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The effect of risk – taking incentives on the internal control quality of a firm

Evidence from the United States of America

Msc in Accounting, Auditing and Control
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Abstract

In this study I examine firstly the effect of risk – taking incentives provided to the CEO on the internal control quality of a company during the era of SOX Section 404. I find that CEO's payoff to alterations in firm risk, or vega, is not related to the possibility of the occurrence of weaknesses in the internal control environment of a firm. I investigate publicly held companies of the United States of America and the period tested extends from December 2004 up to December 2010. Second, after taking simultaneously CEO's equity and risk – taking incentives into consideration, I test which of them predominates regarding the likelihood of the incidence of internal control weaknesses in the internal control systems of an organization. My results show that even in this case, there is no association between each of the above incentives and the probability of the disclosure of an ineffective control quality in the financial reports of a firm. In previous literature a significant negative relationship was found between the sensitivity of the aggregate wealth of CEO and CFO to changes in the firm's stock price and the propensity of a company to report material internal control problems. However, when the sensitivity of CEO's wealth to shifts in the firm's stock price is only taken into consideration, then, prior literature did not detect any association between CEO's delta and the internal control quality of a firm, a result with which my findings are also consistent.

*Key words***:** risk – taking incentives, equity incentives, internal control quality, internal control weaknesses, delta, vega, SOX Section 404

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Contents

1. Introduction

1.1 The subject of the study

This thesis investigates the relationship between the sensitivity of CEO wealth to stock return volatility, or vega and the possibility of the occurrence of material weaknesses in the internal control systems of a firm. Additionally, after controlling for the sensitivity of CEO wealth to changes in a firm's stock price, or delta, I test which of these two types of incentives provided to management is more dominant regarding their association with the likelihood of the existence of material internal control weaknesses in a company. The reason why I decided to deal with the above topic will be analyzed next.

Aligning managerial interests (agents) with those of the shareholders of a company (principals) had always been an important issue for the companies and an extended body of previous literature had tried to detect the reasons of this divergence and suggest also some solutions in order to solve this problem. For example, some researchers suggested that in order to mitigate risk – aversion of managers, whose biggest part of their compensation is performance - based and in order to urge them undertake risky projects, it is important to provide them with stock options. Because, this type of equity based compensation rises the expected utility of managers, by creating convexity in their wealth and on parallel, it affects the firm value, due to fact that managers usually influence the firm's share price, since gains and losses are shared between them and the owners of a company (*Jensen and Meckling., 1976; Smith and Stulz., 1985).*

What is more, performance – based incentives not only drive up delta, but they drive up also vega, as higher delta leads to the exposure of managers to more risk. Furthermore, increased vega leads to the implementation of riskier policies *(Coles et al., 2006).* However, in order that managers (agents) take up risky decisions, besides providing them with risk - taking incentives, I assume that it is important that lax internal controls should also be applied by the owners of a company (principals). Because, the existence of tight controls in the systems of a company limit the discretion of management and would probably prove a barrier into risk – taking decisions. The same holds also for the subordinates of the executives. If executive officers want to urge the lower – level employees to take risks, then they should relax the internal controls imposed to them.

To my mind, the rehearsal of a loose internal control environment will most probably lead to the existence of weaknesses in a firm's internal control systems and financial reports. Another case in which internal control problems may show up, is the enactment itself of riskier policies.

Risky decisions usually hide unexpected situations, which, a lot of times, managers do not know how to handle properly. Moreover, executives often do not know which controls are best to impose in such situations, or there is sometimes a delay in their reaction, due basically to lack of managerial experience and / or knowledge. For that reasons, internal control deficiencies may arise.

1.2 Motivation

However, maintaining adequate internal controls has always been a significant issue for most of the firms, as they promote efficiency in operations (*COSO. Internal control - Integrated framework. Retrieved May 1, 2016 from http://www.coso.org/documents/internal%20control-integrated%20framework.pdf*) and therefore they are considered as the key to a successful business *(U.S Small Business Administration. Internal controls – Keys to business success. Retrieved on May 1, 2016 from https://www.sba.gov/sites/default/files/files/internal%20controls(3).docx)*. For that reason, I think it is important to examine whether providing the executives of a firm with a specific type of incentives, the risk – taking ones, besides urging them to take up risks and helping solve the principal – agent problem, will also have a negative impact on a firm. Because, as I said above, such incentives may create internal control problems and lead to the disclosure of material control weaknesses in its annual financial reports.

1.3 Findings of previous literature

So far previous literature examined the effect of delta on the internal control quality of an organization. *Balsam et al (2014)* found that equity incentives, which are provided to the CEOs and CFOs of a company, are negatively related to the likelihood of the existence of internal control weaknesses in a firm. Additionally, they concluded that this effect varies according to the severity of the weaknesses, which is stronger for most severe type of internal control problems, the company – level, rather than the account – specific ones. Furthermore, it is essential to mention, that when they take separately the sensitivity of CEO's and CFO's wealth into consideration, they detected that there is no relation between CEO's delta and the internal control quality of firm, while CFO's delta is negatively associated with it.

What is more, the results of *Jha et al (2013)* showed that if long – term equity incentives are provided to CEOs and CFOs, then it is less likely that internal control problems will show up in the internal control environment of a firm. Moreover, they found also, that this effect is more intense towards the company – level weaknesses, rather than the account – specific ones. In contrast, no significant relation was detected between the short – term equity based

compensation and the internal control quality of an organization. Furthermore, these researchers pointed out that, in comparison with CEOs' delta, CFOs' delta is stronger associated with the probability of the disclosure of an ineffective internal control opinion by a firm.

1.4 The main research and the follow – up question

However, previous literature has not examined yet the association between the risk – taking incentives (vega) provided to management and the internal control quality of a firm. So, the main research question of my thesis is the following:

"Is there any relation between the sensitivity of CEO's wealth to changes in firm risk and the possibility of the occurrence of material internal control weaknesses in a firm?".

Due to the fact that a significant negative relation was found between the aggregate equity incentives (aggregate delta) provided to the CEO and CFO and the likelihood that material weaknesses will show up in the internal control environment of a company (*Jha et al., 2013; Balsam et al., 2014)*, but no relation was found between CEO's delta and the internal control quality (*Balsam et al., 2014)*, I decided to test also the joint effect of CEO's vega and delta on the probability of the incidence of material internal control problems in an organization. So, the follow - up question of my study is the following:

"By considering CEO's delta and vega together, which of the two types of incentives rehearses towards their relation with the internal control quality of a company?".

1.5 The sub – questions of the study

In order to give an answer to my main research and the follow - up question, seven sub – questions are created, which are analysed in the next sections and which are the following:

➢ Sub – question 1:

"How are the internal controls of a company and the material weaknesses of a firm defined?"

➢ Sub – question 2:

"Why was Section 404 of Sarbanes Oxley Act issued and did any other provisions exist before SOX Section 404, which referred to the process of the identification, assessment and disclosure of the material internal control problems of a company?"

➢ Sub – question 3:

"Why are risk – taking incentives provided to management and what does existing research tell about the relation of financial incentives and the internal control quality of a firm?"

➢ Sub – question 4:

"Which hypotheses are developed, in order to answer the main research and the follow - up question?"

➢ Sub – question 5:

"Which methodology is used, in order to test the two hypotheses?"

➢ Sub – question 6:

"What do the empirical results show? Do they support, or do they reject the two hypotheses?"

➢ Sub – question 7:

"What are the conclusion drawn from the statistical results? Are there any limitations and / or suggestions for further study?"

1.6 Methodology

I examine the main research question and the follow – up, by using a sample that consists of two groups. The "ICW" group consists of 401 firm – year observations and comprises of companies which are public listed, operate in the United States of America and report "material internal control weaknesses" in their annual statements, according to SOX Section 404. On the other hand, the number of the firm – year observations of the "NICW" group is 6928 and there are also American publicly traded companies included, whose internal control status, however, was effective, pursuant to the provisions of the same SOX Section. What is more, the period tested spans from December 2004 to December 2010.

Regarding Section 404 of SOX, it became effective for accelerated filers on and after November 15, 2004 (*SEC, 2003*). According to it, both management and auditors were obliged to assess and provide a report about the effectiveness of the internal control quality of their firm. Additionally, SOX Section 404 defines clearly the three different levels of deficiencies that may arise in the internal control organizational environment and constitutes obligatory for the firms to disclose the most severe type of them, the so called "material weaknesses". These provisions followed Section 302 of SOX, which was a response to the high - profile accounting scandals that occurred in the beginning of 2000, due to lack of proper internal controls and which damaged the public trust towards the capital markets (*PWC, 2004*). Pursuant to these

regulations, it became mandatory only for the managers of an organization to provide a report about its internal control status and not for its auditors *(SEC, 2002)*. This is also the main difference between Section 302 and Section 404 of SOX.

What is more, my study was based into auditors' opinion about the effectiveness of the internal controls of a firm, due to the fact that I considered it as more objective in comparison to that of managers. Because, executives have the discretion to manipulate the financial statements and reports, in case they want and thus provide a subjective internal control opinion. As far as vega and delta are concerned, both are retrieved from the original dataset of *Coles et al (2013),* which was based on the methodology developed in *Core and Guay (2002)* and *Coles et al (2006).* Vega is defined as the dollar change in CEO's wealth associated with a 0.01 change in the standard deviation of the firm's returns (in $000s) in year t-1, while delta is the dollar change in CEO's wealth associated with a 1% change in the firm's stock price (in $000s) in year t-1.

1.7 Findings

According to my findings, there is no association between CEO's vega and the likelihood that material weaknesses will show up in the internal control systems of a company. Furthermore, by taking simultaneously CEO's delta and vega into consideration, my study concluded that none of these incentives predominates towards their association with the internal control quality of a firm. Because, no relation is found between each one of them and the probability of the disclosure of an adverse internal control opinion by a firm. It is important to highlight that prior literature detected a negative association between the combined sensitivity of CEO's and CFO's wealth and the occurrence of material internal control problems in a company *(Jha et al., 2013; Balsam et al., 2014).* However, in order to examine the second hypothesis and due to the fact that CEO's behavior is investigated in this thesis, only CEO's delta is taken into consideration. Consistent with *Balsam et al (2014),* no link was found between the equity incentives provided to CEO and the internal control quality of a firm.

In order to get these results, which do not support any of my hypotheses, I run two Linear Probability (hereafter LP) and two Fixed Effects (hereafter FE) regression models, in which robust standard errors are produced. Additionally, in order to check whether my findings are robust, I run two LP and two FE regression models, in which, however, classical standard errors are produced. When I compare the statistics of the last specifications mentioned, with that of

the first specifications, I end up in the same conclusions, which means that my findings are reliable.

1.8 Limitations and contributions of the study

Despite several limitations, such as the narrow database used to retrieve my data, the sample period chosen, the choice to take into consideration auditor's attestation on the internal control status of a company, rather than that of management and the fact that my results cannot be generalized to other settings, my research makes also some important contributions. Overall, the results suggest that the internal control quality of a firm is not affected, when risk – taking incentives are provided by the owners of a company to its CEO. More specifically, my study adds to the literature on the determinants of the internal control quality of a firm, as it is the first to rule out that the provision of risk – taking incentives leads to an ineffective internal control quality. Second, this research is the first to take simultaneously both types of incentives into consideration, the equity and risk – taking ones and to try to prove which of them rehearses towards their relationship with the likelihood of the disclosure of an adverse internal control opinion in a company.

Third, my findings are useful for the shareholders. Because, they make clear to the owners of a company that it is good idea to provide their CEOs with risk – taking incentives, since this type of incentives does not cause any negative impact, at least, on the internal control quality of their firm. Fourth, my findings are significant also for the auditors of a firm, who are obliged to attest on the effectiveness of the internal control status of a company and for that reason they try to identify its determinants. Last, but not least, my study gives the regulators insight into whether or not risk – taking incentives belong to the factors that have a negative effect on the quality of the organizational internal controls and thus helps them decide whether to suggest or not measures against them.

1.9 Thesis structure

The remainder of the thesis is structured as follows. Next section refers to some background information about the role of different organizations towards the identification and evaluation of internal controls of a company, as well as the disclosure of internal control problems. Section 3 provides a summary of related literature, while in section 4 the two hypotheses are developed. Section 5 presents my sample selection and discusses the specification of my model. Section 6 analyses my findings and additional tests are run, in order to check for the robustness of my

results. Last section concludes my thesis, by providing a summary of my results, discussing the limitations of my study and making some suggestions for further study.

2. Background information

2.1 Introduction

In this section some background information will be provided related to the role of different public organizations towards the identification and assessment of internal controls in a firm. Additionally, the differences between SOX Section 302 and 404 will be highlighted and the choice of investigating post –SOX 404 in this study will be justified. The definition of internal controls will be also given and the classification of the internal control deficiencies will be presented, too. Furthermore, sub – question 1 and 2 will be also answered.

2.2 The role of COSO

Maintaining a strong internal control environment has long been an important issue for the firms. The first trial to evaluate and estimate a firm's internal controls was done in 1992 by the *Committee of Sponsoring Organizations of the Treadway Commission* (COSO), when the "*Internal Control-Integrated Framework*" was released. The issuing of this framework was a response to the financial scandals that incurred in the early 90's. Its aim was to give a definition of the internal controls of a company and provide guidelines on how they could be evaluated and improved (see next section).

2.3 The role of SEC

Before the publication of the "*Internal Control-Integrated Framework*" (1992), *Security and Exchange Commission* (SEC) registrants were obliged to disclose publicly any significant internal control problems only in case they changed their auditors. Additionally, any deficiencies detected had to be disclosed by the predecessor auditors *(SEC, 1988)*. Besides this responsibility, public firms did not have any other obligation regarding the evaluation and reporting on the effectiveness of their internal control environment. In other words, any disclosure related to information about the internal control status of the public companies was done voluntarily (*Krishnan., 2005)*. However, a series of major accounting scandals in the beginning of the 21th century, such as that of Enron (2002), WorldCom (2003) and Adelphia Brothers (2002) triggered an alteration in the rules and the way companies would report about and evaluate their internal control quality.

2.4 The establishment of SOX

Besides the collapse of the companies involved in the huge bookkeeping scandals, investors' public trust towards corporate accounting and reporting practices was also negatively affected.

Aiming to restore the confidence of the capital markets to the public, *Sarbanes Oxley Act* (SOX) was established in 25th of July 2002 (*SEC, 2002*). The Act included changes in the reporting practices of the companies and redefined the firms' responsibilities regarding their internal controls.

2.5 SOX Section 302

More specifically, under the provisions of *SOX Section 302* (effective August 29, 2002) it became obligatory for the managers of a public company to assess the effectiveness of their firm's internal controls and procedures. Furthermore, they had to disclose in the quarter and annual reports any changes and any significant deficiencies regarding their firm's internal control systems and financial reports since the last Form 10-K or Form 10-Q filing *(SEC, 2002).* Additionally, they were compelled to inform the firm's auditors and audit committee about their company's internal control status *(SEC, 2003).*

2.6 SOX Section 404

What is more, *Section 404 of SOX* or else named *"Management Assessment of Internal Controls",* followed the enactment of Section 302 and became effective for fiscal years ending on and after November 15, 2004 for accelerated filers. It required that not only management, but also external accountants should evaluate and attest the effectiveness of the internal control structures and procedures for financial reporting. Moreover, both, management and public auditors were obliged to report any changes or material control weaknesses detected in the annual financial reports of their firm *(SEC, 2003).* As we see, in comparison to SOX Section 302, the later SOX regulation considers as important the conduct of independent audits. Thus, it requires the affirmation of the effectiveness of internal controls not only by management, but also by the independent body of public accountants.

2.7 The main differences between Section 302 and Section 404 of SOX

When further comparing the provisions of the above two SOX Sections, further significant differences can be noticed. For example, it remained ambiguous whether Section 302 of SOX required that internal control deficiencies should be disclosed to shareholders *(Ashbaugh – Skaife et al., 2007).* Because, according to the answer of the SEC staff in a relevant question *(SEC, 2004, Question 9),* disclosures of all material changes in controls would be welcomed by the SEC staff, but, in case of the identification of a material weakness, the registrants should take carefully into consideration whether that fact, as well as changes made in response to the

material weaknesses, need to be disclosed. However, in SOX Section 404 it was mandatory that material weaknesses should be disclosed by the executives of a company and its auditors.

