UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

Executive Compensation and Firm Risk-taking

A study of the compensation practices in the UK financial industry

Johan Mellberg

Graduate School
Master of Science in Finance
Master Degree Project No. 2012:100
Supervisor: Oege Dijk

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1. Introduction

1.1 Background

The effects of pay for performance and the relationship between executive compensation and managerial risk-taking has retained a central positions in the economic debate following the financial crisis of 2008. In the UK, there is an ongoing political debate targeting the structure and size of the general remuneration package as well as the adopted disclosure practices. What is noteworthy is that executive compensation grew by approximately 300 percent between 1998 and 2010 in the UK, whereas the real wage for the median worker stagnated during the same period (The Economist 2012). There is a growing concern among regulators that the incentives used to align the interests of executives and shareholders induce risk-taking and fail to create long-term value. The performance conditions applied to variable compensation plans are generally not tied to any risk measures. Instead, various return measures are used, which means that awards are given without any concerns about the risks underlying those returns.

From a theoretical point of view, the compensation structure have implications for both the managerial risk-taking as well as the agency relation between executives and shareholders. When the use of equity-based compensation increases, the interests of executives and shareholders converges, thereby decreasing the agency cost in the classical principal-agent model. However, due to their option-like claim on the assets of the firm, shareholders of leveraged institutions have an incentive to increase the risk.

In addition, the moral hazard problem arising from a governmental deposit insurance in the banking industry and/or from being classified as "too big to fail" may give shareholders further incentives to increase risk-taking. With this background, the question of whether or not compensation practices in the UK are structured to promote risk-taking is indeed justified. It is further recognized that the question of whether or not executive compensation will in fact affect managerial risk-taking depends on the effectiveness and the structure of the incentives as well as the regulatory framework subject to which firms enjoy discretionary power to construct their remuneration packages. It is therefore interesting to investigate this relationship from both a shareholder's and a regulator's perspective.

1.2 Problem Discussion

The financial crisis of 2008 highlighted the problem of excessive risk-taking in the financial industry and the ongoing debate in the UK shows that policymakers take this problem seriously. As was discussed in the background, the use of equity-based

compensation reduces the agency costs but can also provide incentives for excessive risk-taking. To what extent these incentives will cause excessive risk-taking will in turn depend on both the type of incentives used and the size of the award, both in real terms and in relation to the overall compensation. It is therefore justified to pose the following question:

> *Is executive compensation in the UK financial industry structured to promote firm risk-taking?*

1.3 Purpose

The main purpose of this study is to investigate whether or not the recent critique of the use of equity-based compensation is justified by investigating the relationship between executive compensation and firm risk-taking empirically. I also wish to highlight any structural changes in the composition of executive compensation over time and to discuss how such changes may affect the empirical results.

1.4 Limitations

This study is limited in several ways. One obvious limitation lies in the comparatively small sample size. The sample consists of a panel of 25 firms with 7 observations for each firm, resulting in 175 observations in total. In comparison, Chen, Steiner and Whyte (2005) use a sample of 68 US banks and their study stretches over 9 years, resulting in 591 observations. In contrast to Chen, Steiner and Whyte (2005), I did not have access to documented data on executive compensation, which means that I had to collect everything by hand using annual reports.[1] The process of collecting the compensation data was therefore very time consuming, which limited the number of firms that could be researched. A small sample size can affect the empirical results in many ways and can lead to inconsistent and biased estimators. The results in this paper should therefore be read with some caution and the reader is advised to view them as indicative rather than definitive. In addition, the sample only contains firms that were publicly traded on the London Stock Exchange during the whole investigation period. This may also cause a small sample bias.

Another limitation relates to the problem of measuring and valuing the different components of the remuneration package. As will be further discussed in section 2.2, earlier studies on executive compensation differ considerably both in terms of the

[1] At the time when this study was conducted, documented compensation data was only available for US firms. Much of the to-date research on the relation between executive compensation and firm performance has been conducted using US samples, which most likely shortened the collecting process considerably in those studies.

different compensation components included in the analysis as well as the valuation of these components. In chapter 3, I describe the methodological approach used in this study and discuss some of the advantages and drawbacks associated with this approach.

A third limitation is the potential endogeneity issue embodied in equation 5. Specifically, in terms of economic theory, there is a possibility that executive compensation and firm risk-taking are endogenous. Statistically, this poses a potential limitation since it is difficult to find a good instrument for executive compensation.

2. Framework of Reference

2.1 The Relationship between Compensation and Risk

This section presents the underlying theoretical framework relevant for investigating the relationship between executive compensation and firm risk-taking. I begin by outlining the well-known agency theory and then move to explain how this basic framework relates to managerial risk-taking.

2.1.1 Agency Theory

Much of the research on the relationship between executive compensation and firm performance build on modern agency theory and on the concept of separation of ownership and control. The theory was famously formulated by Jensen and Meckling (1976) and incorporates the important notion that, absent of incentives, insiders of the firm are unable credibly commit to returning funds to investors. Tirole (2006) summarizes this basic idea of corporate governance as follows; corporate governance relates to the ways in which the suppliers of funds to firms assure themselves of getting return on their investment.

