has, the less probable it is to commit fraud. (Yu X. , 2013)

Financing needs are also an important predictor of fraud. Companies with higher capital needs are more likely to resort to frauds. Dechov et al. (1996) found that desire to attract additional financing can be incentive to commit fraud. Managers manage earnings of the companies in order to increase capital at the lower cost, however when fraud is disclosed the cost of capital significantly increases. Kumar and Langberg (2009) and Wang (2011) presented complementary studies. They showed that easy access for external financing can create an incentive for fraud. Wang mentioned also factors such as extensive growth, profitability and leverage as factors influencing propensity for committing frauds.

The hypothesis of fraud commitment due to high growth is also presented in Crutchley et al. (2007). They claimed that companies experiencing high growth feel pressure to keep good results in the future and decide to use illegal practices. The median company involved in the financial scandal has 77 percent growth in sales over the two-year period before the scandal. Berkman et al. (2009) presented evidence on how financial distress influences fraud propensity. Companies with higher leverage ratios are more likely to manipulate their earnings. Accused companies have average five-year leverage ratio 23 percent higher than control firms. Additionally, 51 percent of those firms experience earning losses for more than two consecutive years for the fraud group but only about 16 percent of the firms for the control group do. Thus, this finding

supports the hypothesis that external financing needs influence propensity for fraud commission.

2.4 Fraud and its consequences

As the possible incentives for frauds are already explained, this section is devoted to findings of the literature on the consequences of fraud. First, fraud implications for accused company and the effect on its cost of capital are discussed. Afterwards, the findings on the consequences for peers and spillover effect are presented.

2.4.1. To the company

2.4.1.1. Excess negative returns and reputational loss

The majority of papers regarding corporate fraud are about the consequences of this misconduct for the accused firm. The consensus of those studies is one: the initial disclosure of corporate fraud causes negative (and significant) abnormal returns for accused companies (Karpoff and Lott (1993); Karpoff et al. (2008); Armour et al. (2010); Palmrose et al. (2004); Murphy et al. (2009)).

Another proven fact is that legal sanctions cannot fully explain the losses of the firm accused of misconduct. It has been shown that other than the legal sanctions the loss in firm's reputation plays a major role in the punishment of the company. Legal sanctions are simply the fines, fees or penalties that the company is obliged to pay. Reputation can be defined as "expectations of partners of the benefits of trading with it in the future" (Armour et al. (2011)). This penalty imposed by the market can be explained by the fact that the firm might be non-reliable in the future. Such revisions of the expectations would affect the terms of trade in the future, its costs and operations. Those negative changes in input and output price would decrease the firm's earnings and, as a consequence, its market value (Klein and Leffer (1981) and Jarrell and Peltzman (1985))

Already in the 80s Klein and Leffer (1981) showed that reputation is related to firm's reliance on the implicit contracts. The implication of this finding is that companies with large research and development expenditures and greater growth

opportunities are more exposed to reputational losses than analogue companies operating on less implicit contracts and reputation.

The first meaningful research on the corporate fraud was conducted by Karpoff and Lott (1993). After analyzing 132 cases of corporate fraud from US market they found that companies accused of committing a fraud face huge reputational losses, comparing to legal sanctions. Only 6.5 percent of the losses of companies can be attributed to court-imposed costs, penalties account for 1.4 percent; the rest, meaning over 90 percent, can be assigned to reputational losses. What is more, corporate fraud contributes to an average decrease in common stock values of 1.34 percent. The loss is even higher in case of fraud against government agencies, a 5.05 percent decrease, on average. They also claim that the actual losses for the companies are higher than the costs of crime and regulators should endeavor to reduce the court-imposed penalties.

Following research confirmed results of Karpoff and Lott. Karpoff et al. (2008) discovered that the highest penalties are imposed by the market, not regulators. "For each dollar of inflated value when a firm's books are cooked, firm value decreases by that dollar when its misrepresentation is revealed; in addition firm value declines $0.36 more due to fines and class-action settlements and $2.71 due to lost reputation. For firms that survive the enforcement process as independent entities, the estimate of lost reputation is even greater at $3.83 per dollar of inflated value".

Armour et al. (2011) used a more recent sample from UK that the authors claim are more explanatory comparing to the US examples because British Financial Services Authority does not disclose investigations of misconduct until they have been concluded and found against the company and that the penalty is set. They found that stock prices of companies that are found guilty experience abnormal losses of around nine times the penalties paid. However, reputational losses occurred just in related-party offenses, i.e. cases in which misconduct involved violation of implicit contracts; whilst in cases where victim was third party (not directly related) results were not statistically significant and losses were the consequence of the fees paid[4]. Additionally, reputational

[4] Those two categories of fraud were introduced by Karpoff and Lott (1993). Related-party offenses include cases of parties in direct contractual relationship, e.g. customers, suppliers, employees or investors. Those parties repeatedly engage in contracting with offending company or have any other

losses are more intensive in the post-crisis period. The confirmation of the argument that reputational losses affect companies in which victim party is directly related, can be found in other papers as well, e.g. Murphy et al. (2009).

On the other hand, some authors show that the losses can be attributed to the different factors. Karpoff et al. (2005) examined cases of violation of environmental laws and they got to the conclusion that the change in the returns is explained almost solely by the fine paid. Karpoff et al. (1999), who analyzed defense procurement frauds, found that influential contractors are penalized lighter than similar companies with less connections, experiencing not significant market share decrease.

2.4.1.2. Other implications of fraud to cost of capital

Companies committing fraud faced increase in cost of capital due to changes in the terms of trade. Allegations of fraud can result in revision of existing contracts, including bank loans, a major source of financing for the companies. The study of bank loans allows understanding the real financial consequences of misreporting since the implications for the cost of debt can be assessed, both in a direct (interest rates) and indirect way (maturity, covenants etc.).

The literature focuses on the restatements, not corporate fraud in particular. Restatement of the financial statements means that bank has to reevaluate the company because previous valuation was based on false financial information. It creates uncertainty about the reliability on the firm and deepens asymmetric information.

Graham et al. (2008) stressed that in the United States in the period between January 1997 and June 2002 about 10 percent of all listed companies restated their financial statements at least once, and the market value of restating company in this period increased from $500 million to $2 billion. They found the evidence that after restatement, loan spread increases on average by 42.5 percent, but if the restatement is fraud-based the spread increases by 68.9 percent. Other implication is non-direct consequences of restatement such as: “loans contracted after restatement announcements have significantly shorter maturity, higher likelihood of being secured

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direct relationship with it. In contrast, in third-party offenses offended party is not a stakeholder or does not engage in repeat contracting with the firm, e.g. fraud against government agency.

and more covenant restrictions." The availability of loans in general decreases, firms have to depend on the short-time financing, what implies that the company might have to give up some investment opportunities. This last finding is consistent with the Diamond's (1991) theory that debt maturity is a function of risk ratings.