Furthermore, due to the fact that under SOX Section 302 the review procedures were vague, they were also subject to less scrutiny by the managers and the auditors. Moreover, the rules regarding the disclosure of internal control deficiencies were less clear than that of SOX Section 404. It is worth mentioning, that 87% of the companies who reported internal control deficiencies in the first quarter of 2005 (during the SOX Section 404 regime) had attested their internal controls as effective under SOX Section 302 in the previous three months *(Glass Lewis, 2005). This fact* showed that probably management may have not felt obliged to disclose any weaknesses during the SOX Section 302 regime. Additionally, under SOX Section 302 the procedures that managers had to follow in order to evaluate their internal controls were not specified. All the above suggest that during the pre – Section 404 era management had more discretion in disclosing or not internal control deficiencies *(Ashbaugh – Skaife et al., 2007).*

Another important remark that can be made regarding the pre – SOX Section 404 regime, is that the companies received limited guidance regarding the definitions and the classification of the severity of internal control deficiencies *(Ton., 2009).* Till the release of *Auditing Standard No.2* in March 2004, which defined clearly the different levels of control deficiencies, there was an ambiguity on what constitutes a "*material weakness*" in the internal controls of a firm. According to this regulatory guidance, the "*material weaknesses*" are the most severe type of internal control deficiencies (its complete definition will be presented in the next section) and under SOX – Section 404 their disclosure by public firms is mandatory. The other two types of internal control deficiencies in a descending level of severity are, the "*significant deficiencies*" and the "*control deficiencies*" *(PCAOB, 2004).*

Due to the above mentioned reasons, *Ashbaugh – Skaife et al (2007)* concluded that the reports which were disclosed during the pre – SOX Section 404 era included material weaknesses which probably varied in terms of severity. What is more, the regulatory period that refers to the pre – SOX Section 404 could be characterized as a "transitory" one. Because, besides the important changes in previous internal control rules that management and auditors had to face and to conform with, they had also to struggle with the interpretation of vague regulations, since the regulatory guidance provided by SEC was limited *(Ton., 2009).*

2.8 The choice of investigating post - SOX Section 404 era

In my study I will examine the post - SOX Section 404 era, when, in comparison to SOX Section 302 era, more clear guidelines were provided by SEC, about the interpretation of the type of a company's internal control problems (*Ashbaugh – Skaife et al., 2007*). Clarifying terms and regulations made them more comprehensive to managers and to auditors as well, in whose judgement I will base my research. This means also, that probably, SEC's guidelines helped the aforementioned officers and auditing mechanisms form a more objective and accurate internal control opinion, something that makes my study to be considered as more accurate and reliable, too.

Furthermore, at the post – SOX 404 era companies were obliged to provide mandatory reports of the worst level of internal control deficiencies that may arise in the systems and financial statements of a company, the "*material weaknesses*" and not of the "*significant*" and / or "*control*" deficiencies. The disclosure of the later deficiencies was voluntary under SOX Section 404 *(SEC, 2003).* So, I decided to exclude the last two types of deficiencies from my sample, in order to avoid the rehearsal of missing values, due to non-reported deficiencies and thus create a complete and unbiased dataset.

Because, I think that in case executives or auditors of a company would detect any "significant" or "control" deficiencies, they may not disclose any of them, since, according to SOX Section 404, this is not an obligatory part of their job (it is not their fiduciary duty). Or, due to the fact that it is voluntary to disclose such information, they may be inconsistent with the execution of this non - mandatory task, as the reporting of the above type of deficiencies would depend on their willingness and nothing else. Or, it can be the case that managers would not prefer to disclose any "*control*" and "*significant*" deficiencies, in order to avoid negative criticism by the public or its interested parties (e.g. shareholders) and thus keep a favorable picture of their company. To sum up, if I would choose to include in my sample auditors' opinions about the internal controls of a firm that are related to the less severe types of internal control problems, I assume that a non-representative sample would be created, which would most probably lead to biased results.

2.9 The definition of the internal controls of a company

In 1992, in the *Internal Control-Integrated Framework,* COSO defined the *internal controls* of a company as following: "*a process, effected by an entity's board of directors, management and other personnel, designed to provide reasonable assurance regarding the achievement of*

objectives in the following categories: effectiveness and efficiency of operations, reliability of financial reporting, and compliance with applicable laws and regulations." According to it, the most important elements of a firm's internal controls are the following: the Audit committee, the Establishing and Communicating Written Policies, the Organizational Relationships, the Personnel, the Code of Conduct and the Program of Internal Auditing. Moreover, the components of internal controls which interrelate with each other are the following: control environment, risk assessment, control activities, information and communication and monitoring *(COSO, Internal Control-Integrated Framework 1992)*.

2.10 The classification of the internal control deficiencies

In March 2004 a regulatory guideline was issued by the Public Company Accounting Oversight Board (PCAOB) in order to provide the definition of the different types of internal control deficiencies and to classify them according to their level of severity. The three levels of internal control deficiencies in Auditing Standards (AS) are the following: material weaknesses, significant deficiencies and control deficiencies (*PCAOB, 2004*).

> ➢ A "control deficiency" exists when the design or operation of a control does not allows management or employees, in the normal course of performing their assigned functions, to pre-vent or detect misstatements on a timely basis *(AS No. 2, paragraph 8)*.

> ➢ *A "significant deficiency"* is a control deficiency, or combination of control deficiencies, that adversely affects the company's ability to initiate, authorize, record, process, or report external financial data reliably in accordance with generally accepted accounting principles such that there is more than a remote likelihood that a misstatement of the company's annual or interim financial statement that is more than inconsequential will not be prevented or detected *(AS No. 2, paragraph 9)*.

> ➢ *A "material weakness"* is a significant deficiency, or combination of significant deficiencies, that results in more than a remote likelihood that a material misstatement of the annual or interim financial statements will not be prevented or detected *(AS No. 2, paragraph 10)*.

"*Material weaknesses*" are considered as the most severe type, followed by the *"significant deficiencies"* and the *"control deficiencies",* which are the less severe type. Moreover, as we

notice, the three types of internal control deficiencies differ regarding the likelihood that a material misstatement of the periodic financial statements will be hindered or discovered.

As I have already said, one of the variables that will be included in my research are the *"material weaknesses",* which are detected and reported by the managers or the auditors of a public listed company in its annual and interim financial statements. One of the reasons that justifies this choice has already been explained above. Further justification will be provided in the section "*Sample*".

2.11 Summary

After having commented on the aim of SEC, COSO and SOX, the provisions and the differences of SOX Section 302 and 404 were presented. As I already mentioned, my study will be based in SOX Section 404, for the reasons that I analyzed above. Furthermore, the definition of the internal controls and the classification of the internal control deficiencies was given, in order to explain why my study will focus on the most severe type of internal control problems, the "material weaknesses". Last but not least, an answer was given to sub – questions 1and 2. Next follows the literature review.

3. Literature review

3.1 Introduction

In this section the findings of previous literature will be analyzed, related to the topic of my thesis. In other words, current knowledge related to my main research and follow – up question will be presented. Moreover, I will give an answer to sub – question 3.

3.2 The control function of management

Besides making plans, setting goals and strategies, one of the most important tasks that the managers of a company need to carry out is to ensure that the internal control environment of a company works properly. Controls need to be established by management in all organizational levels in order to guard against improper behavior and to encourage actions that are for a company's best interest. Management needs to ensure that everything goes according to plan and if not or if it is needed, even to modify it, so that the organizational goals being achieved. According to *Merchant (1982)* this is the critical control function of management and it is a determining factor for the success of an organization.

3.3 Agency theory

Managers (agents) are appointed by the shareholders (principals) in order to act on behalf of them and to serve their interest. In other words, management's primary task is to maximize shareholders' value *(Jensen and Meckling., 1976).* Furthermore, executives are responsible in providing a clear picture of the economic and the internal control status of the company to the shareholders and the other interested parties, external or internal. Among their fiduciary duties is to maintain a strong internal control environment, which will assure that a firm's financial reports are an accurate representation of the firm's financial status *(COSO, 1992).* Thus, they have to work in a transparent manner and according to SOX 404 to report any material weaknesses noted in the financial statements of a firm or change in its internal control quality *(SEC, 2003).*

However, executives do not always work in an objective manner and usually weigh the costs and benefits before disclosing any material weaknesses in the financial reports of a company *(Ashbaugh – Skaife et al., 2007).* This happens for the reason that often managers' (agents') interests do not align with that of the shareholders (principals). The result is that conflicts arise and in order to achieve its personal goals, management ends up to opportunistic actions, such as the instigation of manipulations in the financial reporting. If executives believe that reporting

any material weaknesses in the financial statements of their company will have a negative impact on their wealth (resulting in its reduction), especially when their compensation consists of equity holdings, they will probably try to improve the quality of their firm's internal controls. On the other hand, if ineffective internal controls provide executives the opportunity to manage or smooth the earnings of their company and thus increase their wealth, they will probably want to maintain a weak internal control environment and thus act in an opportunistic way *(Balsam et al., 2014).*

3.4 The consequences of the disclosure of an adverse internal control opinion

Evidence has shown that disclosures of adverse internal control opinions have negative wealth consequences especially for executives with equity based compensation, as they will lead to higher cost of equity *(Beneish et al., 2008; Ashbaugh – Skaife et al., 2009)* and to the drop in a firm's stock price *(Beneish et al., 2008).* Additionally, in case of misstatements or manipulated internal control reports executives may face stiff regulatory sanctions, as well as the imposition of financial penalties[1].What is more, firms in which material weaknesses are disclosed face the risk of a credit rating downgrade by the analysts *(Doss., 2004),* which is translated as a lower firm valuation. According to *Wiersema and Zhang (2011)* CEOs of companies with negative analysts' assessments face a greater risk of being fired, in comparison to CEOS whose firm's receive favorable credit ratings. Furthermore, the labor market imposes increased sanctions and reputational penalties to the dismissed executives and more specifically to the CFOs of the firms, in which restatements of financial reports took place. It is worth mentioning that these penalties have been greater in the post – SOX era, which we will examine, in comparison to the pre – SOX era *(Collins et al., 2009).*

3.5 Managerial equity incentives and misreporting

Despite the negative effects that we already mentioned and which executives may face when internal control weaknesses are detected and disclosed or when restatements need to be made, different incentives, like the equity incentives may lead managers to an opportunistic behavior, such as the manipulation – misreporting of financial reports. A significant body of the literature has investigated the linkage between managerial equity incentives and the financial misreporting and their findings are being presented below. Noteworthy is that some of the

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[1] According to SOX Section 304, CEOs and CFOs have to return the bonuses and / or incentives / equity based compensation received and any profit that resulted from selling the securities of the issuer in the twelve months that have followed a restatement of the financial statements. Regarding SOX Section 906, fines of up to $5 million and / or 20 years of incarceration will imposed to CEOs and CFOs who will assure that a control report is accurate even though they know that it was not accurate.

researchers used portfolio delta as their primary measure of executive incentives, which I will also use in my research and tested the relation of this executive compensation component with different measures of misreporting, finding mixed results.

For example, *Bergstresser and Philippon (2006)* found a positive relation between the sensitivity of the CEOs' wealth to changes in stock price (portfolio delta) and the magnitude of the discretionary components of a firm's earnings. *Burns and Kedia (2006)* used another measure of misreporting, the restatements of the financial reports and found that they are positively related to the CEO's option compensation package, which is highly sensitive to changes in a firm's share price. However, *Erickson et al (2006)* did not find any association between the executives' sensitivity of equity portfolio to the change in the share price of a firm and the likelihood of a company having been accused of fraud by SEC. Similarly, *Armstrong et al (2010)* did not find any positive relation between the CEO's portfolio delta and the likelihood of the occurrence of accounting irregularities in a firm.

What is more, *Jiang et al (2010)* go a step further trying to test the association between CEO's and CFO's portfolio delta and earnings management. They contemplate that the sensitivity of the CFO's equity based compensation to alterations in the company's share price is positively related to the manipulation of financial statements and that the equity incentives of the CFO play a greater role towards earnings management, in comparison to that of the CEO. Additionally, *Feng et al (2011)* found evidence that the likelihood of the CFOs to involve in misreporting is greater, due to the pressure they face by the CEOs, rather than, due to the fact that the CFOs try to achieve instantly their personal financial goals.

3.6 The effect of equity and risk – taking incentives on misreporting

A considerable literature focused basically on how portfolio delta is related to the manipulations of financial reports. However, *Armstrong et al (2013)* focused both on portfolio delta and vega and found evidence that equity based compensation induces managers to misreport, for the reason that both portfolios link managerial compensation with the value of equity risk and not because they link it with the equity value. Vega reflects the sensitivity of the manager's payoff to alterations in firm risk. The researchers considered important to test the relation between vega and misreporting for the following reason: delta will encourage misreporting, because it is linked with the rise of managerial equity wealth, which results from an increase in the firm's stock price, while it will discourage misreporting, if managers are risk

– averse, because delta increases the magnitude of the effect of equity risk on the overall riskiness of managerial equity based compensation.

3.7 The relation between firm risk and managerial equity related portfolio

Furthermore, changes in a firm's stock return volatility (firm risk) may also have an impact on the managerial equity related portfolio. Detection and reporting of the manipulation of financial statements can lead to negative stock returns, thus affecting negatively also the executives' equity compensation, thereby increasing equity risk. Some researchers examined cases in which the market responded adversely. For example, *Dechow et al (1996)* document a negative stock return of -9% to -10% on the first day of the announcement of SEC enforcement actions (Acounting and Auditing Enforcement Releases) in firms who were accused of having violated GAAP. *Palmrose et al (2004)* show that the average market – adjusted return in firms where fraudulent action was detected and restatements needed to take place was -20% over a two – day announcement window. *Karpoff et al (2008)* found that 38% of firms' market values are being lost when their financial misconduct becomes publicly known, pointing out that the reputational penalty for a firm in such cases is huge and much greater in comparison to the regulatory and legal sanctions.

3.8 The relation between the pricing of discretionary information risk and equity - risk

Not only do SEC or restatement announcements cause negative market returns, thus affecting firm and managerial equity risk, but the pricing of discretionary information risk can also explain the incidence of adverse market responses, especially those related to restatement announcements *(Kravet and Shevlin, 2010).* Whenever such announcements take place, investors' perceptions regarding the reliability of prior as well as future financial statements are negatively affected. Investors start doubting about the quality of financial reports, as well as management's credibility, which starts to decrease. As we already mentioned, managers are responsible for providing reliable financial information to internal and external users. Thus, a restatement may be considered by the investors as a sign of lower quality financial information, or that managerial opportunistic actions have taken place. In other words, investors consider restatements as a signal that there is risk that their prior perceptions regarding the financial status of the company were based on unreliable financial information. Thus, investors' concerns regarding information risk related to management's reporting choices (or else said,

the pricing of discretionary information risk) increase thereby resulting in a negative stock market reaction.

3.9 The risk – agency theory

What is more, not only did a considerable literature deal with the effects of equity incentives on misreporting, but many researchers tested also the relationship between equity incentives and firm risk. According to early studies, risk – averse executives who have most of their equity wealth related to their firm's value may have a disincentive to take over positive net present value projects which are considered by them as risky. *Jensen and Meckling (1976)* as well *as Smith and Stulz (1985)* tried to resolve this risk agency problem. They suggested that in order that agents' costs linked to risk incentives would be diminished, risk – averse managers need to be provided with stock options. Executives will not maximize shareholder value, until offered the proper incentives. A compensation package must be designed in such a way that when executives boost the firm value, their expected utility will also rise. Thus, the researchers concluded that by offering stock options to managers who do not want to bear risks their expected utility would turn into a convex function of their firm's value. In other words, the options' payoff convexity will mitigate the executives' risk aversion.

However, later literature suggests that not always compensating managers with stock options increases their appetite for risk *(Carpenter., 2000)*. For example, *Lambert et al (1991)* state that if risk – averse managers are granted with options and in case they will prove unable to diversify the risk related to their payoff, they will probably not want to involve in projects which increase the volatility of their company's stock returns (firm risk). Because, stock options not only induce an increase in the convexity of the managerial payoff by increasing executives' wealth sensitivity to alterations in risk, or else said vega, but they increase also delta, the sensitivity of managerial wealth to stock price alterations. Despite the fact that vega encourages risk - averse managers to bear risks, delta may discourage risk – taking, for the reason that the *"risk – effect"* of delta may dominate *(Armstrong et al, 2013)*.