In its most basic form agency theory considers a bilateral agreement between the principal and the agent and the associated conflict of interest that emerges from imperfect information. In the setting of the model, the agent is hired to perform a certain task on behalf of the principal. The final result depends on the effort that the agent dedicates to the task as well as a stochastic variable, which is unobservable to all parties. Further, the model assumes that the principal can observe the final outcome but not the actual effort put in by the agent. This is important since it rules out effort as being part of the contractual arrangement, in the sense that the principal cannot directly make the agent's compensation dependent on effort. A justifying argument is to view monitoring as too costly for the principal. Accordingly, the agent is always able to decide whether or not to accept the contractual terms before a decision is made on the amount of effort to put in. Effort is further assumed to be costly for the agent, thereby assuring that the agent is not interested in extracting more effort than necessary to maximize her utility function. Since the agent is contracted by the principal, meaning that she receives compensation that is agreed upon before the final result is known, it is not necessarily in her interest to "care directly" about the outcome of the project. The principal's profit function on the other hand is directly tied to the final result and differs from it only by the amount given to the agent in the form of compensation. This conflict of interest is the cause of moral hazard. The principal must incentivize the agent in order to govern her actions. One way to do so is by making compensation dependent on the final result, that is, to offer a variable

compensation plan. In practice, variable compensation is equivalent to cash bonuses and/or awards of equity-based compensation. This is indeed the most common instrument used to address the moral hazard problem (Macho-Stadler and Péres-Castrillo, pp. 3-14).

2.1.2 The Risk-taking Hypothesis and the Contradicting Hypothesis

The previous section explained the moral hazard problem and the need for using variable compensation. In this section, I discuss the effects of variable compensation on risk-taking. Following the works of Chen, Steiner and Whyte (2005) and Houston and James (1995), I investigate two hypotheses regarding the relationship between executive compensation and firm risk-taking, namely the risk-taking hypothesis and the contradicting hypothesis. The risk-taking hypothesis predicts that the use of equity-based compensation is positively related to risk-taking whereas the contradicting hypothesis predicts that it is negatively related.

It is a well-known fact that equity-based compensation may lead to excessive risk-taking in leveraged firms. Bolton, Mehran and Shapiro (2011) emphasize that the structuring of executive compensation as to maximize shareholder value tends to encourage excessive risk-taking in leveraged firms. The reason is that shareholders have only residual claims on the value of the firm. The value of shareholdings is therefore in nature similar to that of a call option on the assets of the firm, that is, it is increasing in the volatility of the share price. By aligning the interests of shareholders and executives, managerial decision-making is expected to reflect shareholders' incentive for increased risk-taking.

It could also be argued that financial firms operate under distinctive market conditions, which makes the risk-taking hypothesis more likely to prevail. First, financial firms are generally more leveraged compared to firms in other industries, which should make the incentive effects stronger in this industry. Bolton, Mehran and Shapiro (2011) report that the average non-financial firm has about 40 percent debt and that the same figure for financial firms is at least 90 percent and above 95 percent for investment banks. Secondly, banks in the UK are covered by a governmental deposit insurance, which may incentivize executives even further to increase the riskiness of the business. On the one hand, equity-based compensation effectively ensures that executives act in the interest of their shareholders, but on the other hand, a governmental deposit insurance will remove some of the downside risk for shareholders (by reducing the penalty for poor performance) and in response encourage managers whose total compensation is highly dependent on value of the share, to engage in risky activities.

The same argument could be made in those cases where financial firms are considered "too big to fail". Being "too big to fail" works as an default insurance, which should

incentivize shareholders to increase risk-taking. In summary, the high level of firm leverage in the financial industry along with strong incentive plans and the presence of a governmental deposit insurance and/or the indirect insurance of being classified as "too big to fail", could provide executives with strong incentives for risk-taking.

If the risk-taking hypothesis holds, it constitutes a potential problem since the performance of financial institutions do not only affect creditors, but also depositors, taxpayers and in light of today's globalization and the increasing connectedness of financial markets, also the entire financial system and the general economy as a whole (Bolton, Mehran and Shapiro, 2011).

The contradicting hypothesis on the other hand predicts that the use of equity-based compensation will have a decreasing effect on firm risk-taking. The contradicting hypothesis relates to the fact that risk-averse executives become less diversified as the level of variable compensation increases. Note that share options are normally issued at-the-money or slightly in-the-money, which exposes executives to some initial downside risk (Chen, Steiner and Whyte, 2005). The idea is that high levels of variable compensation will restrain executives in their abilities to diversify their personal portfolios, which may lead them to pursue low-risk rather than high-risk strategies (Smith and Stulz, 1985). The ability to diversify risks that are specific to the claims on the firm is always restricted for executives. In general, executives are prohibited from both selling and hedging the risks of awards granted.

The main purpose of this study is to investigate which of these two hypotheses is dominating in the UK financial industry. If the empirical results support the risk-taking hypothesis, then the following argument could be made:

> *Variable compensation is positively related to risk-taking. The general structure of executive compensation in the UK financial industry is structured to promote risk-taking.*

On the other hand, if the empirical results support the contradicting hypothesis, then the following argument could be made:

> *Variable compensation is negatively related to risk-taking. The general structure of executive compensation in the UK financial industry is not structured to promote risk-taking.*

2.2 The Structure of Executive Compensation

This section describes the various components of the remuneration package and discusses some of the difficulties associated with measuring compensation. Surprisingly, there is little agreement among researchers on how to go about this problem. In addition, researchers differ widely in their definitions of the compensation variable, that is, with respect to the components included in the variable.