Similar studies however present varied results depending on the data used. Palmrose et al. (2004) found there is no significant change in spreads during the short period surrounding the announcement date (day -2 to day +1). Anderson and Yohn (2002) found increase in bid-ask spreads only for restatements regarding revenue recognition problems and only for longer periods (7-day window).

Nevertheless, combining these results with findings on the increasing cost of equity and decreasing market value lead to the conclusion that effect of fraud on cost of capital can be catastrophic for the company.

2.4.2. To its rivals

As shown in the section 2.4.1 of this work, number of studies concentrate on the impact of fraud on the fraud company itself. However, more recent studies (e.g. Goldman et al. (2012); Grande and Lewis (2009); Beatty et al. (2013)) attempt to find the implications of restatement to the whole industries, but this phenomenon is not well explored in case of corporate frauds. Impact of disclosure of fraud of one company on its peers is called spillover effect or contagion effect.

There are two possible outcomes. The rival companies lose as a result of fraud within the industry because it is thought that the information provided by the companies is not reliable anymore, or the rival companies benefit from customers outflow from the accused company and reduced competition. Goldman et al. (2012) called those effects information spillover effect and industry competition effect, respectively. The total effect of fraud on rival firms depends on magnitude of those two effects.

Goldman et al. (2012) analyzed the cases from Karpoff et al. (2008) dataset. They showed that on average the value of the firm directly connected to fraud decreases by 19.7 percent and its rivals' value drops by 0.54 percent on average in the three-day window surrounding the event. Among the rival companies, firms operating in less competitive industries experience higher cumulative abnormal returns (CAR) than

others; if the rival company belongs to less competitive industry and has high sales, CAR is even higher (though still negative on average). It means that prior clients of the company that committed fraud prefer to choose big company within the industry.

What is more, company that experienced stock price declines while accused firm announced high earnings prior to disclosure, benefits from the disclosure of fraud. CAR is also subject to information spillover effect. As CAR of the accused company is more negative, the lower the CAR of its peers (the exceptions are competitive industries where industry competition effect is stronger). For firms with higher uncertainty, market will take into account more recent (negative) information and CARs will be lower.

To conclude, Goldman et al. (2012) found that for "firms predicted to be most affected by the industry competition effect (rivals in the least competitive industries, rivals of large accused firms with very negative event date CARs, least opaque rivals, and most opaque accused firms), the average three-day CAR is 3.2 percent. For the subsample of rival firms predicted to be most affected by the information spillover effect (rivals in the most competitive industries, large accused firms with very negative CARs, most opaque rivals, and least opaque accused firms), the average three-day CAR is -1.5 percent."

Grande and Lewis (2009) investigated the effect of shareholder-initiated class action lawsuits on the industry. They showed that "there is an average abnormal price decline of -0.34 percent over a 3 day announcement period for related firms (…). Over the 12-day event window [-10, +1] the average industry loss is $825.76 million". Bonini and Boraschi (2010) showed consistent results. They found that competitors decrease their debt issuance during the fraud period. It could mean that investors (including banks) perceive the fraud as the risk for the whole industry and restrict the availability of financing sources. Additional findings concluded that stocks of peers experience negative returns around the announcement date. It can be more severe due to capital structure changes imposed after disclosure of fraud. Though, the results are similar to Grande and Lewis (2009) (CAR equal to -0.21 percent, -0.56 percent and -0.75 percent for the [-1,0], [-5,+5] and [-10,+10] windows, respectively). Gleason et al. (2007) also found the effect of contagion and stressed that the prices

declines are higher when peer company has high earnings and high accruals and when peer and restating firms use the same external auditor.

Beatty et al. (2013) showed the impact of corporate fraud on peer firms' investments. Focusing on the biggest financial scandals, they documented that capital expenditures of rival companies are higher during fraud period (before the disclosure) than in the preceding 3 years and are associated with earnings overstatement. Additionally, rivals' investments are higher in the industries, in which investor sentiment is higher, cost of capital lower and managers' private benefits higher. Moreover, investments made in fraud periods have low efficiency. There was no significant difference in those effects when comparing high and low growth industries or competitive and concentrated industries. Similar results were obtained by Li (2012), who found that competitors have unexpectedly high expenses on research and development, fixed assets and customer acquisition.

Yu et al. (2010) took a bit different perspective. They showed the importance of corporate governance in the spillover effect. The better quality of corporate governance of the peer companies, the smaller the uncertainty and, as a result, the weaker is the contagion effect after fraud disclosure. The core for better corporate governance is external governance, ownership structure and external auditors; less important is composition of the board. In case of frauds auditors play the major role.

3. Methodology

In this section the methodology and the sample selection process are described.

3.1. Variables

3.1.1. Abnormal returns for accused company and its rivals

For measuring abnormal returns surrounding the initial disclosure the approach of Armour et al. (2011) is followed, who, among others, used standard event methodology.

Daily abnormal returns are computed in two different ways: using raw abnormal returns and using risk-adjusted abnormal returns. In the first case, returns are calculated by subtracting market returns from the raw return of the firm's return.

$$\mathrm{AR_{jt}} = \mathrm{R_{jt}} - \mathrm{R_{mt}} \qquad (1)$$

In second case, following formula is used - actual return minus the CAPM predicted return:

$$\mathrm{AR_{jt}} = \mathrm{R_{jt}} - \alpha_{\mathrm{j}} - \beta_{\mathrm{j}}\mathrm{R_{mt}} \qquad (2)$$

where R_{jt} and R_{mt} are the rate of return on stock j over day t, and the index of market returns over day *t*, respectively. The coefficients α_j and β_j are predicted from ordinary least squares regression of R_j and R_{mt} using period comprising from data from 6 months before fraud disclosure to day -11, where day 0 is the fraud announcement day (the announcement day is considered the date of filing of the civil lawsuit brought by the U.S. Securities and Exchange Commission in federal court).

To get more comprehensive results, two different index types are used. Firstly, value-weighted portfolio of all firms in the industry is created. This index is subject to some restrictions regarding data. Only companies which market capitalization from year before the fraud disclosure is available are considered. Further details are provided in *Sample selection and data description* subchapter. Cumulative abnormal returns using equally-weighted portfolio (market returns measured by S&P500 composite index) is also estimated.

The average abnormal return for each day *t* in the event window is computed as:

$$AR_t = \frac{1}{N}\left(\sum_{j=1}^{N} AR_{jt}\right) \quad (3)$$

where *N* is the number of firms over which abnormal returns are averaged on day *t*. The cumulative average abnormal returns for the window $[T_1,T_2]$ can be computed using following formula:

$$CAR[T_1, T_2] = \sum_{t=T_1}^{T_2} AR_t \quad (4)$$

Different lengths of event windows are checked, standard [-1,+1], but also [-3,+3] and [-10, +10]. By doing so, possible relation between the length of the window and the abnormal returns could be established. Three-day window is the most popular because it captures some eventual leakage of information day before the official disclosure (Armour et al., 2011). If authors want to study the class lawsuit instead of initial disclosure, the window is usually longer in the period before lawsuit, e.g. [-10,+1] to capture cross-sectional variation in the time between trigger (announcement) and filing date (Grande and Lewis (2009)).