Delta has two conflicting effects on the managerial portfolio. On the one hand, delta shows how managerial wealth increases due to an increase in stock price, thus motivating managerial risk – taking. This is the *"reward effect"* of delta. On the other hand, delta has a reinforcing impact on the effect of stock price changes on the managers' firm specific equity wealth. This means that the impact of stock return volatility on the risk – averse managers' firm specific portfolio is reinforced by delta, thus demotivating them to adopt risky projects. This is the *"risk*

effect'' of delta. According to the above, the net effect of option grants on executives' decisions to bear risks is vague *(Armstrong et al, 2013)*.

3.10 Executive stock options and firm - risk

Furthermore, some more recent studies found mixed results regarding the relationship between executive stock options and firm risk. For example, *Guay (1999)* as well as *Rajgopal and Shevlin (2002)* predicted that stock options are positively related to firm risk and that stock options are used in order to incentivize managers to take risks and mitigate problems related to managerial risk - taking. Additionally, controlling for delta, *Coles et al (2006)* found that higher vega leads to policies which contain more risk and that firms which implement investment policies, which entail higher risk, lead to managerial compensation schemes which increase vega, but decrease delta. However, *Lewellen (2006)* predicted that, within a specific framework, granting options to managers will provide them with disincentives to take risks.

3.11 The determinants of internal control weaknesses in the pre – SOX 404 era

Moreover, besides the risk – taking literature and the studies that focused on managerial incentives that lead to financial misreporting, there is also a considerable body of researchers who tried to identify the incentives and firm – specific characteristics related to the discovery and disclosure of internal control deficiencies. For example, *Ashbaugh - Skaife et al (2007)* examined pre – SOX 404 era internal control reports and found that firms who reported internal control deficiencies (hereafter ICD firms) had the following characteristics in comparison to the companies which didn't disclose any internal control problems: They had a more complex operational structure, they had done recent changes within their organization and they faced increased accounting risk. Additionally, they had a bigger number of resignations regarding their auditors and a smaller amount of resources in their disposal for the enactment of internal controls. As far as the incentives to find out and disclose ICDs are concerned, the researchers point out that in relevance to non – ICD firms, ICD companies had faced more previous enforcement actions by SEC and had to restate their financial statements. Additionally, the possibility of the ICD firms to cooperate with a prevalent audit firm was higher and their institutional ownership was more concentrated.

3.12 The determinants of internal control weaknesses in the post – SOX 404 era

Furthermore, *Doyle et al (2007)* examined the post – SOX 404 era and a sample of 779 firms, which reported the most serious type of internal control deficiencies in their financial statements, the so called *"material control weaknesses"*. Similarly to *Ashbaugh - Skaife et al*

(2007) they found that firms who are disclosing material control weaknesses have a complex structure, are facing changes, such as an organizational restructuring and are in a weak financial position, thus proving unable to spend a considerable amount of resources for the maintenance of a strong internal control environment. However, *Doyle et al (2007)* found also that firms who disclose internal control weaknesses are smaller, younger and face a rapid growth, in comparison to companies which do not disclose any material control weaknesses.

What is more, *Doyle et al (2007)* considered the type of internal control weaknesses reported by the firms as being a primary factor, when trying to examine the determinants of internal control weaknesses over financial reporting. Companies with "account – specific" weaknesses, which are considered as easily auditable internal control problems by Moody's, tend to be larger, older and financially in a better condition than firms who disclose "company – level" weaknesses. They are also more complex and face a rapid economic growth. However, according to Moody's, the last type of internal control deficiencies is more difficult to be discovered and disclosed by the auditors. Furthermore, the companies which tend to report them usually face resource constraints, which prevent them from maintaining strong internal controls.

3.13 The relationship between equity incentives and the material control weaknesses

Despite the fact that the above mentioned studies examined the determinants of internal control weaknesses, they only referred to specific firm characteristics. None of the previous researchers tried to analyze the impact of executives' equity incentives on the quality of internal controls. However, *Jha et al (2013)* tested how the sensitivity of CEOs' and CFO's equity based compensation is related to the internal control quality in the post – SOX 404 reporting regime. They also examined whether this effect varies according to the incentive time horizon or to the type of severity of internal control weaknesses reported. According to their findings, there is a negative relation between the sensitivies of CEO and CFO performance – based compensation and the tendency of reporting internal control weaknesses in the financial statements. This effect is stronger for the most severe type of internal control problems, the company – level weaknesses and for the CFO's, who are primarily responsible for the accurate and efficient reporting of financial statements.

Additionally, *Jha et al (2013)* concluded that it is less likely that a company will report internal control weaknesses, if long – term equity incentives are granted to its executives. In contrast,

they did not find any connection between the short – term incentives and the internal control quality. However, the researchers highlighted also a paradox, that there is a positive relation between the sensitivity of CEOs' and CFOs' wealth to changes in firm's stock price and accruals quality. This result, together with the previous, suggest, that even though SOX tries to decrease the ability of the executives to reduce the internal control quality, due to different limitations, the sensitivities of equity incentives may lead to accrual manipulation, thus decreasing the earnings quality.

A concurrent study *(Balsam et al., 2014)* also tried to examine the role of executive equity based compensation in explaining the propensity of the executives to report internal control weaknesses in their firm's financial reports in the post - SOX 404 reporting regime. The researchers found that firms with higher levels of CEO and CFO equity incentives tend to report less weaknesses in their internal controls. This prediction holds for the most severe type of internal control weaknesses, the company – level control problems, rather than for the account – specific ones. Moreover, its effect is stronger for the CFOs in comparison to the CEOs. Because, when they investigated separately the effect of CEO's and CFO's delta on the internal control quality of a company, they noticed that there is no association between CEO's delta and the internal control quality of a firm, but there is a negative relation between CFO's delta and the propensity of reporting an adverse internal control opinion. Last but not least, the researchers point out that restricted equity, rather than unrestricted, plays a greater role in the decrease of adverse internal control opinions.

All in all, the two last studies tested only the link between equity incentives, or delta and the likelihood of the managers to report internal control weaknesses in their firms' financial statements in the post – SOX 404 era. However, they did not take into consideration the effect also of another type of incentives provided to management, the risk – taking ones, or vega, on the possibility of the incidence of material internal control weaknesses in a firm. Thus, in my study, I will go a step further and will examine also this relation, trying to prove whether a causal link exists between the sensitivity of the CEO's equity wealth to changes in risk and the material weaknesses in internal control. Finally, I will consider jointly the incentive effects of delta and vega on the likelihood of the disclosure of any material internal control weaknesses by the auditors of a firm and will try to find out which of the above incentives predominates towards this relationship.

3.14 Summary

In this section the literature review was presented and sub – question 3 was answered, as well. First I focused on critical control function of management, and I analyzed the agency theory. Then, the consequences of the misalignment of the interests between management (agents) and the shareholders (principals) of a firm and that of the disclosure of an adverse internal control opinion were pointed out. Additionally, the analysis of the following topics, which were investigated by several researchers, followed: "Managerial equity incentives and misreporting", "The effect of equity and risk – taking incentives on misreporting", "The relation between firm risk and managerial equity related portfolio", "The relation between the pricing of discretionary information risk and equity risk", "The risk – agency theory", "Executive stock options and firm – risk". Lastly, the determinants of internal control weaknesses over financial reporting in the pre - and post - SOX 404 era were mentioned and the relationship between the equity incentives and the material control weaknesses was analyzed. As we see, previous literature has not yet investigated the relationship between risk – taking incentives and the internal control quality of a firm. For this reason, I conclude that my study is the first to deal with this topic. Next follows the development of the two hypotheses.

4. Hypothesis development

4.1 Introduction

In this section I will present the two hypotheses of my study. So, sub – question 4 will be answered. The development of both of them is based on previous literature, but also on logical assumptions.

4.2 Hypothesis 1

According to early studies, there is a possibility that risk – averse managers, whose major part of their compensation is related to the value of their firm, will prove unwilling to undertake positive net present value projects which will be considered by them as risky. Some researchers suggested that providing managers (agents) with proper incentives, such as a convex compensation package, will give a solution to this risk - related agency problem *(Smith and Stulz., 1985)*. Thus, shareholders (principals) should offer to executives (agents) stock options. Because, providing risk – averse managers' with performance - based compensation, besides affecting firm value (by influencing the firm's stock price) it will also have an effect on managerial expected utility. Stock options will increase the expected utility of managers from pursuing risky projects, by turning it into a convex function of the company's value *(Jensen and Meckling., 1976; Smith and Stulz., 1985).*

Furthermore, stock options increase the sensitivity of managerial wealth to changes in the firm's stock price, or else called "delta" and the convexity of the managerial payoff, as well, by rising the sensitivity of executives' wealth to shifts in risk, or else said "vega" (*Lambert et al., 1991)*. What is more, higher volatility in stock returns (firm risk) leads to higher vega. Additionally, higher vega leads to the implementation of riskier policies, such as investing more in R & D, but less in property, plant and equipment, placing more focus on a smaller number of business lines and higher leverage (*Coles et al., 2006)*. Also, ceteris paribus, managers who have a high vega are more prone to take up risky projects in comparison to managers whose vega is low *(Armstrong et al., 2013).*

Furthermore, as I stated above, since it is likely that managers with lots of risk – taking incentives (high vega) may make decisions which contain risk, I assume that it is possible that these decisions may lead to material weaknesses in the internal controls of a firm. Executives often need to follow risky strategies in order to achieve their goals. However, if principals (owners of the company / shareholders) want agents (managers) to take risks, they need to

impose less strict controls on them. Because, the imposition of tight internal controls on the managers of a company may prove a barrier for them to take risks, since it puts huge limits on managerial discretion. However, lax internal controls in the systems of a company might also lead to the existence of internal control weaknesses.

Additionally, if a CEO who has strong risk - taking incentives wants to encourage risk taking by his subordinates, it is important to impose less stringent internal controls on them, too. In contrast to the executives who take the strategic investment risk of a company, which means that they decide which projects to invest in, non-executive employees are responsible for dealing with operational risk, by implementing and executing the decisions of the executives (*Bova et al., 2012*). Thus, like executives, non - executives need as well to have the proper discretion in order to take risky decisions.

Tight internal controls limit the discretion of the employees. Thus, in order that the lower – level employees (non – executives) can take the risks that the CEO wants them to, looser monitoring has to be imposed by the higher – level employees (executives). However, as we have already mentioned above, if the internal control environment of a company proves ineffective then internal control weaknesses may arise.

What is more, the initiation itself of risky projects by the managers contains risks, which could lead to the reporting of internal control weaknesses. One example of a risky decision could be a company's investment in a different and unknown sector than its current field of activity. Different risks may arise in that case, such as the lack of managerial experience to run the new business, a lack of proper segregation of duties, etc. The above risks, will probably lead to the disclosure of internal control weaknesses in the financial reports.

One reason might be that managers do not detect control weaknesses related to their new business. But, even if managers have detected deficiencies in the internal controls of the new company they run, they may not have the appropriate knowledge and experience on how to improve and deal with the internal control problems that have aroused in their new business. Also, it may be the case, for example, that executives have little knowledge on how to control properly the reports of their subordinates, and to divide and assess correctly the tasks of their employees, due to increased information asymmetry. So, it is probable that intentional or unintentional errors may arise in the reports which the subordinates issue to the management (*Ashbaugh - Skaife et al., 2009)* and which, once detected, will more likely lead to the disclosure of weaknesses in the internal controls of the firm.

All in all, according to the above assumptions, I expect that risk-taking incentives (vega) will be positively related to the possibility that internal control weaknesses will show up and be disclosed in the interim and annual financial reports. Hence, the ***first hypothesis*** of this study is as follows:

"There is a positive relation between the sensitivity of CEO's wealth to changes in risk (portfolio vega) and the likelihood of reporting material internal control weaknesses in the periodic financial statements of a firm".

4.3 Hypothesis 2

As already mentioned in the literature review, the relationship between equity incentives, or delta and the internal control weaknesses has already been examined by *Jha et al (2013)* and *Balsam et al (2014)*. Both studies found that the combined delta of CEO and CFO is negatively related to the possibility that an adverse internal control opinion will be reported by a company. However, when CEO's delta was separated from that of CFO's, then *Balsam et al (2014)* did not report any relation between the sensitivity of CEO's wealth to alterations in stock price, and the likelihood of the occurrence of material internal control weakness in a firm, while they documented that CFO's delta is negatively associated with the internal control quality of a firm. In my study, I will go a step further and by considering simultaneously the effects of CEO's vega and delta, I will examine which of the two types of incentives predominates, regarding the probability of the incidence of material weaknesses in a firm's internal control environment.

If I provide jointly equity and risk – taking incentives to CEO, my assumptions regarding their effects will be the following: CEO's equity incentives will not be associated with the possibility that material weaknesses will show up in the internal control systems of a company, as this was proven by previous literature *(Balsam et al., 2014),* while vega will be positively related with it, for the reasons that were analysed above. So, risk – taking incentives will most probably rehearse towards their relationship with the internal control quality of firm.

So, the ***second hypothesis*** is the following:

"Considering CEO's vega and delta together, since there will not be any association between CEO's delta and the likelihood of the incidence of material internal control weaknesses in a firm, CEO's vega will predominate towards its relationship with the occurrence of material internal control weaknesses, which will continue to be positive".

4.4 Summary

In this section my first and second hypotheses were presented, which try to give an answer to my main research and follow – up question. However, the two hypotheses need to be tested, in order to check whether they hold or not. Before running the appropriate tests and commenting about the statistical results, important is to present the research design of the study. This will be done in the next section, which comprises of the methodology used in order to examine the first and second hypothesis, the analysis of the variables included in the regression models, the presentation of the multivariate models, the criteria used for the sample selection and the validity of the research (internal, external, construct).

5. Research design

5.1 Introduction

In this section, I refer to the methodology I used in order to test the first and second hypothesis of my study. Additionally, I describe the dependent, independent and the control variables included in my regression models. Next are depicted the multivariate models related to the two hypotheses. In the end of this section, an analysis of the sample selection and the validity of the study is provided. All in all, sub – question 5 will be answered.

5.2 Methodology

To begin with, there is a difference in the methodology used, in order to test the two hypotheses. This means that two different regression models were created. In the first one, which is related to the first hypothesis, all the control variables, which are mentioned below, are included, except for the equity incentives variable, "lndelta". However, the second one, which refers to the second hypothesis, comprises of all variables, with no exceptions.

5.3 Measuring the incidence of material internal control weaknesses

The dependent variable of my study is named as "**dincontrol**" and is the likelihood of the incidence of material weaknesses in a firm's internal controls. It is binary, which means that it is coded 1 if the auditor of a firm disclosed material weaknesses according to SOX Section 404 in the annual financial reports in year t, and 0 otherwise. The code of AuditAnalytics database on which I was based to create my dependent one, is described as "ic_is_effective" and refers to the opinion of the auditor or the management of a firm about the effectiveness of its internal controls over financial reporting. More specifically, it refers to as "*effective*", in case there were no internal control weaknesses detected or "*ineffective*", in case there was a disclosure of material weaknesses.

In my study I decided to take into consideration auditors' opinion only and not that of managers', as I followed the tactic of previous studies, like that of *Balsam et al (2014)* and *Jha et al (2013)*. These researchers took into consideration the fact that one main point which differentiates SOX Section 302 from SOX Section 404, is that besides management, auditors are also obliged to provide an independent report about the quality of internal controls of a company. Since external auditors do not have the discretion to manipulate the numbers, like management sometimes does, their opinion may probably be considered by researchers as more reliable when conducting a study and may help them also draw more safe inferences about their

hypothesis testing. However, one limitation here is that managers' opinion is considered as the representative one regarding the internal control status of a company towards public. Another drawback is that though under SOX Section 404 the definition of "*material weaknesses*" is clearly defined, still the aspect of materiality of each company may differ. Thus, the characterization of the quality of a firm's internal controls as "effective" and "not effective" may also not be an objective one and there may be a variation between the assessments of the companies *(Ton., 2009).*

5.4 Measuring the risk – taking incentives

My test variable is the risk – taking incentives and measures the magnitude of the sensitivity of the manager's payoff to alterations in firm risk. I call this variable "**lnvega**" and it is defined as "the natural logarithm of one plus vega". *Coles et al (2013),* from whose dataset I retrieved vega*,* defined it as "*the dollar change in executive's wealth associated with a 0.01 change in the standard deviation of the firm's returns (in \$000s)*". Consistent with prior research (*Armstrong et al., 2013*), my independent variable is measured in the end of the prior fiscal year.

Additionally, I wanted to mention that I tested CEO's vega, as this officer is one of the top executives responsible for providing the attestation of the quality of internal controls of a company (*SEC, 2003*) and whose opinion about the internal control quality is assumed to represent the actual internal control status of a company (*Ton., 2009).* What is more, as it is shown below, I examined also CEO's delta and cash compensation variables.