In general, executives receive compensation in three different forms; fixed compensation, short-term incentives and long-term incentives. For the purpose of conducting an empirical analysis, it is often more convenient to divide these components into cash compensation, equity-based compensation and total compensation. Irrespective of how you categorize compensation, the relative importance of the various components will play a direct role in determining the incentives for firm risk-taking. These are discussed below.

2.2.1 Fixed Compensation

In general, executives receive fixed compensation in the form of monthly salaries with no risk of non-payment. Fixed compensation plays an important role in incentivizing executives. Murphy (1998) emphasizes that, risk-averse executives will prefer an increase in fixed compensation to an equivalent increase in equity-based target awards. I will argue that it is reasonable to assume that executives are risk-averse to some extent, at least before variable compensation is added. To begin with, executives are undiversified compared to shareholders, which reflects that executives invest most of their physical and human capital in the firms that they are managing. Adding to this, executives also run the risk of suffering substantial reputational losses in case of staggering firm performance. Note however that managerial risk-taking is by no means undesirable by nature. For instance, executives may favor undesirably low levels of risk with the ulterior motive to protect their own interests rather than to maximize the value of the firm. In conclusion, an increase in the use of fixed compensation works to divert the interests of executives and shareholders, which is expected to translate into a decrease in firm risk-taking. However, the fact that executives become more diversified when fixed compensation increases also provides an argument for an positive effect on risk-taking.

2.2.2 Short-term Incentives

Executives also receive short-term incentives in response to exceptional performance during the year. Normally, the size of the award has an upper limit, which is pre-determined by the remuneration committee at the start of the year. In order to be eligible for an award, executives must meet several performance conditions. There are no clear standards regarding these performance conditions, but firms tend to use a mixture of

return-based measures, such as total shareholders' return or earnings per share, in conjunction with subjective performance evaluations. Awards are normally granted as cash awards or in the form of shares or deferred shares. Contingent deferral periods are normally limited to either one or three years, during which executives cannot access their shares. Finally, there are no further performance conditions attached to the release of short-term incentives, which means that awards are released with certainty at some future date and that this is known by all parties when the award is granted.

Short-term incentives aim to motivate executives to maximize the value of the firm in the short run. As such, they reward exceptional performance but do not explicitly punish inferior performance, which means that executives are more exposed to the upside benefits than they are to the downside costs. In consequence, if executives are eligible to receive large awards of short-term incentives, they may be encouraged to take on excessive risks since such behavior is more likely to result in extreme values.

2.2.3 Long-term Incentives

Firms use long-term incentives to align the interests of executives and shareholders by ensuring that executives build and retain an appropriate equity stake in the firm. These incentive plans are normally structured as either share option plans or restricted share plans. Awards are normally deferred over a five year period, under which the value of the awards will move in line with the performance of the firm. Awards granted are therefore at risk of decreasing in value over the deferral period, which works to incentivize executives to work for the long-term performance of the firm. In addition, almost all long-term incentives in the UK are subject to further performance conditions, which must be fulfilled in order for the awards to vest. This is a distinctive practice in the UK, which gives further reason to investigate the incentive effects of compensation practices in the UK.

It is important to understand that awards of performance shares and share options do not bring about exactly the same incentives. Most importantly, the use of performance shares and share options are expected to result in different preferences regarding share price volatility. Share options are structured to give full exposure to the upside benefits while limiting the downside costs, whereas regular shares result in a full exposure to both the upside benefits as well as the downside costs.[2] As such, share options are expected to

[2] Note that the value of a share option cannot fall below zero, which is usually the value of the award on the date of grant. As such, the holder of an option is shielded from the downside movements in the underlying price since the option need not to be exercised. Shareholdings on the other hand do not extend the same protection, which means that the holder may suffer losses if the share price falls below the prevailing price at the date of grant.

translate into lower risk aversion than regular shares. DeFusco, Johnson and Zorn (1990) find evidence that share price volatility increases following the approval of new share option plans, which suggests that the use of share options creates an incentive effect. Another distinction between regular shares and share options is that the latter causes a shuttling incentive effect, which is dependent on the movement of the share price in relation to the exercise price of the option. For example, if the share price is sufficiently low compared to the exercise price of the option, then the incentive is essentially lost, which is why it is generally considered justifiable to reevaluate the exercise price if the recent movement of the share price have put the options deep out of the money.