Frauds can have significant consequences to the competitors operating in the same industry as accused company. That is why also CARs for the rival firms are calculated. Similar methodology as described above is used to explore the effect on those companies. Following Grande and Lewis (2009), industry spillover can be measured as average CARs for the all companies within an industry, excluding accused firm and can be presented as:

$$IS_i[T_1, T_2] = \frac{1}{J-1}\sum_{j=1, j\neq i}^{J} CAR_{ij}[T_1, T_2] \quad (5)$$

where *J* is the number of firms with the same four-digit SIC code as accused firm. Industry spillover effect is calculated separately for each industry; after that the results are averaged for the whole sample.

The statistical significance of all average variables are calculated using a cross-section standard error, t-statistics for the mean abnormal returns for fraud companies and for their rivals is computed. In order to avoid any bias, following

Armour et al. (2011) results are winsorized to eliminate eventual outliers in results before estimating the t-test statistic. Outliers are set to an 80th percentile of the data, meaning that all data below the 10th percentile are set to the 10th percentile, and data above the 90th percentile set to the 90th percentile.

3.1.2. Changes in cost of capital – risk

Changes in risk are assessed using the change in three different metrics: total risk, systematic risk and residual risk.

To assess the change in the systematic risk, the beta for pre-announcement period (from 6th month before to the 10th day before) and post-event period (from the 10th day after to 6th month after) using market model slope parameter is calculated. The same methodology applies for the company and its competitors.

To do a more exhaustive analysis additional metrics of risk are calculated. Like in most studies (e.g., Murphy et al. (2009)) we use standard deviation of stock returns – σ_{R_j} – as proxy for changes in the total risk. Also changes in the residual risk (standard deviation of the market model residuals) are calculated, using the formula (6)

$$\sigma_{\varepsilon j} = \sqrt{\sigma_{R_j}^2 + \beta_j^2 \sigma_{mt}^2 - 2\beta_j^2 * \mathrm{Cov}(R_j, R_{mt})} \quad (6)$$

Where $R_{mt}$is the return of market portfolio, $R_j$is the return of the asset j, σ_{mt}^2 variance of returns of market portfolio and σ_{R_j} variance of returns on asset j.

There is no consensus regarding the behavior of beta after fraud disclosure. Some authors predict a decrease, other an increase and other predict it remains constant.

Cloninger and Waller (2000) suggested that company might decide to use some illegal activities like fraud to enhance its returns or smooth cash flows, thereby reducing variability. The lower variability in firms' cash flows would translate into a lower market beta before the initial disclosure of fraud. They called this a hedging hypothesis. Higher post-event betas comparing to the pre-event betas could mean that company was forced to stop using fraud hedging techniques and, as a result, the risk has increased.

Cloninger and Waller (2000) predicted also the opposite situation. Lower post event betas could mean that the market anticipates lower risk associated with the cessation of the firm's illegal activities. Management engaged in the fraud, what destabilized returns of the company – they acted as speculates and market reacts positively to cessation of those actions. Some management or policy changes could be introduced as well, what would cause reduction of beta.

Finally, the last option (no significant change in the firm's beta after the disclosure of fraud) is also predict if he market perceives fraud as random act and firm value will be affected by agency costs but not by the fraud disclosure itself, what Cloninger and Waller (2000) called Rotten Apple Theory.

3.2. Sample selection and data description

The sample of fraud companies is collected from the Securities and Exchange Commission's Accounting and Auditing Enforcement Releases (AAERs) database[5] that comprise of 1070 cases of SEC enforcement actions taken from 2006 to 2012.

From those 1070 cases only companies listed on New York Stock Exchange, NASDAQ and NYSE MKT (former AMEX) are considered. The number of companies is lower than number of filings because some companies were sued multiple times. The sample is then restricted to the firms for which daily stock returns from 6 months before to 6 months after the fraud disclosure (SEC filling) are available in Thomson Reuters Datastream database[6]. Those restrictions reduce the dissertation sample to 80 cases/firms.

Similar filters are imposed on the rival companies. Rival companies are companies with the same 4-digit SIC code as the accused firm. They should be listed on NYSE, NYSE MKT or NASDAQ, having return data for 12-month period around the event available. 5443 cases firms are initially identified but the number decreased to 5265. Peers distribution with the division to industries is presented in the Table III.

[5] AAERs database includes enforcement actions concerning civil lawsuits brought by the SEC in federal court and orders concerning the institution and/or settlement of administrative proceedings (SEC website: http://www.sec.gov/divisions/enforce/friactions.shtml).

[6] Thomson Reuters Datastream database provides market information, such as stock prices and shares outstanding for all listed companies in major stock exchanges worldwide.

Information on SIC codes of the companies is taken from US Securities and Exchange Commission website – EDGAR Search Tool Company Filings[7]. In cases where SIC code available in Datastream database does not correspond to core SIC code extracted from the SEC website, the one that is the closest based on 3-digit code from Datastream is used. If they do not cover even in this case, core SIC code from Capital IQ database[8] is used. Due to some data availability restrictions, for the industry peers only companies currently listed on NYSE, NYSE MKT or NASDAQ are considered since it is not possible to extract historical SIC codes of already delisted companies in Thomson Reuters Datastream database.

In case there is more than one fraud within one industry (with equal SIC code) in one year window surrounding the event of the first disclosure identified, only the first one to commit fraud is examined to avoid any bias in results. All of the other events in one year period surrounding the SEC filing date are excluded. If there are multiple accused companies belonging to same industry accused on the same day, the one with highest market capitalization is investigated.

Finally, if there are less than 4 rivals in the industry, the observation is not included in further analysis. To avoid bias, firms traded in less than 20% of the days of the previously mentioned time frame are also excluded from the sample. Taking into consideration all these constrains our final sample includes 75 fraud cases.

The distribution of the final sample by year and by industry is presented in Table I and Table II, respectively). Table I shows that the highest number of fraud accusations in the sample occurred in 2007 - 15 cases and the lowest number of filings occurred in 2012 representing just 5 cases. The average number of cases per year is 11.

[7] available at: http://www.sec.gov/edgar/searchedgar/companysearch.html
[8] S&P Capital IQ is a database of fundamental and market information on publicly and privately held companies.

TABLE I

Distribution of fraud cases by year

The table represents annual distribution of SEC enforcement actions. Year refers to the initial disclosure of fraud accusation by SEC. Total number of the cases for the studied period accounts for 75.