5.5 Control variables

Equity incentives: One of the control variables I used to test my hypotheses is "**lndelta**", which is defined as "the natural logarithm of one plus delta". Delta is an equity incentive and it reflects the sensitivity of managerial wealth to changes in a company's stock price. Like I did in vega, I borrowed the data related to delta also from the dataset of *Coles et al (2013).* The definition they gave for this variable is that it is "*the dollar change in executive's wealth associated with a 1% change in the firm's stock price (in \$000s)*".

As I have already mentioned in the previous chapter, the relation between the aggregate delta of CEO and CFO and the probability of reporting internal control weaknesses has already been investigated by *Balsam et al (2014)* and by *Jha et al (2013)* and was found to be negative. However, when delta was disaggregated by *Balsam et al (2014),* it was documented that no relationship exists between CEO delta and the propensity that an adverse internal control

opinion would be disclosed by a firm. Due to the fact that I will use a different database and period from that of *Balsam et al (2014),* I will retest delta. However, in my study it will take the place of a control and not of a test variable. Furthermore, following *Armstrong et al (2013)*, I measure all my control variables one year prior to the measure of my dependent variable (dincontrol). So, I measure "**lndelta**" in the year t-1, which means, that, if t is considered as the fiscal year when my dependent variable dincontrol is examined, "lndelta" is measured one year before t.

Cash compensation: Like *Balsam et al (2014*) did, I will also consider "**lnbonus**" and "**lnsalary**", as part of my control variables, which are defined as "the natural logarithm of one plus bonus" and "the natural logarithm of salary" respectively. As we know, salary and bonus are types of cash compensation. These non-equity incentives may affect the likelihood of the disclosure or not of internal control weaknesses in a company's financial reports.

As I have already stated, on the one hand, management may try to maintain strong internal controls in a firm's systems, in order to present a "healthy" picture towards interested parties (insiders and outsiders). Showing that they are doing their job well, managers may be awarded by a high salary or/ and a high bonus. So, driven by the incentive to receive such a monetary reward, the possibility that an adverse internal control opinion would be reported in the financial reports of an organization decreases (*Balsam et al., 2014).*

However, on the other hand, it is likely that executives keep intentionally lax internal controls. In other words, managers may try to maintain a loose internal control environment, in order to facilitate opportunistic actions (e.g. manipulation of accounting numbers), aiming to serve their personal interests, such as the increase of management's salary and / or bonus. So, in such a case, the probability of the incidence of a possible internal control weakness in the financial reports of a firm increases *(Balsam et al., 2014).*

Firm characteristics: In the analysis I did, I controlled also for specific firm characteristics for which mixed results were found about their relation with the probability of the incidence of material weaknesses. More specifically, some prior studies found that companies who were smaller (*Ashbaugh – Skaife et al., 2007*; *Doyle et al., 2007; Jha et al., 2013; Ashbaugh - Skaife et al., 2013),* younger (*Doyle et al., 2007; Ashbaugh - Skaife et al., 2013*) and performing poorly (*Ashbaugh – Skaife et al., 2007)* were related with higher possibility of the occurrence of a material internal control problem. *Ashbaugh – Skaife et al (2007)* also stated that the reason why this is happening is that the aforementioned type of companies tend to spend limited

resources in high quality control systems. However, other researchers did not document any association between the age (*Balsam et al., 2014; Jha et al., 2013*) and the size of a company (*Balsam et al., 2014*) with the likelihood that weaknesses in its internal controls will occur.

So, following prior research, I re-examined the following variables, which belong also to the financial factors of a company, as they depict its economic status and financial health: "**lnat**", which is the "natural logarithm of total assets in year t-1" and "**mbratio**" which is computed as "Market value of equity in the end of t-1 year / Common equity in the end of year t-1". Both of them are used as proxies for the size of a company. Furthermore, I re-tested "**leverage**", which is defined as "Total liabilities in year t-1 / Total assets in year t-1" and shows whether the growth of a firm relies on its own or on foreign resources and "**roa**", which is equal to "Net income in year t-1 / Total assets in year t-1" and depicts how profitable a company may have been for the amount of assets it has invested. Additionally, following *Ashbaugh – Skaife et al (2007) and Doyle et al (2007)*, I controlled for "**salesgrowth**", which is a measure of a company's financial growth and accounting risk, as it is often subject to accounting irregularities (*Ton.,2009*). I computed this variable as "Sales in year t – sales in year t-1 /sales in year t-1" (the percentage change in sales). It is more probable that companies who are growing rapidly will disclose internal control problems in their reports (*Ashbaugh – Skaife et al., 2007; Doyle et al., 2007*).

What is more, I controlled also for "**lnage**", which is the "natural logarithm of the age of a company in the year t-1 ". The way I found out how old a firm is, is by counting how many years it appears in Compustat. The complexity of a firm was measured by using three different factors: 1) "**rd**", which is a ratio equal to "Research & Development expenditure in year t-1 / total assets in year t-1" and is used to show the magnitude of a firm's investments in research and development, 2) "**dforeign**", which is an indicator variable equal to 1 if the firm has a non - zero foreign currency translation in year t-1, and 0 otherwise and 3) "**drcharges**" which is an indicator variable equal to 1 if the firm reported restructuring charges within year t-1, and 0 otherwise. According to prior studies, companies with complex environments, like those who undergo restructuring or else said organizational changes and who involve in foreign transactions have been found to have reported internal control weaknesses (*Doyle et al., 2007).*

As a proxy for audit quality I used the variable "**dbig4**", which is an indicator variable equal to 1 if the auditor is a member of Big4 in year t-1, and 0 otherwise. *Balsam et al (2014) and Jha et al (2013)* found that it is more possible for companies who disclosed material

weaknesses to have been audited by an auditor which belongs to the biggest auditing firms worldwide, or else called the "*Big4*". As "*Big4*" companies are considered the following: Deloitte & Touche, Ernst &Young, KPMG and PricewaterhouseCoopers.

Following *Ashbaugh – Skaife et al (2007),* the last control variable I included in my hypotheses testing was "**dlitigation",** which is an indicator variable equal to 1 if the firm belonged to a litigious industry in year t-1 – SIC codes 2833-2836; 3570-3577; 3600-3674; 5200-5961; and 7370 – 7374, and zero otherwise. Though the aforementioned researchers did not find any relation between the disclosure of internal control deficiencies and the likelihood of a company to belong to a litigious industry, I decided to test it again. Because, I wanted to check whether this relation holds if examined in a much bigger sample, which is characterized by a more extended time span, where more companies are included and in which only the events of material weaknesses are taken into consideration (and not of all control deficiencies). A summary of the variables used in my study is provided in **table 1.**

Table 1

dincontrol	The likelihood of the incidence of material weaknesses in a firm's internal controls in year t according to auditors' reported opinion
lnvega	The natural logarithm of 1 plus the dollar change in CEO's wealth associated with a 0.01 change in the standard deviation of the firm's returns (in $000s) in year t-1
lndelta	The natural logarithm of 1 plus the dollar change in CEO's wealth associated with a 1% change in the firm's stock price (in $000s) in year t-1
lnsalary	The natural logarithm of CEO's salary in year t-1
lnbonus	The natural logarithm of one plus CEO's bonus in year t-1
lnat	The natural logarithm of total assets in year t-1
lnage	The natural logarithm of the age of a company in year t-1
leverage	Total Liabilities in year t-1 /Total Assets in year t -1
roa	Net Income in year t -1 / Assets total in year t-1
mbratio	Market value fiscal year end of year t-1 / Common Equity in year t-1
rd	Research & development expenditure in year t-1 / assets in year t-1
salesgrowth	Sales in year t – sales in year t-1 /sales in year t-1
dforeign	An indicator variable equal to 1 if the firm has a non - zero foreign currency translation in year t-1, and 0 otherwise.
drcharges	Indicator variable equal to 1 if the firm reported restructuring charges within year t-1, and 0 otherwise.

dbig4	Indicator variable equal to 1 if the auditor is a member of Big4 in year t-1, and 0 otherwise.
dlitigation	Indicator variable equal to 1 if the firm was in a litigious industry in year t-1 – SIC codes 2833-2836; 3570-3577; 3600-3674; 5200-5961; and 7370 – 7374, and zero otherwise.

All continuous variables are winsorized at 1% and 99%, in order to mitigate the influence of outliers. Also, I transformed some continuous raw variables into logarithms, in order that they could approach the normal distribution.

5.6 Multivariate model

As already mentioned, my ***first hypothesis*** is described as following: "*There is a positive relation between the sensitivity of the CEO's wealth to changes in firm risk (portfolio vega) and the likelihood of reporting material internal control weaknesses in the annual financial statements of a firm*". In order to test this assumption I created the first Linear Probability regression model, which is presented below. Regarding the analysis of the meaning of all the variables, it can be found above, in table 1.

$$\textbf{dincontrol}_{i,t} = \alpha_0 + \alpha_1\textbf{lnvega}_{i,t-1} + \alpha_2\textbf{lnsalary}_{i,t-1} + \alpha_3\textbf{lnbonus}_{i,t-1} + \alpha_4\textbf{lnat}_{i,t-1} + \alpha_5\textbf{lnage}_{i,t-1} + \alpha_6\textbf{leverage}_{i,t-1} + \alpha_7\textbf{roa}_{i,t-1} + \alpha_8\textbf{mbratio}_{i,t-1} + \alpha_9\textbf{rd}_{i,t-1} + \alpha_{10}\textbf{salesgrowth}_{i,t-1} + \alpha_{11}\textbf{dforeign}_{i,t-1} + \alpha_{12}\textbf{drcharges}_{i,t-1} + \alpha_{13}\textbf{dbig4}_{i,t-1} + \alpha_{14}\textbf{dlitigation}_{i,t-1}$$

The ***second hypothesis*** is defined as following: "*Considering CEO's vega and delta together, since there will not be any association between CEO's delta and the likelihood of the incidence of material internal control weaknesses in a firm, CEO's vega will predominate towards its relationship with the occurrence of material internal control weaknesses, which will continue to be positive*".

As we can realize, I will consider jointly the incentive effects of both vega and delta and as already stated, this is also the difference between the two hypotheses. I will follow this method, in order to find out which of the two types of incentives provided to the CEO predominates regarding the likelihood of disclosing material weaknesses in a firm's financial reports. Here is the second Linear Probability regression model of my research:

$$\textbf{dincontrol}_{i,t} = \alpha_0 + \alpha_1\textbf{lnvega}_{i,t\text{-}1} + \alpha_2\textbf{lndelta}_{i,t\text{-}1} + \alpha_3\textbf{lnsalary}_{i,t\text{-}1} + \alpha_4\textbf{lnbonus}_{i,t\text{-}1} +$$

$$\alpha_5\textbf{lnat}_{i,t\text{-}1} + \alpha_6\textbf{lnage}_{i,t\text{-}1} + \alpha_7\textbf{leverage}_{i,t\text{-}1} + \alpha_8\textbf{roa}_{i,t\text{-}1} + \alpha_9\textbf{mbratio}_{i,t\text{-}1} + \alpha_{10}\textbf{rd}_{i,t}$$

$$+\alpha_{11}\textbf{salesgrowth}_{i,t\text{-}1} + \alpha_{12}\textbf{dforeign}_{i,t\text{-}1} + \alpha_{13}\textbf{drcharges}_{i,t\text{-}1} + \alpha_{14}\textbf{dbig4}_{i,t\text{-}1} +$$

$$\alpha_{15}\textbf{dlitigation}_{i,t\text{-}1}$$

In both regressions, **dincontrol** represents my dependent and **lnvega** my test variable. The rest are the control variables. The meaning of the indicators used is the following: *i* is the unique firm identifier, *t* represents the fiscal year t and *t-1* depicts the year before fiscal year t. The difference between the two models lies on the control variable **lndelta,** which is included in the latest, but not the former model, because, as I have already said, it is part of the second and not the first hypothesis testing.

5.7 Sample

In order to calculate my variables and test my hypotheses, data from WRDS platform were obtained, which is divided into many different databases. My study focuses on publicly traded companies in the U.S.A. and especially on those who were obliged to submit an annual report about their internal control status, pursuant to SOX Section 404. More specifically, data related to the effectiveness of internal controls were retrieved from AuditAnalytics, whereas financial and compensation information was collected from Compustat and Execucomp, respectively. Additionally, part of the original dataset of *Coles et al (2013)* was also used*,* which included estimated values of the CEO's delta and vega, based on the methodology developed in *Core and Guay (2002)* and *Coles et al (2006).*

The period examined spans from December 2004 to December 2010. I decided to set the beginning of my sample period on December 2004, due to the fact that SOX Section 404 became effective for accelerated filers (market capitalization in excess of $75 million) in fiscal years ending on or after November 15, 2004 (*SEC, 2003*). The ending period of my sample is also not chosen randomly. *Coles et al (2013)* original dataset expands till 2010. So, any further observations were not available in case I wanted to examine companies whose fiscal years ended after 2010.

In **table 2** we can see a detailed summary of the selection process. As "ICW sample" were named companies, which reported internal control weaknesses and as "NICW sample", firms whose internal control status was ineffective, according to SOX Section 404. It's worth

mentioning, that taking the fiscal year-end of each company into consideration, the first submission of its auditors' opinion regarding the condition of its internal control environment, took place either in 2004 or 2005. The initial total sample that was created consisted of 11,798 distinct firm-year observations or 2083 unique companies, for which reports about whether auditing firms or management attested the existence or not of a company's internal control weaknesses can be found in the AuditAnalytics database. Firms which had missing values in some variables were ruled out, in some or all the years examined. After several eliminations were made, my final total sample comprised of 7,329 observations or of 1535 distinct firms.

Table 2

Sample selection procedure

__NICW sample__

Number of firm-year observations with an effective internal control opinion under SOX 404 (12-2004 through 12-2010) available in AuditAnalytics	10976
Elimination of firm-year observations not provided by Compustat	(1855)
Elimination of firm-year observations not available in Execucomp	(552)
Elimination of firm-year observations not provided by Coles et al (2013)	(62)
Exclusion of firm-year observations belonging to financial services industries	(825)
Exclusion of firm-year observations belonging to utilities industries	(754)
Final NICW sample	6928

__ICW sample__

Number of firm-year observations with an adverse internal control opinion under SOX 404 (12-2004 through 12-2010)	822
Elimination of firm-year observations not provided by Compustat	(283)
Elimination of firm-year observations not available in Execucomp	(52)
Elimination of firm-year observations not provided by Coles et al (2013)	(15)
Exclusion of firm-year observations belonging to financial services industries	(39)
Exclusion of firm-year observations belonging to utilities industries	(32)
Final ICW sample	401

In the beginning, the "NICW sample" included 10,976 firm-year observations or 2059 companies. However, after excluding 1,855 firm-years, which were not available in Compustat, 552 that could not be detected in Execucomp and 62 which were not provided by *Coles et al (2013)*, the initial sample dropped to 8,507 observations. This number declined further due to the fact that 1,579 firm-years were left out, which referred to companies who belonged to the

industrial categorization of the so called "financial services" and "utilities". Actually, at this point, I followed the pattern of *Ashbaugh-Skaife et al (2007),* who also dropped firm – year observations related to the aforementioned industries. As we know, this is a common practice widely used in quantitative research in economic science. After all computations, the final "NICW sample" that was created consisted of 6,928 firm-year observations, or of 1512 companies.

What is more, the same steps were followed, in order to form also the "ICW sample". In the first stage, the number of its firm-year observations was 822, which corresponds to 503 companies. Due to the fact that 283 values were missing from Compustat, 52 from Execucomp and 15 from *Coles et al(2013)* dataset, the initial "ICW sample" went down to 472 observations. Additionally, 71 firm-year observations of organizations in the financial services and utilities industries were also dropped, yielding a final "ICW sample" of 401 firm-years or of 272 companies.

5.8 The validity of the study

5.8.1 Construct validity

The construct validity of a study refers to how adequately a theoretical concept is captured by the variables used to measure it *(Smith and Strauss., 2009).* The Predictive Validity Framework of Libby (1981) or commonly called the "Libby boxes" will help me to describe the construct validity of my research and is presented in **table 3**. Due to the fact that the control variables of my two hypotheses differ and in order to represent their concepts individually, there are two models of Libby Boxes created. As we can notice, in comparison to the first model that refers to the conceptual elements of the first hypothesis, the second model which describes the construct of the second hypothesis includes the extra control variable "*lndelta*". In order to make this difference more visible, the equity incentives "*lndelta*" in table 3 were highlighted.