Measuring long-term incentives is a contentious subject and earlier studies offer no clear guidance on how to go about it. Core, Holthausen and Larcker (1999) emphasize that the valuation of shares and share options have varied widely and that the choice of valuation method is likely to influence the interpretation of the result. As for share options, the literature uses a number of valuation methods. Jensen and Murphy (1990) use a version of the well-known Black-Scholes valuation formula, McKnight and Tomkins (1999) use a minimum share option valuation formula and Cordeiro and Veliyath (2003) use a binominal valuation formula. Henderson and Fredrickson (1996) refer to the work of Lambert, Larcker and Verrecchia (1991) and Lambert, Larcker and Weigelt (1993), in which the authors argue that share options can be effectively valued at 25 percent of their exercise price when awards are valued from an executive's perspective. This approach is appropriate when researching incentive effects of executive compensation since the observed actions are in fact the result of the executive's' own valuation of the award. It could further be argued that conventional market-based valuation models, which rely on the ability to diversify risk and which are only pricing non-diversifiable risk, are inappropriate in the case of executive compensation. In general, executives are prevented from diversifying risk exposures, including the prohibition of hedging share positions or selling equity stakes in the firm. Valuing at 25 percent will tend to understate the value assigned by conventional pricing models, which reflects this inability to diversify. In contrast, one could also make the argument that this simplistic valuation method fails to take important determinants of the value of the option into consideration, such as the fluctuation of the share price.

The treatment of performance shares has also varied. Eichholtz, Kok and Otten (2008) and Core, Holthausen and Larcker (1999) use the face value at the date of grant to value performance shares whereas Conyon, Peck and Sadler (2001) discount the face value by 20 percent to account for the performance conditions. Jiraporn, Young and Davidson (2005) only include the amount of shares that has been released by the remuneration

committee, thereby eluding the valuation problem associated with the use of performance conditions.

2.2.4 Other Components of the Remuneration Package

Executives are also eligible to other forms of compensation during the year. In general, executives are entitled to benefits in kind, which includes private chauffeurs, gym memberships, housing etc. Usually, benefits in kind will only constitute a small part of the total remuneration package. In addition, executives are eligible to participate in different share save plans, which require the participants to make a personal investment in the firm shares. Further, top executives are normally required to hold a certain amount firm shares as part of their contracts. Such share-holdings aim to further incentivize executives without increasing the costs for the shareholders.

2.3 Compensation Practices in the UK

As was discussed in section 1.2, compensation practices in the UK differ from those in the US, which means that executives in the UK do not necessarily have the same incentives as do their US counterparts. It is also recognized that much of the literature focuses on US firms, which means that much of the research on the relation between executive compensation and firm performance may not be representative for UK firms.

One example of how compensation practices differ in the UK is the use of performance conditions attached to the release of pre-granted share options and deferred shares. In the UK, the use of such performance conditions was called for by the *Greenbury Committee* in 1995 as a way to regulate how executives in the UK are compensated. Performance conditions has the effect of making the release of equity-based awards uncertain on the date of grant. In the US on the other hand, such awards are normally only accompanied by a mandatory deferral period with no risk of non-payment except in the case of personal resignation. In consequence, equity-based incentives may value less by executives in the UK than in the US. Conyon, Core and Guay (2009) emphasize that the problem with excessive compensation and managerial rent extraction in the UK are generally considered to be less problematic than in the US. However, the use of performance conditions may create a strong incentive for risk-taking, since awards become harder to earn.

Another example of how compensation practices differ in the UK is that the use of share options has become associated with bad compensation practices ever since the *Greenbury Committee* urged firms to replace share option plans with conditional incentive plans and performance shares back in 1995. The use of share options is therefore expected to be smaller than the use of performance shares.

2.4 Earlier Studies on Executive Compensation and Firm Risk-taking

This section presents a selection of the relevant literature. The relationship between executive compensation and firm risk-taking have been studied in a number of papers. Examples of relevant studies are Mullins (1992), Saunders, Strock and Travlos (1990), Bolton, Mehran and Shapiro (2011), Andersson and Fraser (1999), Houston and James (1995) and Chen, Steiner and Whyte (2005). The methodological approach in these papers is to make cross-sectional comparisons of risk, usually measured as the variance in the firm's common share, and different components of the remuneration package. For example, Saunders, Strock and Travlos (1990) find a positive and significant relationship between firm risk-taking and executive shareholdings. John, Saunders and Senbet (1995) report that the compensation structure affect the investment choices made by financial firms and that such effects are magnified when the moral hazard problem is present and when firms enjoy greater discrepancy when settling on the compensation structure of the firm. As pointed out by Chen, Steiner and Whyte (2005), this gives both regulator and shareholders an incentive to monitor the compensation structure in the financial industry.

Chen, Steiner and Whyte (2005) investigate the relation between option-based compensation and firm risk-taking for 68 US banks between 1992 and 2000. They find that US banks have increasingly employed option-based compensation over the investigation period and that this have induced risk-taking. They also report that both the compensation structure as well as option-based wealth induces risk-taking in the US banking industry. The authors recognize that the positive relationship between executive compensation and firm risk-taking can partly be explained by the expansion in investment opportunity set following the deregulation of financial markets.

Houston and James (1995) investigate the moral hazard hypothesis, predicting that executive compensation plans are structured to promote risk-taking. Their sample consists of 134 commercial banks in the US during the period from 1980 to 1990. By comparing samples from the banking industry and the industrial sector, they find that, on average, bank executives receive less cash compensation, are less likely to participate in share option plans, hold fewer share options and receive a smaller percentage of their total compensation in the form of share options and shares than do executives in the industrial sector. They also report a positive and significant relationship between the relative importance of equity-based incentives and the value of the bank's charter, which contradicts the hypothesis that compensation schemes are structured to promotes risk-taking. They conclude that the compensation structure in the banking industry does not promote firm risk-taking.