Year	Number of Cases
2006	11
2007	15
2008	14
2009	13
2010	8
2011	9
2012	5
Total	75

Table II shows that frauds occur in vast array of industries, though in this sample manufacturing industry represents 47% of cases, followed by services – 20%.

TABLE II

Distribution of fraud cases by industry

The table represents distribution of 75 cases of fraud accused companies with the division into 2-SIC codes industries.

2-digit SIC code	Industry	Number of cases
10-14	Mining	5
15-17	Construction	3
20-39	Manufacturing	35
40-49	Transportation, Communications and Utilities	4
50-51	Wholesale Trade	3
52-59	Retail Trade	2
60-67	Finance, Insurance	8
70-89	Services	15
	Total	75

The number of peers by industry is presented in Table III and the descriptive statistics of the whole sample is shown in Table IV.

According to Table III the highest average number of competitors is observed in Finance sector, followed by Services. Maximum number of rivals varies from only 4 among some manufacturing companies and 305 in banking sector.

TABLE III

Distribution of rivals

The table presents the average, minimum and maximum number of competitors per case with the division into 2-SIC codes industries.

2-digit SIC code	**Industry**	**Mean**	**Min**	**Max**
10-14	Mining	67	35	132
15-17	Construction	20	10	31
20-39	Manufacturing	55	4	196
40-49	Transportation, Communications and Utilities	35	7	76
50-51	Wholesale Trade	27	15	37
52-59	Retail Trade	16	14	17
60-67	Finance, Insurance	141	13	305
70-89	Services	85	8	242

Finally, Table IV shows that fraud companies included in the sample are, on average, larger than its industry peers in terms of total assets, sales and market capitalization. They also tend to be more profitable taking EBITDA as profitability measure. Fraud companies are also on average more leveraged. These statistics are in line with previous research which had shown that factors such as leverage and extensive growth increase the propensity for fraud. Descriptive statistics of fraud companies also indicate the presence of some outliers given the presence of huge companies in the sample, e.g. American International Group, Pfizer or Prudential Financial.

TABLE IV

Descriptive statistics

Table IV shows the descriptive statistics of the the fraud companies (Panel A) and their respective peers (Panel B). Values are shown in million dollars.

Panel A: Fraud Companies				
	Mean	**Median**	**Maximum**	**Minimum**
EBITDA	2.75	0.39	42.14	-0.34
Total assets	11 874.40	4.37	853 380.00	0.03
Sales	14.84	2.14	158.48	0
Market capitalization	17.97	2.16	177.17	0
Net Debt	3.57	0.19	122.14	-10.53
Panel B: Peers				
EBITDA	0.81	0.04	74.33	-7.37
Total assets	12.29	0.66	2 199.85	0
Sales	4.08	0.27	376.50	0
Market capitalization	6.96	0.56	504.24	0
Net Debt	1.99	0.00	809.48	-38.24

4. Empirical results

4.1. Event study results

The study concentrates on the 21-day event window [-10;+10] to capture the stock price behavior in the longer time period before and after fraud than the standard 3-day window. Cumulative returns of accused companies are shown, followed by section summarizing cumulative abnormal returns for fraud companies and their rivals, computed in two different ways – using equally or value-weighted indexes and implementing risk factor in one of the analysis.

4.1.1. Cumulative returns of fraud companies

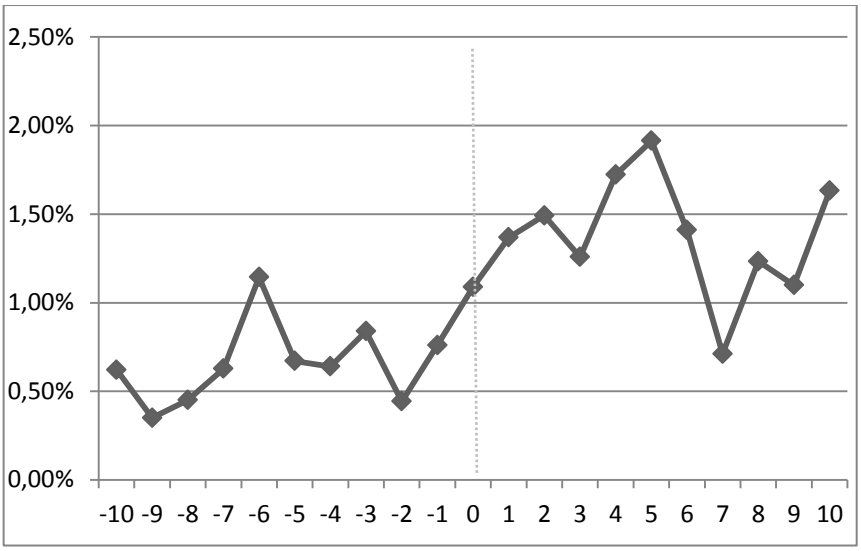
Figure I presents cumulative returns of the companies accused of fraud in the window [-10;+10]. When the returns are not adjusted for the market return (raw returns), during this period, stock price increases, on average, 1.63%. This return is statistically significant for a significance level of 5%[9]. This result, is, surprisingly, contrary to the results of previous studies

[9] T-statistics for the mean cumulative returns are computed from the cross-sectional standard error of returns

FIGURE I

Cumulative returns of fraud companies

Figure below presents cumulative returns of companies accused of fraud in the 21-day period surrounding the event. There are 75 fraud cases in the sample.



4.1.2. Cumulative abnormal return – value-weighted index calculated CARs

When results are market-adjusted[10], fraud companies experience a big drop in stock prices before the announcement day, what could suggest there is some information leakage before the official fraud disclosure. The average CAR for the period [-10,0] is equal to –1.34%. For the whole 21-day window the average CAR of accused company although still negative representing only a drop of -0.36%, which suggest that investors, after the fraud is disclose, start to believe in the company again, perhaps anticipating lower risk associated with the cessation of the firm's illegal activities, as predicted by Cloninger and Waller (2000) CARs in the sample vary significantly, with maximum of 65.91% and minimum of -32.97%.

When CARs are calculated for 3-day window, returns are only significant, at a level of significance equal to 10%, for the disclosure day (average CAR equal to -0.49%) and the day before (-0.41%). These results are consistent with previous studies.

[10] Market return is market capitalization-weighted index created for each industry

For rival companies the CAR in 3- and 7-day window is slightly negative but results are not statistically significant. It means that on average spillover effect is stronger than competition effect. Though, in the longer 21-day event window the effect reverses and on average industry peers earn positive returns. Figure II shows even that during the longer event window, cumulative abnormal returns of industry competitors are reverse of the abnormal returns of fraud companies. This proves that in the longer time periods competition effect is stronger and peers benefit from fraud occurrence.

FIGURE II

Cumulative Abnormal Return

The cumulative abnormal return (CAR) of fraud companies and their rivals over 21-day event window.