In order to measure my dependent variable "*dincontrol*", the reported opinion of a company's external auditors about its internal control quality, pursuant to SOX Section 404, was used as a proxy. To my mind, this variable is quite representative for depicting the probability or not of the incidence of an internal control weakness in a firm. Because, as already stated, executives and auditors of a company are responsible for the attestation of the effectiveness or not of its internal control environment and no one else. Additionally, as already stated above, auditors'

internal control report may be more objective and thus more accurate than that of managers', whose opinion may be affected by possible opportunistic behaviour.

What is more, I believe, that the way "*vega*" was computed by *Coles et al (2013),* on which my test variable "*lnvega*" was based, also captures its underlying concept very well. Because, as far as I know, there is no other way so far proposed by other researchers of computing vega differently, which probably means, that the mathematical concepts and way used to compute it are quite representative. The same stands also for my control variable "*lndelta*". Regarding the rest of the control variables, which reflect the size, age, profitability, business complexity and audit quality, I used the same values to proxy for them like that used by prior research. However, I would like to point out that different variables were also used in academia to proxy for the same firm characteristics, as that used in my study, but they were used to test different relations. For the above reasons, I conclude that the construct validity of my model could be characterized as a high one.

5.8.2 External validity

The external validity of a research shows whether its results can be generalised to the broader population (*Smith, 2011*). To my mind, my paper suffers from low external validity. Because, firstly, I carried out an observational study and in such studies the sample selection is usually considered as non - random. In most observational researches, it often happens that the data which are included in a dataset are retrieved from several databases and in case these data do not overlap or are not available, then they have to be left out. For example, in my research I had to exclude 2469 firm – year observations related to the "NICW" sample and 350 which refer to the "ICW" sample due to the above mentioned reasons. However, it may be the case that the observations that are excluded may affect the results of the hypotheses testing, thus I do not consider my sample as a random one. Second, though the "NICW sample" is quite big, as it consists of almost 7000 firm-year observations, the "ICW sample" is much smaller, as it comprises only of 401 events of internal control weaknesses, so it may not be a representative one.

However, the fact that the "ICW" sample is limited may happen for two reasons. One may be that this is the actual number of the material weaknesses reported by companies during the period I test, so between 2004 and 2010. However, another may be that my dataset comprises of accelerated filers only and not of non-accelerated ones. And since according to *Ashbaugh – Skaife (2007)* smaller companies are those who usually report internal control deficiencies, it

may be the case that my sample is a non-representative one, since these companies are not included in it. However, this is not a matter of choice, but a matter of fact as I will explain next.

Though it was mandatory for companies with more then $75 million market capitalization to start reporting material weaknesses in their internal control systems on and after November 15, 2004, this was not the case for firms with less then $75 million market capitalization. Management of non – accelerated filers, were obliged to file a report on the effectiveness of the internal control status of a company on and after December 15, 2007. So, it may be the case, that though smaller firms may have faced internal control problems between 2004 and the end of 2007, they have not reported them officially, since they were not forced to do so by law. It is important to mention also, that as far as the auditors of non – accelerated filers are concerned, for them it was mandatory to start reporting whether the internal controls of a company where effective or not on or after June 15, 2010. So, till that date, it is probably unlikely that many independent reports by auditors have been published and that their opinion is also included in my dataset.

What is more, I examined only listed companies which belong to U.S.A. and not non - publicly traded ones, or firms which belong to different countries, to see whether the results of my study also hold for them. So, since private American companies are excluded from my research and firms located in different countries have not been taken into consideration, my conclusions cannot probably hold for this kind of organizations. Thus, for all the above mentioned reasons, I cannot argue that the results of my study could be applied to the broader population, as I think that they do not represent it. So, due to sample selection bias, I could say that my research is characterized by low external validity.

5.8.3 Internal validity

The term internal validity means that the causal effect of a test variable (X) on the independent one (y) is well captured, after ruling out other hypotheses. In other words, the results of a study where causal relationship is detected should be attributed to this relation only and not to any spurious one, so that rival hypotheses can be excluded (*Smith, 2011*). Though, the conclusion of my study is that there is no causal relation between "dincontrol" (the likelihood of the occurrence of material weaknesses in internal controls of a company) and "lnvega" (the sensitivity of CEO's wealth to shifts in company risk), it may be possible that there are some unobserved variables which influence both "lnvega" and "dincontrol" and which may lead to spurious correlation between my dependent and independent variable. The reason why this may

happen is that "lnvega" is not randomly assigned to firms. So, according to the above, I conclude that my study suffers from low internal validity.

Table 3

Model 1

Independent variable (x)		Dependent variable (y)
Risk – taking incentives	→	The likelihood of the occurrence of material weaknesses in internal controls

Independent variable (x) operational		Dependent variable (y) operational
Vega: The sensitivity of CEO's payoff to alterations in firm risk, as computed by *Coles et al (2013)*	→	Dummy variable (dincontrol) coded 1, if internal control opinion is ineffective, zero otherwise

Control variables:
- Size
- Business complexity
- Audit quality
- Age
- Accounting risk

Model 2

Independent variable (x)	Dependent variable (y)
Risk –taking incentives	The likelihood of the occurrence of material weaknesses in internal controls

Independent variable (x) operational	Dependent variable (y) operational
Vega: The sensitivity of CEO's payoff to alterations in firm risk, as computed by *Coles et al (2013)*	Dummy variable (dincontrol) coded 1, if internal control opinion is ineffective, zero otherwise

Control variables:
- **Equity incentives**
- Size
- Business complexity
- Audit quality
- Age
- Accounting risk

5.9 Summary

In this section the design of my research was presented and sub – question 5 was answered. Due to the fact that the hypotheses of my study were two, two multivariate models were also created and the relevant variables, which were included in them, were described in detail. The difference between the two regression models was the inclusion or not of the control variable lndelta, which represents the equity incentives provided to the CEO. This is what differentiates also the methodology between the first and the second hypothesis. Furthermore, the way the sample was formulated was also described. Last, the reasons why my study suffers from low internal and external validity were also highlighted, while a justification of the high construct validity was made, too.

6. Research findings and empirical analysis

6.1 Introduction

In this chapter I will analyse the descriptive statistics, the Pearson's correlation matrix and the results of the regressions of the Linear Probability and the Fixed Effects models. More specifically, in the beginning, the statistics of the whole sample will be presented and then the ICW sample will be compared with the NICW one. After that, I will describe the level of correlation between the variables of my study and at last, after commenting on the estimations of the regression models, I will argue whether the two hypotheses hold or not, so they will be either accepted or rejected. All in all, sub – question 6 will be answered.

6.2 Summarized descriptive statistics

In **table 4** the descriptive statistics of the whole sample are presented. As we can see, the number of the total firm - year observations of the sample is 7329 and for each variable we recognize the mean, the standard deviation and its minimum, as well as, its maximum value. As we can see, the dummy variables (***dincontrol, dforeign, drcharges, dbig4, dlitigation***) range between zero and one and by definition, they cannot take any other values. In cases where no equity or risk – taking incentives where provided to CEO's, firm - year observations take the value of zero. The same holds also for the bonus (***lnbonus).*** Furthermore, the mean of **lnvega** is 3.811261 and of **lndelta** 4.997895, which, when unlogged, corresponds to almost $45 million and $148 million, respectively.

What is more, as we can conclude from the value of the minimum ***lnsalary,*** which is 4.012556 (equal to almost $56 million), all CEO's included in my dataset used to receive annual salary. Furthermore, R&D expenses, depicted by the ***rd*** variable, take either a positive value or zero. This means that either there were companies which invested and others that did not at all spend money in research and development. The rest of the variables are all positive except for ***roa*** and ***salesgrowth***, which take also negative values. This shows that my dataset comprises also of companies which are under financial distress and not just of "healthy" companies. As far as the size of the companies included in concerned, the unlogged value of total assets (***lnat)*** of the smallest company is $1.5 billion (logged value: 7.341317), whereas the total assets of the biggest firm are $73 billion (logged value: 11.19538).

 As we can observe, my dataset comprises of big companies, rather than of small companies. This is actually the characteristic of Compustat database, from which I retrieved my data,

which, in comparison to other databases, like Equilar Inc. is narrower, as it consists predominately of companies with greater size (*Armstorng et al., 2010*). Furthermore, young, as well as old companies are included in my sample. The younger one is 3 years old (logged value of **lnage**: 1.098612) and the older one is 59 years old (logged value of **lnage**: 4.077538). As it is shown by the unlogged minimum **lnage**, there is no company included which is less than one year old, so, one that had just started to run its business.

Table 4

	Observations	Mean	Std. Deviation	Min	Max
dincontrol	7329	0.054714	0.227437	0	1
lnvega	7329	3.811261	1.803273	0	7.136734
lndelta	7329	4.997895	2.050467	0	9.019694
lnsalary	7329	6.472343	0.520279	4.012556	7.491098
lnbonus	7329	3.001493	3.237303	0	8.458335
lnat	7329	7.341317	1.475476	4.500221	11.19538
lnage	7329	3.004489	0.713475	1.098612	4.077538
leverage	7329	0.481302	0.200198	0.071876	0.935297
roa	7329	0.045701	0.099167	-0.400972	0.276842
mbratio	7329	3.192394	2.954267	0.502229	20.36602
rd	7329	0.032503	0.050756	0	0.238538
salesgrowth	7329	0.106121	0.219819	-0.466687	0.972347
dforeign	7329	0.360622	0.480213	0	1
drcharges	7329	0.408650	0.491618	0	1
dbig4	7329	0.936144	0.244512	0	1
dlitigation	7329	0.333742	0.471581	0	1

In **table 5** the descriptive statistics of the characteristics of the "*ICW*" (firms who reported internal control weaknesses) and the "*NICW*" (firms who did not report internal control weaknesses) sample are depicted. In order to compare the means between these datasets and to check whether they differ significantly from each other, I conducted *two-sample t - tests*. In cases where the variances of different variables of the two groups where equal the *pooled* method was applied automatically by Stata and when they were unequal, the *Satterthwaite*

method was used. Additionally, *Wilcoxon rank – sum tests* were used in order to estimate the difference between the medians of the companies which belong to the above mentioned groups.

As we can see, the mean (median) value of CEOs' **lnvega** of *ICW* companies is 3.42 (3.74), which corresponds to the unlogged value of $30.6 million ($42.10 million) and is smaller than that of firms which do not report any material weaknesses in their annual reports and which is 3.83 (4.09) or $46.06 million ($59.74 million). This result, which is statistically significant at 1% level, suggests the following: companies of CEOs who are provided with lots of risk – taking incentives are less likely to have internal control problems. As we realize, this finding is the opposite of what is predicted in my first hypothesis. Thus, it does not provide any support for it and for the second hypothesis, as well.

Furthermore, CEOs' of companies that belong to the "*ICW*" sample have smaller **lndelta** (mean: 4.63, median: 5.00) in comparison to that of the "*NICW*" sample (mean: 5.02, median: 5.31). Or else said, the incidence of weaknesses in the internal control quality of a firm is less probable in firms where the CEOs' have higher equity incentives. This result is inconsistent with the findings of *Balsam et al (2014),* who did not find any relation between CEO equity incentives and the likelihood of the disclosure of material weaknesses in the internal control environment of a firm. Regarding the cash compensation components, CEOs' mean, as well as, median salary (**lnsalary**) in the "*ICW*" sample is lower, while their bonus (**lnbonus**) is higher. Both of these predictions are inconsistent with prior literature (*Balsam et al., 2014).*

As far as the firm characteristics of the two samples are concerned, companies with internal control weaknesses are smaller in size (consistent with *Ashbaugh – Skaife et al., 2007*; *Doyle et al., 2007; Ashbaugh - Skaife et al., 2013 and Jha et al., 2013*) and younger in age (*Doyle et al., 2007; Ashbaugh - Skaife et al., 2013).* The mean of the total assets (**lnat**) of "ICW" firms is around $880 million (log value: 6.78) and their average age (**lnage**) is eighteen years old (log value: 2.88). However, the average size of "NICW" companies is about $1.6 billion (log value: 7.37) and the mean of their age is 20 years (log value: 3.01). It is worth mentioning, that the above statistical estimations about size and age are inconsistent with the findings of *Balsam et al (2014)* and *Jha et al (2013),* respectively.

What is more, firms that report internal control weaknesses have smaller return on assets (**roa**), so, lower profitability. It is worth mentioning, that *Ashbaugh – Skaife et al (2007)* used a different measure of profitability than mine. They examined the "*%Loss*" variable, which was defined as "*the proportion of years from 2001 to 2003 that a firm reports negative earnings*"

and found, that firms which reported internal control deficiencies reported losses the last two years prior to SOX – mandated audits. Furthermore, companies with internal control weaknesses, have lower market value to book value of equity (***mbratio***), a statement that was also made by *Jha et al (2013).*

Table 5

<p align="center"><u>**Descriptive statistics of ICW firms vs. NICW firms**</u></p>

	ICW firms			**NICW firms**			
Variables	**Mean**	**Median**	**Sign of predicted difference**	**Mean**	**Median**	**Mean difference** **t-value**	**Median difference** **z-value**
Invega	3.42	3.74	?	3.83	4.09	4.4719***	4.926***
Indelta	4.63	5.00	=	5.02	5.31	3.6507***	4.07***
Insalary	6.26	6.30	>	6.48	6.53	7.6498***	8.529***
Inbonus	3.47	5.01	<	2.97	0.00	-3.2028***	-1.988**
Inat	6.78	6.62	<	7.37	7.24	8.8440***	7.699***
Inage	2.88	2.77	<	3.01	3.00	3.6306***	4.087***
leverage	0.49	0.50	=	0.48	0.49	-0.8418	-0.917
roa	0.01	0.02	?	0.05	0.06	6.6957***	9.225***
mbratio	2.94	2.01	<	3.21	2.37	1.7663*	3.975***
rd	0.037	0.011	>	0.032	0.005	-1.7225*	-2.182**
salesgrowth	0.12	0.08	>	0.10	0.09	-1.4886	-0.519
dforeign	0.41	0	>	0.36	0	-2.1287**	-2.181**
drcharges	0.49	0	>	0.40	0	-3.3009***	-3.357***
dbig4	0.92	1	<	0.94	1	1.3887	1.553
dlitigation	0.42	0	=	0.33	0	-3.6634***	-3.830***
N	401			6928			

<p align="center">*** p<0.01, ** p<0.05, * p<0.1</p>

Finally, "*ICW*" companies have bigger ratio of R&D expenditures (***rd***) *(Ashbaugh – Skaife et al., 2013),* involve in more foreign transactions (***dforeign***) *(Doyle et al., 2007),* have more complex environments, as they have higher restructure charges (***drcharges***) *(Doyle et al., 2007;*

Ashbaugh – Skaife et al., 2007) and a higher number of them face a **litigation risk** (inconsistent with *Ashbaugh – Skaife et al., 2007)*. The comparison of means (medians) between the two groups related to *leverage***,** *salesgrowth* and *dbig4* is statistically insignificant, though, according to *Jha et al (*2013) and *Balsam et al (2014),* companies with internal control problems tend to get audited in a less extent by Big4 companies. Regarding sales growth there are mixed results, with *Ashbaugh – Skaife et al (2007) and Doyle et al (2007*) proving, that firms with an increasing sales growth tend to disclose internal control problems and *Balsam et al (2014)* finding a non – significant relationship. Regarding *leverage*, the findings of *Jha et al (2013)* confirm my result.