Another interesting study on the relationship between executive compensation and firm risk-taking is that of Bolton, Mehran och Shapiro (2011). They build a model that incorporates shareholders, debtholders, depositors and executives and show that the issue of excessive risk-taking can be effectively addressed by tying compensation to both the share price and the price of debt, which is approximated with the CDS spread. They also stress that the adoption of such compensation practices may fail due to commitment problems among shareholders or simply due to unwillingness to reduce risk when a governmental deposit insurance is present.

The fact that the literature often reports conflicting results has been discussed to some extent by researchers. Houston and James (1995) emphasizes that conflicting results can potentially arise from differences in the methodology used and the way in which compensation is measured. In particular, the existing literature focuses mainly on the relation between selected components of the remuneration package and firm risk-taking.[3] In fact, many studies only include cash compensation in the compensation variable. Examples of such studies are Grima, Thompson and Wright (2007), Gregg, Jewell and Tonks (2005) and Benito and Conyon (1999). There are two common reasons for not including equity-based compensation. One is the difficulties associated with collecting the data and the other is the complexity of attributing a value to awards of share options and/or firm shares. As pointed out by Kole (1993), failure to include all components of the equity-based compensation plan may lead to misleading inferences concerning the overall relation between executive compensation and firm risk-taking.

[3] For example, Chen, Steiner and Whyte (2005) investigate the relationship between the use of share options and firm risk-taking whereas Saunders, Strock and Travlos (1990) investigate the relationship between share-holdings and firm risk-taking.

3. Methodology

3.1 Preliminary Study

When I decided to write about the relationship between compensation and risk-taking, my first approach was to review as much as possible of the literature. The preliminary study was particularly valuable for two reasons. First, it gave me valuable guidance on how to conduct the analysis and helped me to decide which model to use. Secondly, it pointed out some of the difficulties associated with measuring compensation, which proved valuable when collecting the compensation data.

3.2 Investigation Time Period

The investigated time period stretches from 2004 to 2010. There are several reasons why I settled on this particular period. First, it is interesting to include the years before 2008 since they constitute the run-up of the financial crisis, a period which is strongly associated with excessive risk-taking. Secondly, in light of the more recent lending crisis in the eurozone and the renewed criticism pointed at the financial industry with talks about reckless lending and unregulated investment practices, I find it interesting to stretch the investigation period as close to present day as possible.

There are also a number of practical issues underlying the choice of investigation period. First, it was necessary to exclude 2011 since most of the firms included in the study had not yet released their annual reports for 2011 by the time when the compensation data was collected. Secondly, it was practical to settle on 2004 as the starting year since the *Combined Code* of 2003, which inured that year, represented a change in the legislation regarding the disclosure practices of executive compensation. *The Director's Remuneration Report Regulations (2002)*, *The Higgs Report (2003)* and *The Combined Code (2003)* are all important steps when it comes to improving the transparency of compensation practices in the UK. Another reason why I chose not to go back further in time was that I wanted to include as many firms as possible in my sample, which in turn required that the firms had been listed on the London Stock Exchange during the whole investigation period.

3.3 Investigation Sample

The sample consists of 25 firms drawn from a pool of commercial banks and financial institutions in the UK. Just like Gregg, Machin and Szymanski (1993), I take a sample of the largest financial firms in the UK (based on the top 500 quoted firms in 2011). The panel stretches from 2004 to 2010, which resulted in 175 observations in total. Due to various reasons, some firms were deliberately excluded from the analysis. For example,

all firms that had not been listed on the London Stock Exchange during the whole investigation period were excluded. This was necessary since the choice of model relies on market-based risk measures, which are calculated using share price data. Also, due to the time limit of this study, it was impossible to produce an exhaustive sample of the UK financial industry.

Some firms were excluded on the basis of their line of business. For example, real estate firms were not included in the sample despite the fact that they are normally categorized as financial firms. The reason is that real estate firms do not have as much financial assets as other firms in the industry. Firms that have mainly financial assets are expected to be able to change their risk exposures more quickly than other firms. Insurance firms were also excluded from the analysis because they operate under special regulation, which limits their investment opportunity set considerably.

3.4 Data Treatment

The data was collected from several sources. The compensation data as well as most of the data used to calculate the control variables was collected directly from the annual reports. The particular treatment of the compensation data will be thoroughly discussed in section 3.5. The share price data, which I used to calculate the three risk measures as well as the Black-Scholes option prices, was collected from *yahoo finance*. I used the daily adjusted closing price provided under historical prices. The closing price is adjusted using appropriate split and dividend multipliers. Split multipliers are determined by the split ratio. For example, in a 2 for 1 split, the pre-split price is multiplied by 0.5. Dividend multipliers are calculated based on dividend as a percentage of price, primarily to avoid negative historical pricing. For example, given a £0.05 dividend distribution on date X and a closing price of £5 on date X-1, the pre-dividend price is multiplied by (1-0.05/5). From 2008 and onwards, *yahoo finance* only reports the closing price for those trading days in which the share was actually traded, which created gaps in the data. I approached this issue by inserting the adjusted closing price of the latest trading day in which the share had been traded.

3.5 Variables Specification

In this section I discuss the methodology used for calculating the regression variables. The rest of this section is organized as follows: subsections 3.5.1-3.5.5 cover the independent compensation variables as well as the control variables and subsection 3.5.6 covers the dependent risk variables.