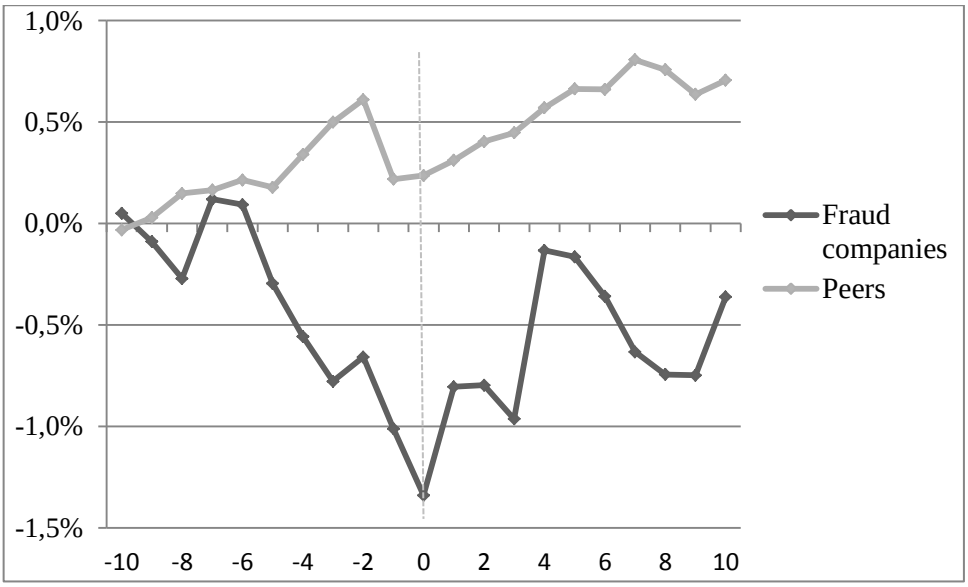


Table V shows that rivals' results are, similarly to fraud accused firms, also characterized by big variability. These findings are consistent to previous research.

TABLE V

Fraud firms' CARs and industry spillover effect – value weighted index

Table IV presents cumulative abnormal returns in three different event windows. Day 0 is defined as SEC fraud disclosure day. Panel A shows CARs of fraud accused companies while Panel B shows the industry spillover effect. CARs are calculated using market capitalization weighted index created for each industry. Sample period is 2006-2012.

Panel A: Accused companies				
Event date	**Mean**	**p-value**	**Min**	**Max**
CAR(-1;+1)	-0.19%	0.6131	-13.78%	10.87%
CAR(-3;+3)	-0.38%	0.4913	-31.83%	13.07%
CAR(-10;+10)	-0.36%	0.7780	-32.97%	65.91%
Panel B: Rival companies				
CAR(-1;+1)	-0.27%	0.4671	-11.64%	6.73%
CAR(-3;+3)	-0.10%	0.6706	-15.18%	9.40%
CAR(-10;+10)	0.71%	0.1425	-20.63%	50.05%

4.1.3. Cumulative abnormal returns – market model residual and industry spillover

In this section cumulative abnormal returns are computed taking risk into consideration – more specifically betas for the fraud companies. It is vital part of this research because the whole next chapter is devoted to risk changes caused by fraud disclosure. In this section equally weighted index is used.

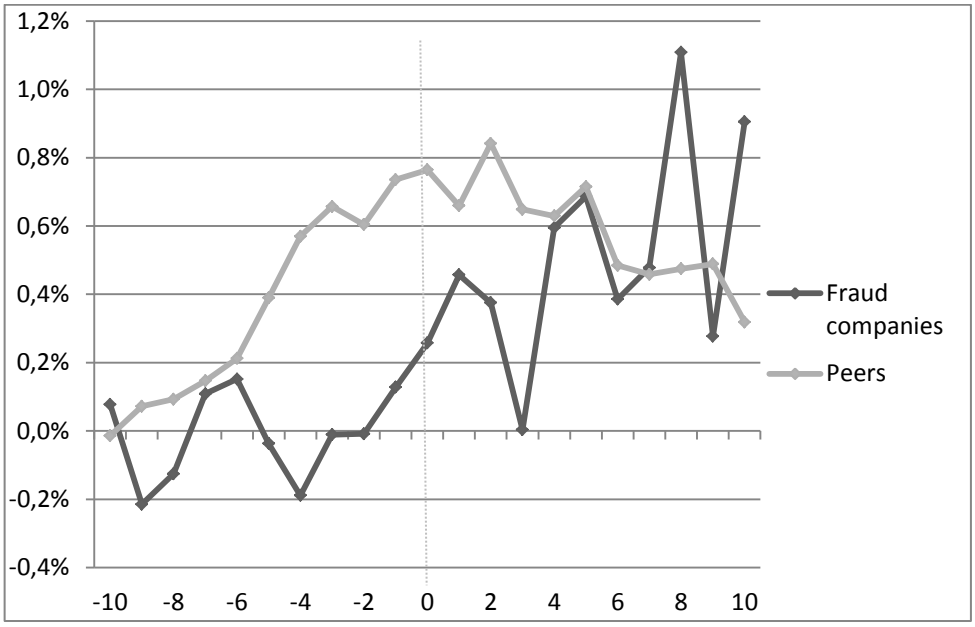
Figure II and Table VI show the results of the cumulative abnormal returns for both, fraud companies and their peers. Market return is the daily return of S&P500.

Figure III shows the evolution of CARs of the accused firms and their rivals in the 21-day window. CARs of fraud companies are not insignificantly different form zero, what could suggest that, on average, fraud information is processed in an efficient manner or that during our period of analysis SEC enforcement actions were treated rather trivially.

FIGURE III

CARs of fraud companies

Cumulative abnormal returns of fraud companies and their rivals over 21-day event window. Risk of the companies is taken into consideration. Market return is calculated using equally weighted S&P500 index.



The situation looks differently if we look to different time windows.. For the rival companies the cumulative abnormal returns are statistically significant during 10-day window surrounding the event (days -5 to +5). Returns of rivals are in general positive but they decrease with time. In the shorter period surrounding fraud disclosure those returns are symmetrical. Thus, while considering risk of the companies, the competition effect dominates over the spillover effect in the shorter windows and while considering longer windows in this sample information spillover is stronger.

Table VI presents the CARs for both groups of the companies calculated taking into consideration equally weighted S&P500 index and risk of the companies. On average both fraud companies and their rivals get positive, albeit not statistical significant, abnormal returns but comparing these results to those presented in previous subchapters, rival companies do not benefit from fraud (information spillover effect is stronger) and end up worse than average fraud company.

TABLE VI

Fraud firms' CARs and industry spillover effect – equally weighted index

Table VI presents cumulative abnormal returns in three different event windows. Day 0 is defined as SEC fraud disclosure day. Panel A shows CARs of fraud accused companies while Panel B shows the industry spillover effect. CARs are calculated using S&P500 index. Sample period is 2006-2012.