6.3 The disclosure of internal control weaknesses over time

Following *Ashbaugh - Skaife et al (2013),* in **panel A** of **table 6** I depict the number of internal control weaknesses reported by the auditors of companies pursuant to SOX Section 404, over the years 2004 to 2010 and the total annual number of reports related to the internal control status of the firms, while in **panel B** two relevant graphs are drawn to provide a better picture of the statistical data. As we can observe, less and less internal control problems are reported between 2004 and 2009, which means that the internal control effectiveness increased during that period. However, in 2010 the internal problems of the firms rose slightly (0.01%). Regarding the number of firms whose auditors filed an internal control opinion, it follows a totally opposite trend. More and more companies seem to have reported about their internal control status from 2004 to 2010, while 1/3 less seems to have provided such a report in 2010.
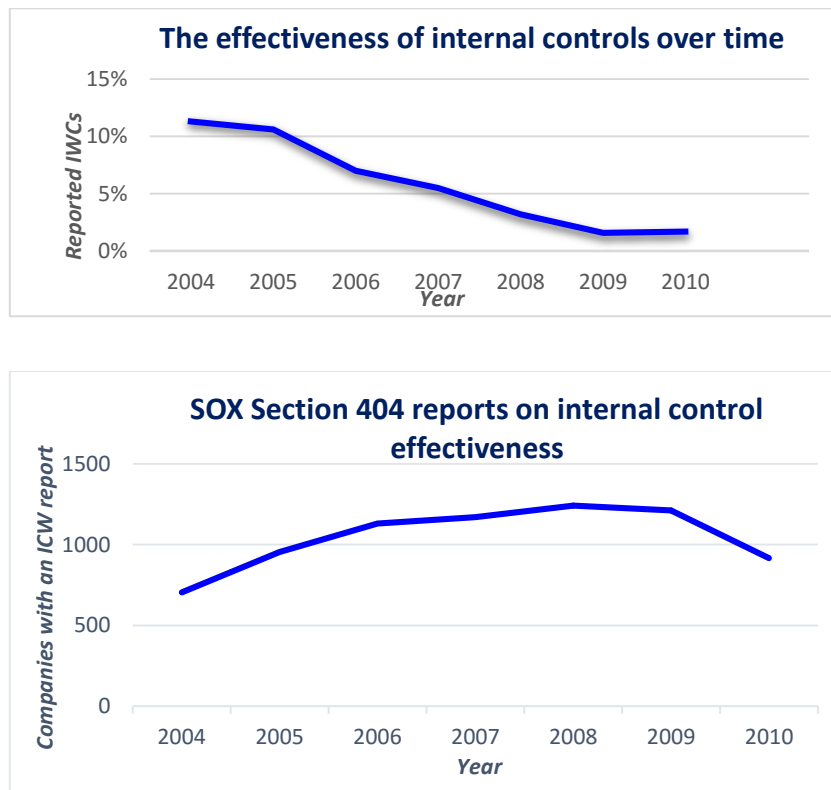
Table 6

Panel A

The effectiveness of internal controls over time

Year	2004	2005	2006	2007	2008	2009	2010	Total
Percent of reported internal control weaknesses	11.3%	10.6%	7.0%	5.5%	3.2%	1.6%	1.7%	5.5%
N (number of firm – year observations)	705	955	1130	1171	1241	1211	916	7329

The effectiveness of internal controls over time

[chart: Reported IWCs vs Year, showing a declining line from about 11% in 2004 to about 2% in 2010]

SOX Section 404 reports on internal control effectiveness

[chart: Companies with an ICW report vs Year, showing values rising from about 700 in 2004 to a peak around 1250 in 2008, then declining to about 900 in 2010]

6.4 Pearson's correlation matrix

In **table 7** Pearson's product - moment correlations are presented. Almost all of my variables are correlated with one another either at 1%, 5% or 10% significance level, positively or negatively. When there is a "*positive correlation*" among two variables, e.g. A and B, it means that when A increases (decreases) also B increases (decreases) by the percentage depicted in the Pearson's matrix and vice versa. On the other hand, when a "negative correlation" between A and B exists, then, as A goes up by a specific percentage, B goes down and conversely. In other words, A moves in the opposite direction than B.

The largest correlation detected is 0.5982 and is between CEO's salary (*lnsalary*) and firm size (*lnat*). The second highest is 0.5455 and refers to CEO's risk – taking incentives (*lnvega*) and equity incentives (*lndelta*). As we notice, my test variable (*lnvega*) is positively and highly correlated also to *lnat* (0.4771) and to *lnsalary* (0.4444). The above correlations are the four highest of Pearson's matrix and are all statistically significant at 1%.

What is more, it is important to examine also whether and to what extent my independent and the rest of the control variables are correlated, because it is possible that strong relationships, like the ones reported previously, may influence the outputs of my regressions and lead to

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multicollinearity (this will be discussed in one of the next sub - sections). The correlations between *lnvega* and *lnbonus, lnage, leverage, roa, mbratio, rd, dforeign, drcharges dbig4* and *dlitigation* are positive and statistically significant at 1% level and range between 0.0606 and 0.1882. Since all the coefficients of determination are quite far below 1, I would characterize the relationship between the above control variables and *lnvega* as a weak one. The relationship with *salesgrowth* is statistically insignificant (p=0.7764).

Furthermore, my dependent variable, *dincontrol*, is negatively correlated with my independent one, *lnvega* (-0.0522) and this is significant at 1% level (p=0.0000). This quite small correlation indicates that there is a weak relationship between my dependent and my test variable. Additionally, the negative relationship between these two variables indicates the opposite of what is predicted in the hypothesis development section, where it is assumed that the above relationship would be a positive one.

As far as the correlation between *dincontrol* and *lndelta* is concerned, it is also very low, negative (-0.0426) and significant at 1% level (p=0.0003). This finding is inconsistent with prior literature *(Balsam et al., 2014)*. Additionally, this relationship is very weak, as the coefficient of determination is far below -1. Regarding whether and to what extent *dincontrol* is correlated with CEO's compensation components *lnsalary* and *lnbonus* and with most of the firm characteristics (*lnat, lnage, roa, mbratio, rd, dforeign, drcharges, dbig4* and *dlitigation*), the direction of these relationships is the same as that analyzed in the "Descriptive statistics" section and their measures fall between – 0.9833 and 0.0447. All the relationships are statistically significant, except that between *lnvega* and *leverage*, *salesgrowth* and *dbig4*.

6.5 Multiple regression results

In this section I will analyse the results of my regressions that are presented in **table 8** and which are related to my first and second hypothesis. As we can see, I used the cluster option in Stata of the two *Linear Probability models* (LP) and the two *Fixed Effects models* (FE). The first and third specification refer to the first hypothesis (H1) testing, while the second and fourth to the second (H2). The difference among the same type of regression models is the inclusion or not of the control variable *lndelta* and the reason related to this choice has already been analysed in the previous section. Additionally, in all cases I controlled for time effects using year dummies and in the parentheses of table 8 the standard errors are presented. A more detailed analysis of the four models will follow next.

Table 7

Pearson's correlation matrix

	1.dincon~l	2.lnvega	3.lndelta	4.lnsalary	5.lnbonus	6.lnat	7.lnage	8.leverage	9.roa	10.mbratio	11.rd	12.salesg~h	13.dforeign	14.drchar~s	15.dbig4	16.dlitig~n
1	1															
2	-0.0522***	1														
	(0.0000)															
3	-0.0426***	0.5455***	1													
	(0.0003)	(0.0000)														
4	-0.0983***	0.4444***	0.2867***	1												
	(0.0000)	(0.0000)	(0.0000)													
5	0.0352***	0.1576***	0.0757***	0.0759***	1											
	(0.0026)	(0.0000)	(0.0000)	(0.0000)												
6	-0.0908***	0.4771***	0.3407***	0.5982***	0.1121***	1										
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)											
7	-0.0424***	0.1802***	0.0546***	0.3574***	0.0370***	0.4110***	1									
	(0.0003)	(0.0000)	(0.0000)	(0.0000)	(0.0015)	(0.0000)										
8	0.0107	0.1261***	0.0581***	0.3672***	0.0430***	0.4349***	0.2610***	1								
	(0.3613)	(0.0000)	(0.0000)	(0.0000)	(0.0002)	(0.0000)	(0.0000)									
9	-0.0822***	0.1311***	0.1957***	0.0519***	0.1284***	0.0983***	0.0191	-0.1764***	1							
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.1021)	(0.0000)								
10	-0.0206*	0.1276***	0.1518***	-0.0179	0.0593***	0.0031	-0.0711***	0.2241***	0.2618***	1						
	(0.0774)	(0.0000)	(0.0000)	(0.1261)	(0.0000)	(0.7923)	(0.0000)	(0.0000)	(0.0000)							
11	0.0201*	0.0905***	-0.0094	-0.1912***	-0.0580***	-0.2072***	-0.1542***	-0.2731***	-0.1958***	0.1307***	1					
	(0.0850)	(0.0000)	(0.4231)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)						
12	0.0189	0.0033	0.1018***	-0.1329***	0.1897***	-0.0509***	-0.1986***	-0.1042***	0.2604***	0.1387***	0.0293**	1				
	(0.1058)	(0.7764)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0120)					
13	0.0255**	0.0606***	0.0097	0.0176	-0.0472***	0.0627***	0.0554***	-0.0172	-0.0447***	-0.0164	0.1598***	-0.0338***	1			
	(0.0292)	(0.0000)	(0.4076)	(0.1326)	(0.0001)	(0.0000)	(0.0000)	(0.1401)	(0.0001)	(0.1599)	(0.0000)	(0.0038)				
14	0.0392***	0.1042***	-0.0496***	0.1343***	-0.0799***	0.1528***	0.1459***	0.1873***	-0.2403***	-0.0451***	0.1424***	-0.2145***	0.1740***	1		
	(0.0008)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0000)	(0.000)			
15	-0.0181	0.1882***	0.0752***	0.1594***	0.0609***	0.2618***	0.0541***	0.1576***	0.0113	0.0096	-0.0259**	-0.0195*	0.0195*	0.0707***	1	
	(0.1204)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.3351)	(0.4112)	(0.0269)	(0.0948)	(0.0952)	(0.0000)		
16	0.0447***	0.0733***	0.0127	-0.1086***	-0.0646***	-0.0946***	-0.1965***	-0.2230***	-0.0279**	0.0493***	0.3890***	0.0462***	-0.0025	0.0144	-0.0507***	1
	(0.0001)	(0.0000)	(0.2788)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0169)	(0.0000)	(0.0000)	(0.0001)	(0.8332)	(0.2182)	(0.000)	

6.6 Linear Probability models – production of robust standard errors
6.6.1 Hypothesis 1

To begin with, in my first hypothesis I assumed a positive relation between the sensitivity of the manager's wealth to changes in risk (portfolio vega) and the likelihood of reporting internal control weaknesses in the periodic financial statements. As we can see in the (1) column of table 8, the coefficient of **lnvega** is negative (-0.00132) and this shows that my test variable is negatively related to my dependent variable, **dincontrol.** However, this association is statistically insignificant ($p > 0.1$). This means that my first hypothesis does not hold and that the incidence of internal control weaknesses is unlikely for companies which provide their CEOs with risk – taking incentives.

Besides commenting on the coefficient estimate of my test variable important is to check also the fit of the first LP model. Its R - squared is 0.061 and this means that only 6.1% of the variation of **dincontrol** can be explained jointly by the independent and the control variables. In other words, the predicting power of my model is low and this is a possible limitation of my study. One explanation may be that, though the "NICW" group is big, the "ICW" one is limited and does not include smaller companies, which were found by some researchers (*Ashbaugh – Skaife et al., 2007*; *Doyle et al., 2007; Jha et al., 2013; Ashbaugh - Skaife et al., 2013)* to be more prone to face internal control problems. So, my sample may not be a quite representative one.

Another justification for the low value of R - squared could be that, despite the fact that in my regressions most of the variables used in prior research were included, other control variables could probably also be used which may have affected my results. For example, variables related to corporate governance could also be tested, e.g. size or level of independency of board of directors and some extra characteristics associated to auditors, such as frequency of auditor change, auditors' fees, and auditors' tenure. Regarding the F – value, it was not given by Stata and for that reason I have also not reported it in table 8. The only explanation given by the statistical program was that there was not necessarily anything wrong with the model.

Furthermore, **lnsalary** is negatively (-0.0202), but significantly associated ($p < 0.05$) with **dincontrol**. These statistics confirm Pearson's correlation documented in the previous section and indicate that while CEO's salary increases the possibility of the occurrence of internal control weaknesses in a company decreases and vice versa. The same holds also for CEO's bonus. **Lnbonus** is negatively (-0.00262) related with the likelihood of an internal control

weakness at 5% significance level (p<0.05). This can be interpreted as following: when CEO's bonus goes up, the likelihood of reporting an adverse internal control opinion becomes lower and conversely. These findings do not overlap that of *Balsam et al (2014)*, who did not detect any association between the above compensation measures and the managerial risk – taking incentives.

As far as the firm characteristics are concerned, both measures used to proxy for the size of a company ***lnat*** (-0.0122) and ***mbratio*** (-0.00329), are negatively and significantly related to the probability that internal control weaknesses will show up in the systems of a company (***dincontrol***) at 1% (p<0.01) and 5% level (p<0.05), correspondingly. In other words, the bigger a company the less likely it is that an internal control weaknesses will rise up. These findings match with that of *Ashbaugh – Skaife et al (2007), Doyle et al (2007), Jha et al (2013)* and *Ashbaugh - Skaife et al (2013)*, but not with that of *Balsam et al (2014)* and they support also the statistics of Pearson's table.

 What is more, the relation between other economic factors, like ***leverage*** and ***roa*** which, as already stated, reflect the financial health of a company and ***dincontrol*** is for both statistically significant at 1% level and is positive (0.0722) or negative (-0.111), accordingly. The first coefficient mentioned in this paragraph shows that in companies with higher leverage the probability that material internal control problems will arise is increasing. This however is inconsistent with *Jha et al (2013),* who did not find any association between these two variables and does not also confirm the results of Pearson's matrix. The coefficient of ***roa*** can be interpreted as following: while roa increases by one unit, the likelihood of the disclosure of weaknesses in the internal controls of a firm decreases moderately, by almost 11%, holding all other independent variables constant, supporting also the correlation reported in the previous section.

Regarding the effect of ***rd, dforeign*** and ***drcharges***, which depict the magnitude of a company's complexity, it was found to be negative on ***dincontrol*** in the first case (-0.174), while it is positive in the second (0.0183) and third one (0.0160). Additionally, all of the above findings are statistically significant (p<0.1, p<0.05 and p<0.05, respectively) and they suggest that firms with ineffective control environments involve less in R&D, though this is contrary to what was documented by *Ashbaugh - Skaife et al (2013)* and to what is mentioned in the analysis of Pearson's matrix, have more foreign transactions *(Doyle et al., 2007)* and higher restructure charges *(Doyle et al., 2007; Ashbaugh – Skaife et al., 2007).*

Table 8

LP and FE models – production of robust standard errors

VARIABLES	(1) LP	(2) LP	(3) FE	(4) FE
lnvega	-0.00132	-0.00117	0.000084	-0.000416
	(0.00213)	(0.00240)	(0.00320)	(0.00341)
lndelta		-0.000275		0.000797
		(0.00183)		(0.00200)
lnsalary	-0.0202**	-0.0202**	-0.0116	-0.0119
	(0.0102)	(0.0102)	(0.0194)	(0.0195)
lnbonus	-0.00262**	-0.00265**	-0.000886	-0.000775
	(0.00119)	(0.00120)	(0.00140)	(0.00143)
lnat	-0.0122***	-0.0121***	0.0563***	0.0559***
	(0.00325)	(0.00325)	(0.0147)	(0.0148)
lnage	0.00230	0.00225	-0.0420	-0.0415
	(0.00633)	(0.00632)	(0.0412)	(0.0412)
leverage	0.0722***	0.0720***	-0.00548	-0.00442
	(0.0244)	(0.0246)	(0.0461)	(0.0464)
roa	-0.111***	-0.111***	0.00167	0.00105
	(0.0390)	(0.0390)	(0.0472)	(0.0471)
mbratio	-0.00329**	-0.00327**	0.00178	0.00169
	(0.00139)	(0.00139)	(0.00234)	(0.00235)
rd	-0.174*	-0.174*	-0.0295	-0.0293
	(0.0958)	(0.0958)	(0.220)	(0.219)
salesgrowth	0.00429	0.00447	0.00305	0.00280
	(0.0163)	(0.0164)	(0.0182)	(0.0183)
dforeign	0.0183**	0.0183**	-0.0211	-0.0212
	(0.00739)	(0.00739)	(0.0131)	(0.0131)
drcharges	0.0160**	0.0159**	0.00889	0.00897
	(0.00693)	(0.00696)	(0.00816)	(0.00817)
dbig4	-0.00754	-0.00768	0.150***	0.150***
	(0.0143)	(0.0144)	(0.0494)	(0.0493)
dlitigation	0.0393***	0.0392***	-	-
	(0.0136)	(0.0136)		
Constant	0.334***	0.334***	-0.232	-0.232
	(0.101)	(0.101)	(0.181)	(0.181)
Observations (N)	7,329	7,329	7,329	7,329
ICW		6928		6928
NICW		401		401
Year dummies	Included	Included	Included	Included
Industry dummies	Included	Included	-	-
Fixed effects	-	-	Included	Included
R-squared	0.061	0.061	0.038	0.038
F	-	-	6.38	6.38

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

As far as ***dlitigation*** is concerned, which is the variable that reflects the accounting risk of an organization, it is positively (0.0393) and significantly (p<0.01) related to ***dincontrol***. Though *Ashbaugh – Skaife et al (2007)* did not find any association between these two variables, my results show that companies which belong to litigious industries are more prone to face weaknesses in their internal controls, something that was also mentioned when analysed Pearson's correlations. Additionally, no association was found between ***dincontrol*** and ***lnage,*** though a negative correlation was detected in Pearson's table*.* Moreover, consistent with what was found in Pearson's table, ***salesgrowth*** and ***dbig4*** have no effect on ***dincontrol***.