3.5.1 Compensation Variables

This study uses two compensation variables, which I refer to as *Proportion* and *Acc_Incentive*. *Proportion* equals the ratio of total equity-based compensation and total compensation for each firm during the year and serves as a proxy for the compensation structure of the firm. *Acc_Incentive* equals the total value of all variable compensation granted during the year and is a measure of variable income. Much of the earlier literature investigates the separate effects of option-based incentives or deferred performance shares on firm performance. However, as was pointed out in section 2.4, one possible explanation for the mixed results in previous studies is the failure to include all types of long-term incentives. This study tries to fill that gap by including both share options, deferred shares and performance shares. Also, the fact that performance shares and deferred shares have been replacing the use of share option over the last couple of years makes it suitable to investigate the combined effect of these components on firm-risk-taking.

In order to calculate *Proportion*, it was necessary to first calculate the value of all granted equity-based awards during the year as well as the value of total compensation. As was discussed in section 2.2, total compensation normally consists of fixed compensation, short-term incentives, which are generally granted as either cash bonuses or deferred shares bonuses, and long-term incentives, which can be either share options or performance shares or both.

In this study, fixed compensation includes executives' basic salary as well as benefits in kind granted during the year. I chose to categorize benefits in kind as part of fixed compensation despite the fact that its final value is not agreed upon at the start of the year. The reason is that it is not granted in response to any performance conditions as is the case with both short-term and long-term incentives. In any case, benefits in kind will usually constitute a very small proportion of total compensation and will therefore not have a great effect on the results.

Short-term incentives incorporate all forms of performance-related compensation, for which the final value is not conditioned upon further performance conditions. For firms in the investigated sample, all short-term incentives were granted as either cash bonuses or as a cash equivalents to be held by the remuneration committee to acquire firm shares. In general, share-based awards had a three-year deferral period. I value all short-term incentives as reported at the date of grant, that is, irrespective of whether or not they are deferred. The reason for this is again that short-term incentives are not tied to further

performance conditions, which means that the award has no risk of non-payment except in the case of personal resignation.

Long-term incentives include all equity-based awards whose size is dependent on future performance conditions.[4] For the firms in the investigated sample, all long-term incentives were granted as either share options or deferred performance shares. Referring to section 2.2.3, the valuation of share options and performance shares is a controversial topic and there seems to be little agreement among researchers on how to approach it. In this study, the following valuation models have been adopted. For share options, I used the formula outlined by Henderson and Frederickson (1996), Lambert, Larcker and Verrecchia (1991) and Lambert, Larcker and Weigelt (1993). Per that formula, all share options are valued at 25 percent of their exercise price, which produces values in the same range as more sophisticated option-pricing methods such as the Black-Scholes model (Lambert, Larcker and Verrechia, 1991). Also, in order to make the analysis more robust, I used a modified version of the Black-Scholes valuation model.[5] Unlike Chen, Steiner and Whyte (2005), I corrected for the performance conditions commonly used in UK firms by discounting the calculated value of the option by 20 percent.

As for the valuation performance shares, I follow the approach of Conyon, Peck and Sadler (2001). Per that formula, performance shares are valued at the time of grant using the share price prevailing on that particular date. In order to correct for the possibility of non-vesting, I then discounted the calculated value by 20 percent.

[4] Regular deferred shares constitute a grey-zone in the categorization of compensation. One the one hand, such awards can count as short-term incentives as they are normally granted in response to short-term performance and in conjunction do not rely on any further performance conditions, which means that in some sense, the reward is certain at the time of grant. On the other hand, deferred shares work to incentivize executives in their future doings, which is a reason to view such awards as long-term incentives. In this study, this particularity does not pose a problem since it is not the aim to investigate the impact of short-term and long-term incentives separately, but rather to investigate the accumulated effect of all equity-based compensation on firm risk-taking. This reduces the issue to a mere question of terminology. For the sake of simplicity, I treat all performance shares as long-term incentives and all deferred shares as short-term incentives. If nothing else, this is in line with the categorization in most annual reports.

[5] I follow the model used by the ExecuComp database for valuing share options. Per ExecuComp's formula, options are valued at the time of grant using the Black-Scholes call price. The model uses 70 percent of the stated life of the option as a proxy for the true expiration date (recall that executives' are normally permitted to execute the option over a five-year period once the deferral/performance period is reached) , a seven-year treasury bond yield as a proxy for the risk-free rate and the annualized standard deviation of the previous 60 monthly stock returns as a measure of historical volatility. I make similar assumptions, but I use the yield of a UK gilt instead of a US treasury bond and also I use daily share returns over one financial year to calculate the historical volatility.

3.5.2 Trading Frequency

Trading frequency is a measure of how fast the market can process new information. It is included as an explanatory variable since it believed to affect the movement of the share price, which in turn affects the market-based risk measures. According to Demsetz and Strahan (1997), trading frequency should be correlated with the underlying variances of a bank's assets, liabilities and off-balance sheet positions, which means that if the market is efficient in valuing the firm's share, trading frequency can be expected to account for some of the variation in company's market-based risk measures. The variable can be specified as follows:

$$Trading\_Frequency_{ij} = Avg\_Volume_{ij} \div Number\_Of\_Shares_{ij} \quad (1)$$

, where Avg_Volume_{ij} is the average traded daily volume for firm i in year j and $Number\_Of\_Shares_{ij}$ is the number of outstanding shares for firm i as of the last trading day in year j.