Panel A: Accused companies				
	Mean	**p-value**	**Min**	**Max**
CAR(-1;+1)	0.46%	0.1752	-11.39%	9.15%
CAR(-3;+3)	0.37%	0.4979	-28.79%	14.16%
CAR(-10;+10)	0.91%	0.421	-34.80%	39.60%
Panel B: Rival companies				
CAR(-1;+1)	0.07%	0.6456	-8.84%	7.74%
CAR(-3;+3)	0.21%	0.4002	-12.60%	7.92%
CAR(-10;+10)	0.32%	0.4774	-20.54%	15.33%

4.2. Changes in risk

In this section changes in risk occurred due to fraud disclosure are presented. Firstly, the change in risk for the fraud company and its competitors are shown. Secondly, more detailed analysis of fraud companies' risk profile is presented.

Like stated in the previous sections, the risk changes are assessed using the change in three different risk measures: total risk, systematic risk and residual risk. Total risk change is measured by the change of standard deviation of returns, systematic risk change by the market model slope parameter and residual risk by the standard deviation of the market model residuals.

4.2.1. Changes of risk of fraud accused companies

The results in Panel A of Table VII reveal, consistent with previous research, that on average total risk change for fraud companies is positive (+21.3%) and statistically significant (p-value equal to 0.01). These results suggest that fraud disclosure increases the total risk (measured by return volatility) of the fraud company. The table also show that the systematic risk of fraud companies decrease (-12.37%) but the decrease is not statistically significant (p-value equal to 0.28). Finally, residual risk (or specific risk) increases significantly (19.49%, on average, and p-value equal to 0.05).

4.2.2. Changes of risk of rival companies

Panel B of Table VII shows that the changes of risk of the rival companies is similar (although in small extension) to the changes occurred in fraud companies. Average change of total risk is positive (+13.16% and p-value equal to 0.01), what is consistent with previous research. Change in systematic risk is slightly negative (-5.29%), but not statistically significant (p-value equal to 0.27) and residual risk increases on average 8.10% and is statistical significant (p-value equal to 0.09).

These results suggest that fraud negatively affects peer companies almost as much as the fraud company consistent with the industry spillover effect.

TABLE VII

Changes in risk of the fraud companies and rival companies

Table VII represents fraud companies average change in total risk (ΔTOTALRISK) measured as standard deviation of returns, systematic risk (ΔBETA) measured as market model slope parameter and residual risk (ΔSTDERR) measured as standard deviation of the market model residuals for the pre-announcement period (-6 months; -11 days) and post-announcement period (+11 days; +6 months) where day 0 is the SEC fraud filing date.

Panel A: Accused companies			
	Mean	**p-value**	**Median**
ΔTOTAL RISK	21.30%	0.01	9.12%
ΔBETA	-12.37%	0.28	-3.22%
ΔSTDERR	19.48%	0.05	2.69%
Panel B: Rival companies			
ΔTOTAL RISK	13.16%	0.01	0.58%
ΔBETA	-5.29%	0.27	2.99%
ΔSTDERR	8.10%	0.09	1.41%

4.2.3. Additional tests

As some of the results in the previous subsections are not statistically significant additional test are performed. The sample is divided into five quintiles based on pre-disclosure risk metrics, following Cloninger and Waller (2000).

4.2.3.1. Fraud companies

As it can be seen the Panel B of Table VII, systematic risk seems to decrease significantly in the 5th quintile (companies with the highest systematic risk pre-disclosure) and increased significantly in 2nd quintile. In others subsamples the risk changes are not statistically significant. These results may suggest that market was misestimating the company's beta before the fraud was disclosed that was corrected through time. Alternatively, beta decrease in the companies in the 5th quintile can be explained by the discontinuation of illegal practices and management changes that could lead to a lower return volatility. By the contrary, the beta increase in the companies in the 2nd quintile (companies with low betas pre-disclosure) can be explained by the fact that those firms achieved low volatility/high stability due to fraud techniques and

disclose makes the company potentially more risky in the future when those fraud activities stop.

The similar pattern is observed in case of total risk and residual risk changes. In both cases the risk in the companies in the 5th quintile decreases whereas the risk in the companies in the first four quintiles increases.

TABLE VIII

Comparison of risk changes dividing the sample into quintiles by the pre-disclosure measure levels – fraud companies

This table shows the mean risk measures and their mean changes in the quintiles. Quintiles are created taking into consideration pre-disclosure level of the respective risk measure: total risk – Panel A, systematic risk – Panel B and residual risk – Panel C. Quintile 1 contains cases in which risk measure was the smallest in the sample.

Panel A: Total risk				
Quintile	**Pre-disclosure**	**Post-disclosure**	**Δtotrisk**	**p-value**
1	0.0116	0.0161	38.61%	0.02
2	0.0189	0.0272	45.35%	0.04
3	0.0263	0.0351	32.21%	0.17
4	0.0341	0.0390	13.81%	0.28
5	0.0549	0.0423	-23.49%	0.07
Panel B: Systematic risk				
Quintile	**Pre-disclosure**	**Post-disclosure**	**Δbeta**	**p-value**
1	0.2315	0.1698	-81.42%	0.16
2	0.7702	0.9897	32.52%	0.03
3	1.0608	1.2052	13.85%	0.12
4	1.2987	1.4111	7.99%	0.27
5	1.9417	1.5156	-19.06%	0.02
Panel C: Residual risk				
Quintile	**Pre-disclosure**	**Post-disclosure**	**Δresidrisk**	**p-value.**
1	0.0096	0.0102	8.75%	0.19
2	0.0154	0.0263	75.31%	0.07
3	0.0216	0.0245	15.71%	0.49
4	0.0290	0.0311	8.62%	0.53
5	0.0449	0.0394	-11.00%	0.37

4.2.3.2. Rival companies

Finally, to complete the analysis, the peers companies are also divided into quintiles, according to the pre-disclosure risk measure. The method used is exactly the same as for the fraud companies. Results are reported in the Table IX.

The results are similar to the results of fraud companies. Total risk increases in the companies in the first four quintiles (though only 1st and 2nd quintiles' results are statistically significant) and total risk decrease (significantly) in the companies with the highest values of pre-disclosure total risk. Changes in residual risk follow the same pattern.

The results are however different in the case of the systematic risk measure. In case of rival companies, betas' change is not closely correlated with the level of pre-disclosure measure. Companies' betas decrease in all but the second quintile but the decrease is only statistically significant in the 4th quintile. Betas increase in the 2nd quintile (p-value 0.08).