In contrast to *Doyle et al (2007) and Ashbaugh - Skaife et al (2013) as well, Balsam et al (2014) and Jha et al (2013)* did also not report a link between the age of an organization and the probability that internal control weaknesses will occur in its systems. Regarding sales growth, *Balsam et al (2014)* did also not document any connection between this variable and the disclosure of material weaknesses in the internal controls of a firm. However, *Doyle et al (2007)* and *Ashbaugh – Skaife et al (2007)* state that this relation exists and is positive. Lastly, contrary to my conclusion, *Balsam et al (2014) and Jha et al (2013)* mention that it is less likely for firms with internal control problems to be audited by Big4 companies.

6.6.2 Hypothesis 2

In the (1) and (3) specifications of table 8 ***lndelta*** is not examined. This is happening, because it is not part of the first, but of the second hypothesis testing, where I assume the following: "*Considering CEO's vega and delta together, since there will not be any association between CEO's delta and the likelihood of the incidence of material internal control weaknesses in a firm, CEO's vega will predominate towards its relationship with the occurrence of material internal control weaknesses, which will continue to be positive"*. Among the (1) and (2) LP model, the existence of equity incentives is the biggest difference, as the statistical results which refer to the two hypotheses do not differ much.

As we can notice in the (2) LP model of table 8, there is a negative (-0.000275), but insignificant association between ***lndelta*** and ***dincontrol*** (p>0.1). This means, that CEO's equity incentives provided by a company do not have any effect on the likelihood that material internal control weaknesses will show up in its systems. Regarding the relation between ***lnvega*** and ***dincontrol*** it is also negative (-0.00117) and insignificant (p>0.1). According to the aforementioned results, I fail to accept the second hypothesis and this can be interpreted as following: if equity and risk – taking incentives are considered together, there is no link

between each one of them and the probability of the existence of weaknesses in the internal controls of an organization.

Additionally, the coefficients, as well as the statistical significance of **lnsalary, roa, rd** and **dforeign** remain exactly the same, while the statistics of the rest of the control variables differ slightly. However, this does not affect their interpretation, as it remains the same as that made in the section describing the (1) LP model with the robust standard errors. For example, in the (2) column, **lnbonus** is negatively (-0.00265) and significantly ($p<0.05$) associated with **dincontrol**, **salesgrowth** is not related to **dincontrol** (p-value: 0.00447, $p>0.1$), etc.

Regarding R – squared, it is obvious that its value (0.061) does not differ at all from that reported in the previous section. The same holds also for the F-value. So, despite the fact that the two LP models test different hypotheses, the explanation given for both of these parameters in the (1) specification stands also for the (2). Moreover, it is important to point out that in both specifications firm – level clustering was used in order to yield robust standard errors to control for potential serial correlation. Additionally, though not tabulated, in columns (1) and (2) 56 industry dummy variables were used and indicator variables were introduced for each of the six years after the first year when SOX Section 404 became effective for accelerated filers.

6.7 Firm Fixed Effects Models – production of robust standard errors

6.7.1 Hypothesis 1

The above LP models rely on cross - sectional variation, which means that their statistics show whether variation in portfolio vega explains variation in the incidence of material internal control weaknesses across firms, over time. As already argued, the relation between the above two variables is an insignificant one. So, the variation in the occurrence of material internal control problems cannot be interpreted by the variation in risk – taking incentives across firms, over time.

 However, it is possible that regressions like the above may suffer from omitted variable bias, which means that besides the observed factors, there may be some unobserved, time invariant ones, which might drive the relationship between the predictor variables and the dependent one and be correlated with both of them. In such a case, the model of a study is considered to be poorly specified and the coefficient estimates are most probably biased. In order to rule out such a possibility it is important to focus on within – firm variation, which means that we should run a firm fixed effects regression. By using fixed effects it is possible to control for the effects of such unobserved time – invariant firm characteristics, but it is not feasible to estimate

them (*Torres – Reyna O., Princeton University, Panel Data Analysis – Fixed and Random Effects using Stata, Version 4.2, 2007*).

I run the fixed effect model which refers to the first hypothesis, in order to check whether changes in portfolio vega explain shifts in the probability of disclosing an ineffective internal control report within firms, over time. The (3) FE model of table 8 was characterized as "unbalanced" by Stata, for the reason that not every firm includes data for every year. However, the fact that my dataset was not balanced did not create any problems in the estimation of the results.

Regarding the value of the coefficient of determination, R – squared, it is 0.038, which means that only 3.8% of the variability of **dincontrol** can be attributed both to the test and the control variables. This value is considered to be very low and as already analysed in the previous section, it constitutes a potential limitation of my research. It is important to mention also, that the value of the R – squared of the (3) FE model of table 8 is almost half of that documented in the (1) LP model of the same table. Why this is happening will be mentioned below.

One of the formulas of R – squared is the following: $R^2 = 1 - SS_{res} / SS_{tot}$, where SS_{res} is the sum of squares of residuals and SS_{tot} is the total sum of squares (Coefficient of determination, Retrieved on May 1, 2016 from https://en.wikipedia.org/wiki/Coefficient_of_determination). The maximum value R^2 can take is 1 and the fit of the model is considered as a very good one. When R^2 values approach zero, as it is the case in my model, the fit of the model is considered as poor. In order that R^2 approaches 1, the following fraction SS_{res} / SS_{tot} must approach zero or become minimum and this is happening when SS_{res} approaches zero and SS_{tot}, infinity. However, when R^2 is very small, or when it approaches zero, which is the case of both my LP and FE models, then the contrary is happening. SS_{res} gets very big (approaches infinity), while SS_{tot} gets very small (almost zero).

As already argued, fixed effects are used in order to control for the effect of omitted variables that do not change over time (*Torres – Reyna O., Panel Data Analysis – Fixed and Random Effects using Stata, Princeton University, Version 4.2, 2007*). Since fixed effects reduce the possibility of omitted variable bias, it is expected that, the predicting power (R^2) of the FE model would increase in comparison with that of the LP model. However, as I mentioned above, the opposite is documented in my study. In case there are no omitted time - invariant factors to be controlled for, the error terms of the LP model and the fixed effect model have

approximately the same magnitude. This means that SS_{res} remains almost the same between the two models and the value of R^2 is consequently driven mainly by SS_{tot}. So, if this is the case also in my study, the limited value of R^2 can possibly be attributed to the magnitude of SS_{tot}. The reason why R^2 in the (3) FE model is smaller than that of the (1) LP model is that, in the FE model, SS_{tot} is smaller than that of the LP model, due to the usage of FE, which "smooth" the squared difference of each observation from the overall mean.

As far as the statistics are concerned, after including the cluster option in Stata, robust standard errors were produced and the coefficient estimate of *lnvega* (0.000084) changed to a positive one, but remained insignificant (p>0.1). This means that the relation between *lnvega* and *dincontrol* is not robust to including fixed effects and that changes in the test variable cannot explain shifts in the dependent variable within firms, over time. This suggests, that there may be a correlation between *lnvega* and some unobserved time – invariant firm characteristics which affect its relation with *dincontrol*.

What is more, though in specification (1) a negative and statistically significant association was detected between *dincontrol* and *lnsalary* and *lnbonus*, this is not the case in column (3). As we notice, after controlling for robust fixed effects, the coefficient estimates of salary and bonus lose their power and the relation between each of these two variables and *dincontrol* becomes insignificant (p>0.1 in both cases). The same stands also for *leverage, roa, mbratio, rd, dforeign* and *drcharges*. This can be interpreted as following: there is no relation between the disclosure of weaknesses in internal controls of a company and CEO's salary or bonus or each one of the following firm characteristics: profitability (*leverage, roa, mbratio*) and business complexity (*rd, dforeign*).

Moreover, surprisingly is that not only the absolute value of the coefficient of *lnat* (0.0563) changed completely, but also its sign, though its significance level remained the same (p<0.01). This is inconsistent with prior literature (*Ashbaugh – Skaife et al., 2007; Doyle et al., 2007; Jha et al., 2013; Ashbaugh - Skaife et al., 2013; Balsam et al., 2014*) which found mixed results, but no positive relation was reported between the likelihood of reporting internal control weaknesses and firm's size. Furthermore, like in the (1) LP model, *lnage* and *salesgrowth* continues to be insignificantly related with *dincontrol* (p>0.1). Last but not least, though there was no relation detected in (1) column among *dbig4* and *dincontrol*, in the (3) FE model a positive (0.150) and significant (p<0.01) relation is detected. This statistical result is contrary to what was predicted by *Balsam et al (2014) and Jha et al (2013).* As far as *dlitigation* is

concerned, Stata omitted this variable due to collinearity and it did not report any statistics related to it.

6.7.2 Hypothesis 2

In the (4) specification of **table 8** the second hypothesis is tested after controlling for robust fixed effects. By jointly taking *lnvega* and *lndelta* into consideration, *dincontrol* is not statistically associated with any of these variables ($p>0.1$). In other words, there is no link between the simultaneous provision of equity and risk – taking incentives by a company to its CEO and the possibility of the occurrence of weaknesses in a firm's internal controls.

Regarding the rest of the variables, none of them is statistically related to *dincontrol*, except for *lnat* (coefficient: 0.0559, p-value<0.01), which is the proxy of firm's size and *dbig4*, which is the indicator variable of auditor quality (coefficient: 0.150, p-value<0.01). As I already said, these findings are contrary to what was predicted by previous literature, as they show that ICW firms tend to be bigger in size and to be audited in a bigger extent by Big4 companies. Moreover, *dlitigation* is dropped by Stata due to collinearity. As far as the R – squared and the F-value are concerned, they are the same as that of the (3) FE model (0.038 and 6.38 respectively).

6.8 Robustness checks

Besides reporting the statistics of the Linear Probability (LP) and the Fixed Effect (FE) models, in which robust standard errors were produced, it is also important to examine whether potential statistical issues exist, whose existence may bias the results of my tests and affect their reliability. For example, one of the problems that may arise when dealing with a LP model is *heteroscedasticity (Williams, R., Heteroskedasticity, Retrieved on March 20, 2016 from* https://www3.nd.edu/~rwilliam/stats2/l25.pdf). This term is the opposite of *homoscedasticity* and means that the variance of a variable (Y) is not the same across the values of another variable who is its predictor (X). In such a case standard errors get biased and when this is happening, the significance of the statistical results (coefficients) is influenced, leading to wrong conclusions.

The way I controlled for heteroscedasticity, is by using in all specifications of **table 8** the "*cluster*" command of Stata. In other words, firm – level clustering was introduced in order to yield robust standard errors to check for intra group correlation. It is worth mentioning, that this type of errors does not affect the coefficient estimates reported, but they influence their p-values and the values of the classical standard errors. In **table 9**, I present the (1) and (2) LP

model and the (3) and (4) FE model, where the cluster option is not in function. As can be noticed, the results among the relative models of both tables are similar. However, some individual differences detected will be analyzed below.

6.9 Comparison between the LP models with and without robust standard errors

6.9.1 Hypothesis 1

When comparing the specifications of the two LP models which examine the first hypothesis, we see that in both cases the coefficient estimate of lnvega is the same and is negative (-0.00132) and insignificant (p>0.1). However, in table 8 the robust standard errors (0.00213) are bigger than that of the non – robust ones (0.00186). This implies existence of heteroscedasticity. However, since the p-value and the significance of lnvega do not change at all among the two LP models, the interpretation of my results is not affected. In other words, the assumption that there is no association between the provision of risk – taking incentives by a company to its CEO and the probability of the incidence of internal control weaknesses in a firm can be considered as trustworthy.

Regarding the rest of the variables, their coefficient estimates are the same in both tables, but in some cases the statistical significance changes and in all cases the standard errors are different. However, the way the overall results are interpreted does not change at all. For example, in both specifications *lnsalary* is positively related to *dincontrol* (-0.202). However, the value of the classical standard errors is 0.00712 and the p – value is smaller than 1%, while that of the robust standard errors is bigger (0.0102) and the significance level increased to 5%. *Mbratio*, *dforeign* and *drcharges* follow the same pattern regarding their significance level. However, the sign and values of their coefficients is the same in both tables. *Rd* continues to be negatively associated with *dincontrol*, but the significance of its coefficient level goes up from 0.05 to 0.1. As far as *lnbonus, lnat, lnage, leverage, roa, salesgrowth, dbig4* and *dlitigation* is concerned, the statistical significance stays stable.

6.9.2 Hypothesis 2

In both tables, 8 and 9, the two LP models that examine the second hypothesis and in which robust and non – robust standard errors were produced, correspondingly, created similar results. *Lnvega* and *lndelta* in both cases are not significantly related to *dincontrol* (p>0.1) and the only difference in the two tables is the magnitude of standard errors. As we see, again the robust standard errors are bigger (s.e. of *lnvega*: 0.00240 and of *lndelta*: 0.00183), than the classical (s.e. of *lnvega*: 0.00204 and of *lndelta*: 0.00164), but this does not change the interpretation of

the overall outcome. In other words, the statistics of table 9 proof what was predicted in table 8, that when risk – taking and equity incentives are provided simultaneously to the CEO of a company, there is no effect on the likelihood of disclosing any material weaknesses in the internal controls of a firm. For that reason, we can rely on the results of table 8 and hypothesis 2 is safely rejected.

Additionally, there are no changes in the values of the coefficient estimates in the rest of the variables. However, as already explained, the robust standard error terms are bigger than the non – robust and in specific variables, such as in *lnbonus, lnat, lnage, leverage, roa, salesgrowth, dbig4* and *dlitigation* the significance level of their coefficient estimates is higher in the LP model of table 8, than in that of table 9. However, the relationships between the control variables and the dependent one can be explained in a common way, in both tables.

6.10 Comparison between the FE models with and without robust standard errors

6.10.1 Hypothesis 1

When comparing the results of the specifications of the FE models in table 8 and 9 where robust and non – robust standard errors were produced, accordingly and which refer to the first hypothesis, the following inferences are made: *lnvega* is not significantly related with *dincontrol*, in both tables (p>0.1). Since the same result was found in both cases, we conclude safely that hypothesis 1 fails to be accepted. As, expected, the standard errors in table 9 are smaller than that of table 8 for the reasons that have already been analyzed. The same holds also for the rest of the variables. Regarding the sign and the magnitude of the significance level, they do not face any shifts in all variables, but one. *Dforeign* is the only variable whose association with *dincontrol* changes from an insignificant (p>0.1) to a significant one (p<0.1).