3.5.3 Size

Size is expected to be negatively related to risk-taking since larger firms enjoy greater opportunities to diversify both geographically as well as over different asset classes. Anderson and Fraser (1999) emphasize that larger financial institutions are more capable of diversifying firm-specific risks than smaller firms. Moreover, larger firms have better access to capital markets and are therefore more flexible to adjust to any shortfalls in capital or liquidity.

On the other hand, Demsetz and Strahan (1997) argue that larger financial firms may offset their diversification advantage by holding more risky loan portfolios and more leverage. In addition, Saunders, Strock and Travlos (1990) emphasize that firm size may also be positively related to firm risk-taking since larger firms are sometimes considered "too big to fail", which creates a classic moral hazard situation. This effect may be further reinforced for commercial banks. Bank depositors are normally covered by a governmental deposit insurance and it therefore seems likely that the government would grant emergency loans to such institutions in case of financial distress due to their vital importance for the well-being of the general economy. It should also be noted that "too big to fail" does not apply exclusively to commercial banks – other institutions may qualify as well, especially when it concerns financial firms since they hold a key role in the economy. In this study, I measure firm size as follows:

$$Size_{ij} = ln(Book\_Value\_Of\_Assets_{ij}) \quad (2)$$

, where $Book\_Value\_Of\_Assets_{ij}$ is the value of the assets for firm *i* at the last day of year *j*. If the estimated coefficient is positive and significant, the result favors the "too big to fail" hypothesis. On the other hand, if the estimated coefficient is negative and significant, the result favors the diversification hypothesis.

3.5.4 Capital Ratio

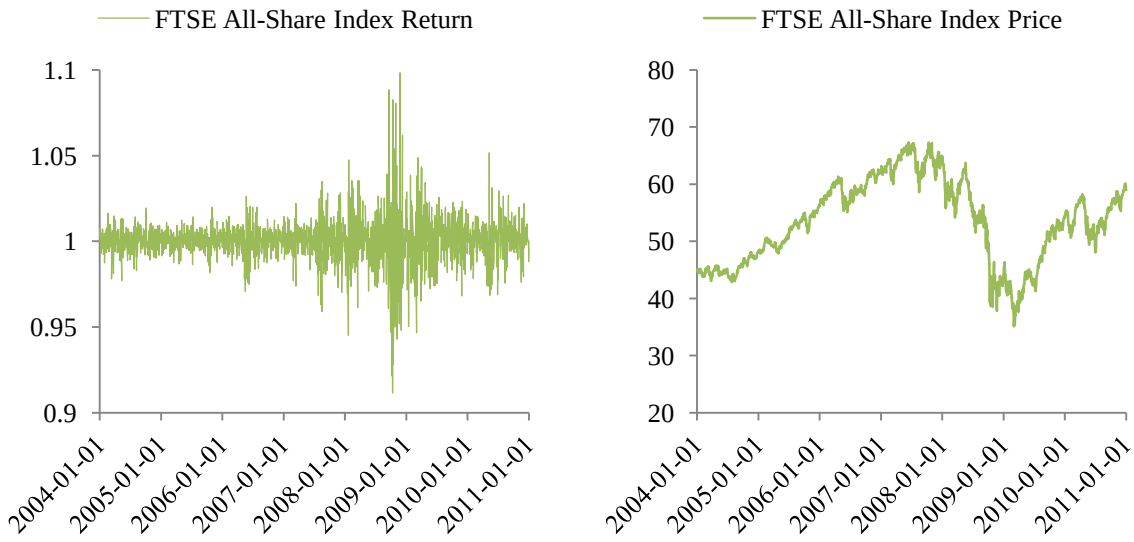
Capital ratio is a measure of financial leverage and highly leveraged firms tends to exhibit greater share return variances (Saunder, Strock and Travlos, 1990). In order to control for this effect, the firm's capital-to-assets ratio was included as an explanatory variable. A high ratio corresponds to a low leverage ratio, hence we expect the capital-to-assets ratio to be negatively related to firm risk-taking. Capital ratio can be specified as follows:

$$Cap\_Ratio_{ij} = Book\_Value\_Of\_Capital_{ij} \div Book\_Value\_Of\_Assets_{ij} \quad (3)$$

3.5.5 Fluctuations in the General Economy

In order to control for the movements in the general economy during the investigated period, a dummy variable for each year was included. 2004 served as the benchmark and was not included in the regression. The UK economy had a stable groth between 2004 and 2007. The volatility was low and the index value was increasing. During 2008 and 2009 the cycle turned and as can be seen in figure 1, the volatility increased dramatically and the index value dropped to levels below that of 2004, which is of course attributable to the financial crisis. During 2010, the volatility stabilized a little but remained above the levels for 2004-2007.

Figure 1
The FTSE All-share Index between 2004 and 2011.



The figure shows the movement of the FTSE All-share Index over the investigated period. The left graph shows the return whereas the right graph shows the value.