TABLE IX

Comparison of risk changes dividing the sample into quintiles by the pre-disclosure measure levels – rival companies

Panel A: Total risk				
Quintile	**Pre-disclosure**	**Post-disclosure**	**Δtotrisk**	**p-value**
1	0.0191	0.0252	31.84%	0.02
2	0.0252	0.0327	28.95%	0.02
3	0.0305	0.0355	16.99%	0.22
4	0.0355	0.0394	10.40%	0.27
5	0.0570	0.0426	-22.40%	0.01
Panel B: Systematic risk				
Quintile	**Pre-disclosure**	**Post-disclosure**	**Δbeta**	**p-value**
1	0.6249	0.6949	-1.25%	0.95
2	0.8842	0.9583	8.35%	0.08
3	0.9480	0.9431	-0.65%	0.88
4	1.0863	0.9681	-11.05%	0.01
5	1.4084	1.3346	-3.94%	0.46
Panel C: Residual risk				
Quintile	**Pre-disclosure**	**Post-disclosure**	**Δresidrisk**	**p-value**
1	0.0004	0.0006	58.53%	0.04
2	0.0007	0.0010	50.52%	0.09
3	0.0009	0.0013	52.80%	0.11
4	0.0016	0.0025	51.65%	0.12
5	0.0035	0.0028	-14.00%	0.49

4.2.4. Significance of beta change

The sample of fraud cases was also divided into three groups taking into consideration the significance of beta change. There are 16 cases in which beta significantly decreased, 26 cases in which beta significantly increased and 33 cases in which beta did not change significantly[11].

One more time results are consistent with the previous hypothesis that the effect of change of systematic risk depend on the perception of the investors case by case. No significant change in beta could mean that fraud was perceived as a random act and the change in risk is explained solely by fine paid. In case of increasing beta, the variability after the fraud disclosure is expected to increase and, as a result, company is more risky. Reduction in beta could be explained by the changes introduced in the company and by doing so the returns are expected to stabilize in the future.

The results contribute to the hypothesis that three types of beta change described above exist simultaneously in the market and the overall effect of fraud on the systematic risk depends on the individual features of the specific fraud case.

[11] Detailed table showing the results of each company can be found in the Annexes

5. Conclusions

This dissertation studies the consequences of fraud announcement on the value and risk profile of the fraud company and its peers. Prior research concentrates on examining mainly the stock price reaction, rarely taking into consideration risk changes. Moreover, previous studies explored the impact of fraud only on the fraud company. Spillover effect on peers is not widely studied in the fraud literature. This work combines both streams of literature in one paper. The short-term return and risk changes due to fraud disclosure for the involved companies and their industry competitors are analyzed.

The final sample of this analysis comprises 75 SEC enforcement actions taken, from 2006 to 2012, involving companies from vast array of industries. On average, fraud firm's value decreased when a value-weighted index and raw returns method was used and increased in case of equally weighted index and risk measure was used during the 21-day window surrounding the event. During the same time period, on average, rival companies' value increased insignificantly, independently of the method. Results for both groups are though subject of big variability. Sources of this variability are not explored in this paper and could underlie further research.

In terms of risk both the companies accused of fraud and their peers faced, on average, an increase in total (21.3% and 13.16% change respectively) and residual risk (19.48% and 8.10% respectively) but a decrease in systematic risk (-12.37% and -5,29%). The result suggest that fraud occurrence affects negatively accused company and its peers – spillover effect. Again, the results vary a lot within the sample and overall average for systematic risk shows no statistical significance. Increases in total risk and residual risk are however statistical significance.

When the samples are divided into quintiles based on pre-disclosure risk measure the results show that fraud companies in the high quintiles (with the highest pre-event risk measures) face a risk decrease while companies in low quintiles face a risk increase after the fraud disclosure. These results suggest that the companies' risk adjust to its correct level with the disclosure of additional (fraud) information.

Sample is also divided into three groups based on the significance of beta change. There are 16 companies in which beta significantly decreased after the fraud disclosure, 26 cases in which beta significantly increased and 33 cases in which beta did not change significantly.

This study shows that risk changes can be explained by the value of pre-disclosure risk measures of fraud companies. High pre-disclosure betas fall due to changes in the policy of the company because market perceives it as good change for the company while low pre-event betas increase because fraud was considered as destabilization of the company. The overall effect of fraud on the systematic risk of the company depends on the specifications of an individual fraud case.

Although these results of this study look sound and significant, both cumulative abnormal returns and risk changes are subject of great variability and further research could look for the sources of the differences in the sample. It is possible that factors such as size, industry, size of penalty, debt value or other described in the literature have significant impact on the results achieved. The period of analysis could also be extended in order to include data from before and after the crisis since there is the possibility that investors during this time treated fraud accusations rather trivially, comparing to normal market conditions.

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Annexes

A. Sample

Date	Name	SIC Code
Jul 7, 2010	ENI, S.p.A.	1311
Nov 4, 2010	Transocean Inc.	1381
Jul. 30, 2009	Helmerich & Payne, Inc.	1381
Feb. 11, 2009	Halliburton Company	1389
May 14, 2008	Willbros Group, Inc.	1389
Sep. 24, 2008	Beazer Homes USA, Inc.	1531
Feb. 11, 2010	KBR, Inc.	1623
Aug. 30, 2007	Integrated Electrical Services, Inc.	1731
Jul. 28, 2009	Avery Dennison Corporation	2672
Feb. 13, 2007	The Dow Chemical Company	2821
Aug. 8, 2012	Pfizer Inc.	2834
Apr. 8, 2011	Johnson & Johnson	2834
Jun. 20, 2007	Cambrex Corporation	2834
Sep. 13, 2007	Ferro Corporation	2851
Jul. 18, 2007	OM Group, Inc.	3341
Mar. 24, 2011	Ball Corporation	3411
Oct. 13, 2011	Watts Water Technologies, Inc.	3491
Feb. 7, 2006	Cummins Inc.	3519
Apr. 27, 2006	Oil States International, Inc.	3533
May 19, 2008	Brooks Automation, Inc.	3559
May 13, 2011	GSI Group, Inc.	3559
Feb. 11, 2009	ITT Corporation	3561
Jun. 5, 2007	International Business Machines Corp.	3571
Jul 22, 2010	Dell Inc.	3571
Nov 12, 2008	Blue Coat Systems, Inc.	3572
Sep 29, 2010	ABB Ltd	3612
Oct. 24, 2011	Koss Corporation	3651
Mar 29, 2006	Netopia, Inc.	3661
Feb 17, 2009	Research in Motion Limited	3663
May 8, 2007	Motorola, Inc.	3663
Dec. 31, 2009	UTStarcom, Inc.	3669
May 1, 2008	UTStarcom, Inc.	3669
Dec 10, 2010	Vitesse Semiconductor Corporation	3674
Apr. 15, 2008	Broadcom Corp.	3674
Jan. 12, 2007	Lattice Semiconductor Corp.	3674
Aug 5, 2010	Navistar International Corporation	3711
Jun. 28, 2006	Raytheon Company	3812
May 3, 2011	Rockwell Automation, Inc.	3829
Jun. 5, 2008	Faro Technologies, Inc.	3829