6.10.2 Hypothesis 2

The coefficient estimates of table 8 and 9, which are related to the analysis of the second hypothesis and their significance level are the same in all cases, except for one. When the robust option is put in place, the relation between *dforeign* and the dependent variable transforms into an insignificant one (p>0.1), something that was also mentioned in the previous paragraph. As far as the standard errors are concerned they follow the same trend as that described above: the

Table 9

LP and FE models – production of classical standard errors

VARIABLES	(1) LP	(2) LP	(3) FE	(4) FE
lnvega	-0.00132	-0.00117	0.000084	-0.000416
	(0.00186)	(0.00204)	(0.00283)	(0.00307)
lndelta		-0.000275		0.000797
		(0.00164)		(0.00192)
lnsalary	-0.0202***	-0.0202***	-0.0116	-0.0119
	(0.00712)	(0.00713)	(0.0123)	(0.0123)
lnbonus	-0.00262**	-0.00265**	-0.000886	-0.000775
	(0.00104)	(0.00106)	(0.00118)	(0.00121)
lnat	-0.0122***	-0.0121***	0.0563***	0.0559***
	(0.00276)	(0.00278)	(0.0118)	(0.0119)
lnage	0.00230	0.00225	-0.0420	-0.0415
	(0.00444)	(0.00446)	(0.0370)	(0.0370)
leverage	0.0722***	0.0720***	-0.00548	-0.00443
	(0.0184)	(0.0184)	(0.0355)	(0.0356)
roa	-0.111***	-0.111***	0.00167	0.00105
	(0.0324)	(0.0325)	(0.0406)	(0.0406)
mbratio	-0.00329***	-0.00327***	0.00178	0.00169
	(0.00108)	(0.00108)	(0.00180)	(0.00181)
rd	-0.174**	-0.174**	-0.0295	-0.0293
	(0.0742)	(0.0742)	(0.195)	(0.195)
salesgrowth	0.00429	0.00447	0.00305	0.00281
	(0.0139)	(0.0139)	(0.0155)	(0.0156)
dforeign	0.0183***	0.0183***	-0.0211*	-0.0212*
	(0.00586)	(0.00586)	(0.0113)	(0.0113)
drcharges	0.0160***	0.0159***	0.00889	0.00897
	(0.00610)	(0.00611)	(0.00761)	(0.00762)
dbig4	-0.00754	-0.00768	0.150***	0.150***
	(0.0113)	(0.0113)	(0.0259)	(0.0259)
dlitigation	0.0393***	0.0392***	-	-
	(0.0107)	(0.0107)		
Constant	0.334***	0.334***	-0.232*	-0.232*
	(0.0703)	(0.0703)	(0.139)	(0.139)
Observations (N)	7,329	7,329	7329	7329
ICW		401		401
NICW		6928		6928
Year dummies	Included	Included	Included	Included
Industry dummies	Included	Included	-	-
Fixed effects	-	-	Included	Included
R-squared	0.061	0.061	0.0378	0.0378
F	6.16	6.08	11.95	11.36

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

robust standard errors of all variables tend to be bigger than the non – robust ones. Additionally, in specification (4) of table 9, *lnvega* and *lndelta* are not significantly linked with *dincontrol*, something that provides extra support to the result of table 8, where the robust option was used when running the FE model and to rejecting hypothesis 2.

6.11 Multicollinearity test

Besides examining whether heteroscedasticity exists it is important to check also for multicollinearity, which means that a moderate or high degree of correlation exists between two or more predictor variables. When this is the case, the analysis of the regression is affected and can end up to misleading conclusions, because, the standard errors and the variances of the coefficient estimates get inflated *(Multicollinearity and other regression methods. Penn State – Eberly College of Science: https://onlinecourses.science.psu.edu/stat501/node/343)*. In section "Pearson's table" I already checked and commented about the correlation among the variables used in my regressions and as already mentioned, some of them were highly correlated. However, it is important to check whether the VIF (variance inflation factor) is also high, as this would be a signal of the existence of multicollinearity.

The VIF shows how increased the variance is and more specifically, the square value of the standard deviation. If the computed values of VIF exceed 10, this can be considered as a red flag and multicollinearity is an issue. In **table 10**, the values of VIF related to the variables of the first hypothesis are presented. As we can notice, none of the VIF values is greater than 10 and in general they are between 1.07 (*dforeign*) and 2.17(*lnat*). What is more, the mean VIF is 1.43. Since, all values of VIF are lower than 10, I can safely conclude that no multicollinearity was detected in the non-robust LP regression model related to the first hypothesis testing.

  Additionally, I controlled also the VIF values of **table 11**, which refer to the variables associated with the second hypothesis. As can be noticed, also here the VIF values are very far below the value of 10 and they range between 1.07 (*dforeign*) and 2.21(*lnat*). The average VIF is 1.46 (much smaller than 10). From the above, it is obvious that no multicollinearity is in place and that the results of the non - robust LP regression model which refer to the second hypothesis are the same reliable as that associated with the first one. The two tables, 10 and 11 are presented below.

Table 10

Table 11

<div align="center">

Hypothesis 1

VIF test for Multicollinearity

Variable	VIF	1/VIF
lnat	2.17	0.46
leverage	1.81	0.55
lnsalary	1.78	0.56
rd	1.56	0.64
lnvega	1.55	0.64
roa	1.49	0.67
mbratio	1.38	0.72
lnage	1.33	0.75
dlitigation	1.24	0.80
drcharges	1.20	0.83
salesgrowth	1.20	0.83
dbig4	1.09	0.91
lnbonus	1.09	0.92
dforeign	1.07	0.93
Mean VIF	1.43	

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<div align="center">

Hypothesis 2

VIF test for Multicollinearity

Variable	VIF	1/VIF
lnat	2.21	0.45
lnvega	1.90	0.52
leverage	1.82	0.55
lnsalary	1.79	0.56
rd	1.56	0.64
lndelta	1.53	0.65
roa	1.49	0.67
mbratio	1.39	0.72
lnage	1.34	0.74
dlitigation	1.25	0.80
drcharges	1.21	0.83
salesgrowth	1.20	0.83
dbig4	1.10	0.91
lnbonus	1.09	0.92
dforeign	1.07	0.94
Mean VIF	1.46	

</div>

6.12 Summary

The values of most of the descriptive statistics that were presented in this section prove what was predicted by previous literature. Additionally, the correlations depicted in Pearson's matrix amplify these statistical results. However, according to the results of the Linear Probability and the Fixed Effects models, both hypotheses fail to be accepted. In order to further support this view, additional tests were run. Among them, was also the VIF test for Multicollinearity. The outcome of the additional tests proved that the inference that the first and second hypothesis should be rejected is a reliable one. Furthermore, based on the above, I conclude that sub – question 6 was answered. The reason why a different outcome arose from what was predicted will be analysed in the next section, which is also the last of my study.

7. Conclusions

7.1 Discussion

In this study I investigated whether the sensitivity of CEO wealth to changes in firm risk (vega) increases the likelihood of the incidence of material internal control weaknesses in a company. This assumption constitutes also my first hypothesis. One of the arguments in which I based this assumption, is that providing CEOs with risk – taking incentives will most probably urge them to take risky decisions. However, in order that risky plans can be put in place, lax internal controls should be used, so that no barrier will limit the managerial discretion. The same holds also for the lower level employees. In order that they get motivated to execute certain tasks which contain risk, the executives need to relax their monitoring, so that the subordinates can have the proper discretion to take action. However, when the internal controls of a company are loose, it is more possible that material weaknesses will emerge.

What is more, risky projects themselves, like e.g. the expansion of a company's business in a new and unknown industry sector, contain risks which may lead to the occurrence of weaknesses in the internal control environment of a firm. In other words, during the execution of risky plans it often happens that new and unforeseen issues arise, which managers need to face and which may trigger internal control problems, due to lack of previous experience or proper knowledge on how to deal with these challenges. This means, that either management does not realize on time that some internal control problems have arisen, so that it can address them before submitting the annual report about the effectiveness of internal controls, or there is a delay regarding their remediation and the material deficiencies need to be reported by the managers or the auditors of the firm.

Additionally, first, I applied the cluster option in Stata in the two different regression types, the Linear Probability model and the Fixed Effects model, in order to get robust standard errors. According to the statistics of both models, the coefficient estimates were statistically insignificant (p>0.1) and for that reason I failed to accept the first hypothesis of my study. Next, I chose the non – robust option in Stata and run the above two models again. The results I found were similar. So, I concluded that there is no association between the sensitivity of CEO wealth to stock volatility (vega) and the likelihood of reporting internal control weaknesses in the periodic financial statements of a firm.

Despite the fact that the estimations of the above tests were different than my prediction about the first hypothesis, they can be considered as trustworthy, due to further tests that I conducted,

controlling for heteroscedasticity and multicollinearity. A reason why what was assumed differs from what was found is most probably associated with the way my sample was formulated and the database I chose to retrieve my data. I investigated the period 2004 – 2010 and for that reason my dataset comprises basically of bigger companies, the so called "accelerated filers" (market capitalization in excess of $75 million), rather than of "non – accelerated filers" (market capitalization lower than $75 million). Because, auditors and management of firms with greater size were obliged to disclose information about their internal control status on and after November 15, 2004, while the auditors of smaller companies had to do the same on and after June 15, 2010. I point out basically auditors' liabilities pursuant to SOX Section 404, because, their opinion about the internal control quality of an organization is considered as more objective (due to the reasons I mention in the "Sample" section) in comparison to that of managers'.

As we know, smaller companies are usually the ones which report adverse internal control opinions *(Ashbaugh – Skaife et al., 2007; Doyle et al., 2007; Jha et al., 2013, Ashbaugh - Skaife et al., 2013)*. So, since they are almost excluded from my dataset, the ICW group that arose was limited, because it comprised only of 401 firm – year observations. This fact most likely affected the statistical outcome and the power of my tests, as my dataset was prone to sample selection bias. I think, that in case I could expand the period I tested, then probably I could get different results. Because, firms with smaller size could also be included in my sample, so it would turn into a more representative one and the results I would get would possibly be more objective. Additionally, the statistical power of the regression models would probably also go up, something that would increase the efficacy of my study.

However, as I already mentioned, the reason why I chose to test the years 2004 – 2010 is that I borrowed the estimated values of delta and vega from *Coles et al (2013)* and they were available till the year 2010. But again, even in case I chose to extend the time span of my research, I should not have chosen Execucomp database. Because, it contains basically firms of big size, so it is considered as a narrow one in comparison to other databases, such as Equilar Inc. that contains also smaller companies and which is characterized as a broader one (*Armstrong et al., 2010*).

Furthermore, it may be that the choice of the control variables has also affected the outcome of my research. For example, following *Balsam et al (2014)*, in order to proxy for firm size, I used the *total assets* of a company in its fiscal year – end. However, *Jha et al (2013)* measured total

assets in the beginning of the year, while other studies used a different variable, such as the market value of equity (*Doyle et al., 2007; Ashbaugh – Skaife et al., 2007 and Balsam et al., 2014*). Additionally, in order to depict organizational complexity, I used the *rd* variable (research and development expenses divided by total assets) and two dummies, the *dforeign* (equal to one if a company had a non - zero foreign currency translation within year t-1, and zero otherwise) and *drcharges* (equal to 1 if the firm reported restructuring charges within year t-1, and 0 otherwise). Instead of, or together with the aforementioned variables, I could examine the number of business and geographic segments of a company, like *Jha et al (2013)* did, which show also the diversity of a firm's operations.

Though in my regressions I incorporated factors which measure the profitability of a company, like return on assets, market value to book value of equity and leverage, I could also take into consideration variables which represent also the bankruptcy risk. For example, the decile rank of the percentage probability of bankruptcy from the default hazard model prediction based used by *Doyle et al (2007),* could also be included in my regression models. Furthermore, I did not check whether any corporate governance variables, like the independence of the board of directors *(Jha et al., 2013*), are associated with my dependent variable. Last but not least, though 56 industry dummies were created when I was testing my LP models, another option would be to follow *Jha et al (2013)* and distribute the firms of my dataset according to the Fama / French 5 industry benchmark portfolios.

In my research I also tested the joint effect of equity and risk – taking incentives on the likelihood of the occurrence of material weaknesses in the internal control environment of a company, something that constitutes my second hypothesis. In other words, I tried to find out which of the above two types of incentives predominates, when provided simultaneously to CEO. At this point it is important to underline that the relation between the sensitivity of executives' wealth to changes in stock price (portfolio delta) and the probability of the existence of material internal control problems in a firm has already been examined by *Jha et al (2013)* and *Balsam et al (2014).*

The above researchers documented that there is a negative relation between the combined delta of CEO and CFO and the propensity that an adverse internal control opinion will be reported in the financial statements of a firm. However, *Balsam et al (2014)* pointed out that, when the overall delta of the CEO and CFO is split up, then no relation is detected between CEO's delta and the incidence of material internal control weaknesses in a company, while the sensitivity

of CFO's wealth to shifts in stock price was found to be negatively related to it. Consistent to the last prediction of *Balsam et al (2014)*, the same was reported also in my study. Furthermore, for one more time, no link was detected between portfolio vega and the disclosure of an ineffective internal control quality and this can most likely be justified by the facts that I analyzed previously.

However, though my findings about CEO delta are the same as that of *Balsam et al (2014)*, it is essential to underline, that these researchers tested a different period than mine and they chose a different database. More specifically, they included the years 2004 – 2005 in their sample and they retrieved their data from Equilar Inc. However, as already mentioned above, the drawback of Execucomp database, which I used, is that it is considered as a narrow one and the analyses based on it suffer probably from sample selection bias *(Armstrong et al., 2010)*. For that reason, it is difficult that the statistical results be generalized to the broader population. Additionally, for the above reason, I believe, that in case I would base my research in Equilar Inc. and broaden the period I would test, I may have got a different statistical outcome than the one I got.

7.2 Contributions of the study

Despite the fact that my results cannot probably been generalized to other settings, my study contributed to the extant literature in the way that it is the first to examine whether besides equity incentives, another type of incentives, provided to the CEOs of a firm, such as the risk – taking ones, have any effect on the likelihood of the occurrence of a material internal control weakness in a firm. Additionally, it is the first research which takes into consideration simultaneously the incentive effects of portfolio delta and vega and tests which of the two types of incentives predominates over their relation with the likelihood of the disclosure of an adverse internal control opinion.

Furthermore, to my mind, the results of my study are useful for the owners of a firm, as it helps them understand whether providing management with incentives, which lead them to take risks, is one of the factors which influences the internal control quality of firm. Since no significant relation was found between my explanatory and outcome variable, this statistical conclusion clarifies that the owners of an organization should not worry whether risk – taking incentives will lead to internal control weaknesses. This result is important for auditors also, because they do not need to be more cautious about whether material internal control problems will arise in a company when management take risks, e.g. by involving in risky projects.

Finally, this result is important for the regulators, who try to identify and take measures against factors which affect a firm's internal control status.

7.3 Limitations

My study has several limitations. First, as I mentioned in the "Sample" sub - section, I focused on auditor's internal control opinion, rather than management's, due to the fact that I considered it as a more objective. Because, auditors, in comparison to executives do not have any discretion on manipulating the numbers in the financial reports and would probably attest in an unbiased way the internal control status of a company. However, executives' opinion about the effectiveness of the internal controls of a firm is considered as a more representative one towards public *(Ton., 2009)*.

Second, the fact that I chose to use Execucomp database may have affected the statistical estimations of my research. Because as I have already stated this database is characterized as a "narrow" one, as it includes predominately bigger companies, rather than smaller ones. Since it has been proven by previous literature that the size of a company is related to the propensity of the disclosure of internal control problems (*Ashbaugh – Skaife et al., 2007*; *Doyle et al., 2007; Ashbaugh - Skaife et al., 2013 and Jha et al., 2013*), I think that it is important to include firms of different size and especially smaller ones, as it is more likely that they will report internal control weaknesses.

Third, even the period that I chose (2004 -2010) may be a limitation of my research, due to the fact that in SOX Section 404 it is defined that the auditors and managers of accelerated filers had to submit their report about the effectiveness of the internal control quality of their firm, on and after 15 November, 2004, while the auditors of non-accelerated filers were obliged to do so on and after June 15, 2010. This choice probably lead to the creation of a non – representative sample, as again, smaller companies, with less then $75 million market capitalization were almost completely excluded by my sample. To my mind, a complete and representative dataset would comprise of companies which belong to both categories. For that reason I believe that the inclusion only of accelerated filers, limits the generalizability of my outcome.

Fourth, the predictive power of my tests is quite low and this is probably because of the small sample size of the ICW firms. As already mentioned, since organizations of smaller size are not included in my dataset, it is highly possible that many internal control weakness events have been left out. Fifth, though other executives, such as the CFOs, are also supposed to take

risks, whenever needed, I did not take their risk - taking incentives into consideration. I think this is an important omission, as, according to Section 404 of SOX, these officers are also obliged to assess the effectiveness of the internal controls of a firm. Finally, it may be the case that some unobserved factors exist which influence the relation between portfolio vega and internal control quality.

7.4 Suggestions for further research

In this section I will make some suggestions for further research. In my study I tested the relation between CEO's portfolio vega and the occurrence of material weaknesses in the internal control systems of a firm. However, the effect of CFO's risk – taking incentives could also be examined, as this officer, together with the CEO, are primarily responsible for reporting on the internal control quality of a firm according to Section 404 of SOX and it could be compared with the effect of CEO's. What is more, instead of taking into consideration auditor's internal control opinion, management's opinion could also be taken into consideration and the results referring to the CFO can be compared with that of the CEO.

Furthermore, I could use the Equilar Inc. database instead of Compustat, since as I declared it is broader and contains besides bigger, smaller companies as well. Additionally, the period tested could be extended for example till the year 2015, so that reports of non – accelerated filers could also be included, because the auditors of such firms as already argued start reporting on the internal control quality of such firms on and after June 15, 2010. Additionally, it is important to take non – accelerated filers into consideration, because some studies have found that companies with smaller size tend to disclose internal control problems in their financial reports.

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