Jul. 25, 2006	Endocare, Inc.	3841
Jan. 30, 2012	Symmetry Medical, Inc.	3842
Feb. 9, 2011	Arthrocare Corporation	3845
Aug 27, 2008	Con-way Inc.	4213
Mar. 29, 2007	Atlas Air Worldwide Holdings, Inc.	4522
Jan. 22, 2009	Cablevision Systems Corporation	4841
Jul. 11, 2008	El Paso Corporation	4922
May 12, 2009	Ingram Micro Inc.	5045
Jul. 9, 2007	Brightpoint, Inc.	5065
Jul. 26, 2007	Cardinal Health, Inc.	5122
Apr. 27, 2006	Ingles Markets Incorporated	5411
Jun. 29, 2007	CVS Caremark Corporation	5912
Aug. 7, 2007	First BanCorp	6029
Jul. 6, 2009	First BanCorp	6029
Aug. 6, 2008	Prudential Financial, Inc.	6311
May 18, 2009	WellCare Health Plans, Inc.	6324
Jul. 22, 2008	HCC Insurance Holdings, Inc.	6331
Feb. 9, 2006	American International Group, Inc.	6331
Dec. 20, 2011	Aon Corporation	6411
Feb. 27, 2006	Sun Communities, Inc	6798
May 1, 2008	Interpublic Group of Companies, Inc.	7311
Sep. 8, 2008	United Rentals, Inc.	7359
May 18, 2009	Monster Worldwide, Inc.	7361
Sep 25, 2007	Electronic Data Systems Corporation	7371
Jul. 31, 2007	Aspen Technology, Inc.	7371
Jun. 28, 2012	FalconStor Software, Inc.	7372
Sep. 24, 2008	Bally Technologies, Inc.	7372
Jan 4, 2006	McAfee, Inc.	7372
Nov. 4, 2009	Merge Healthcare Incorporated	7373
Sep. 24, 2012	Tyco International Ltd.	7382
Apr. 17, 2006	Tyco International Ltd.	7382
Jul 23, 2010	Sunrise Senior Living, Inc.	8059
Apr. 2, 2007	Tenet Healthcare Corporation	8062
Mar 18, 2009	Allion Healthcare, Inc.	8093
May 11, 2011	Michael Baker Corporation	8741
Jul. 19, 2012	Huron Consulting Group Inc.	8742

B. Significance of beta change

Significantly negative beta change			
	Before	*After*	*Change*
Halliburton	1.51	1.25	-0.26
Beazer Homes Usa	2.46	2.16	-0.30
Om Group	2.17	1.53	-0.64
Utstarcom Holdings	2.53	1.96	-0.57
Vitesse Semicon.	1.39	0.72	-0.67
Lattice Semiconductor	2.98	1.33	-1.65
Rockwell Automation	0.55	-0.08	-0.63
Faro Techs.	1.16	0.83	-0.33
Endocare	0.50	-0.99	-1.49
Symmetry Medical	1.47	0.84	-0.62
Con-Way	1.60	0.73	-0.87
Atlas Air	1.16	0.91	-0.25
First Bancorp Prico.	2.48	1.75	-0.72
Falconstor	2.25	0.89	-1.35

No significant change			
	Before	*After*	*Change*
Eni Spa	1.49	1.34	-0.14
Helmerich & Payne	1.55	1.92	0.37
Willbros Group	1.48	1.53	0.04
Kbr	1.36	1.21	-0.16
Avery Dennison	1.27	1.30	0.04
Dow Chemical	1.08	1.02	-0.06
Johnson & Johnson	0.53	0.55	0.03
Ball	1.05	1.01	-0.03
Brooks Automation	0.20	0.06	-0.14
Itt	0.99	0.96	-0.03
International Bus.Mchs.	0.70	0.74	0.03
Dell	0.27	0.03	-0.24
Blue Coat Systems	-0.08	-0.13	-0.05
Symbol Techs.	1.13	1.07	-0.06

Significantly positive beta change			
	Before	*After*	*Change*
Transocean	1.24	1.26	0.02
Integrated Elect.Svs.	1.50	1.90	0.39
Pfizer	0.54	0.78	0.24
Cambrex	0.57	1.02	0.45
Ferro	1.17	1.37	0.20
Watts Water Techs.	1.40	1.74	0.34
Cummins	1.26	1.49	0.23
Oil Sts.Intl.	1.95	2.28	0.33
Gsi Group	0.73	1.38	0.65
Abb	-0.09	0.18	0.27
Research In Motion	0.94	1.19	0.24
Utstarcom Holdings	0.95	1.33	0.39
Navistar Intl.	1.25	1.76	0.52
Cablevision	1.13	1.61	0.48

Sftw. Bally Technologies	1.72	1.32	-0.40
Huron	0.12	-0.15	-0.27
Mean	1.63	0.94	-0.69
Min	0.12	-0.99	-1.65
Max	2.98	2.16	-0.25
Count			16

Koss	0.27	0.05	-0.22
Netopia	0.03	-0.13	-0.16
Motorola Solutions	1.04	0.86	-0.18
Broadcom	1.09	1.03	-0.06
Raytheon	0.75	0.66	-0.09
Arthrocare	1.03	1.03	0.01
Brightpoint	1.27	1.27	0.00
Cardinal Health	0.64	0.48	-0.16
Cvs Caremark	0.64	0.58	-0.06
Wellcare Health Plans	0.25	0.21	-0.04
American Intl.Gp.	0.90	0.84	-0.06
Hcc Insurance Hdg.	0.91	1.02	0.12
Aon	0.96	0.86	-0.10
Sun Communities	1.22	1.21	-0.01
Tyco International	1.07	1.16	0.09
Tyco International	0.95	0.89	-0.06
Sunrise Sen.Lvg.	1.41	1.57	0.16
Tenet Healthcare	0.90	0.68	0.16

Sys.			
El Paso	0.30	0.75	0.44
Ingram Micro	-0.26	0.36	0.62
Ingles Mkts.	0.72	1.26	0.55
First Bancorp	1.02	1.95	0.93
Prudential Finl.	1.45	2.10	0.65
Interpublic Gp.	0.69	1.46	0.76
United Rentals	0.56	1.32	0.76
Monster Worldwide	1.46	2.22	0.76
Aspen Technology	1.15	1.54	0.39
Mcafee	0.34	1.05	0.70
Merge Healthcare	1.02	1.56	0.54
Baker Michael	0.99	1.50	0.51
Mean	0.92	1.40	0.48
Min	-0.26	0.18	0.02
Max	1.95	2.28	0.93
count			26

Allion Healthcare	1.17	1.12	-0.21
Mean	0.89	0.85	-0.05
Min	-0.08	-0.13	-0.24
Max	1.55	1.92	0.37
count			33