The year dummies for 2004-2006 are therefore expected to have a negative effect on risk-taking. The dummies for 2008 to 2010 on the other hand are expected to have a positive impact on risk-taking.

3.5.6 Risk Measures

The three market-based risk measures used in this study are *Company_Risk*, *Market_Risk* and *Total_Risk*. These risk measures were generated using the following factor model;

$$R_{ij} = \alpha + \beta_{ij}^{M} R_j^{M} + e_{ij} \quad (4)$$

, where R_{ij} is the daily return of firm *i* in year *j*, R_j^M is the daily return of the FTSE All-share market index in year *j*, which will serve as a proxy for the fluctuations in the economy, and e_{ij} is an error term. The beta coefficients β_{ij}^{M} will serve as our proxy for the *Market_Risk*. *Company_Risk* will be estimated using the standard deviation of the estimated error term σ_e and *Total_Risk* will be estimated using the standard deviation of the daily stock return σ_R for the relevant year. The reason for studying several risk measures is that different managers may target different risk exposures. For example, managers who focus on hedging credit risks will focus more on idiosyncratic risks. From a regulator's perspective, it is also interesting to see which type of risk is affected by compensation.

3.6 Summary Statistics

Table 1 shows descriptive statistics for the investigated sample. The table reveals several interesting features. *Size* shows a wide range, which means that the investigated firms differ substantially when it comes to the value of their assets. To clarify, the minimum and maximum values stated in the table corresponds to approximate asset values of 100 million pounds and 2.4 trillion pounds respectively, which results in a ratio of 0.00004 between the lowest and the highest observation. This vast span can be explained by the heterogeneity of the investigated firms. The five big commercial banks in the UK all have much more assets than do the rest of the sample. *Capital_Ratio* also has a wide range as some of the firms have almost no leverage. However, as is indicated by the median and mean values, the majority of the firms in the sample are highly leveraged, with debt levels around 70 percent or more.

When looking at the compensation variables, we see that the alternative valuation approaches do not alter the descriptive statistics much. The range of both *Proportion* and *Acc_Incentive* is again wide and the median and mean values for *Proportion* are located

close to the middle, which indicates that the investigated firms are fairly heterogeneous when it comes to compensation too. For *Acc_Incentive*, the median and mean values lie closer to the minimum value, which suggests that the sample contains a few outliers who grant vast awards of variable compensation.

Table 1
Descriptive statistics for the UK financial sector.

	Min	Median	Mean	Max	Std. Dev.
Trading_Frequency	0.000004	0.0021841	0.004058	0.0654384	0.0077223
Size	18.42908	21.50167	22.40119	28.50718	2.788602
Capital_Ratio	0.0042699	0.2240406	0.3427135	0.9963353	0.3055764
Proportion	0	0.375391	0.3240357	0.8499848	0.250019
Proportion_2	0	0.3829355	0.3409441	0.8499848	0.2621553
Acc_Incentive	0	606805.8	1253213	6171490	1481785
Acc_Incentive_2	0	726610.4	1342927	6328986	1539022
Market_Risk	0.028528	0.8226333	0.8456244	2.598149	0.5291752
Company_Risk	0.00465	0.0158876	0.0207862	0.0932135	0.0139129
Total_Risk	0.0060706	0.018434	0.0237619	0.0963077	0.0153862
Observations	175				

The table shows summary statistics for the variables used in the main model. For a thorough definition of the variables, see section 3.5.

3.7 Specification of the Main Model

The main model used to investigate the relationship between executive compensation and firm risk-taking is a fixed-effects regression. Each risk measure is evaluated against each compensation variable, while controlling for the firm-specific factors discussed in section 3.5. The model also contains dummy variables for each year to control for movements in the general economy. The choice of model in inspired by the study of Chen, Steiner and Whyte (2005) and is specified as follows;

$$Risk_{ij} = \alpha_i + \beta_1 \times Compensation_{ij} + \beta_2 \times Trading\_Frequency_{ij} + \beta_3 \times Size_{ij} + \beta_4 \times Capital\_Ratio_{ij} + \beta_5 \times Dummy\_04 + \beta_6 \times Dummy\_05 + \beta_7 \times Dummy\_06 + \beta_8 \times Dummy\_07 + \beta_9 \times Dummy\_08 + \beta_{10} \times Dummy\_09 + \beta_{11} \times Dummy\_10 + e_{ij} \quad (5)$$

, where;

$Risk_{ij} \in \{Market\_Risk_{ij}, Company\_Risk_{ij}, Total\_Risk_{ij}\}$

$Compensation_{ij} \in \{Proportion_{ij}, Acc\_Incentive_{ij}\}$

A positive and significant coefficient β_1 would favor the risk-taking hypothesis, whereas a negative and significant coefficient would favor the contradicting hypothesis. An insignificant coefficient or an absent effect would suggest that executive compensation has no measurable impact on firm risk-taking.

The fixed effects approach allows for cross-sectional differences by estimating an individual intercept for each unit. The alternative approach would be to use a random effects approach, which again assumes that all cross-sectional differences can be captured by individual intercepts, but that these differences can be treated as random. When working with small panels, it is often difficult to determine which approach to use. One potential disadvantage with the fixed effects approach is that the estimator concentrates solely on the differences within individual cross-sections. As such, the fixed effects approach uses less information than the random effects approach. On the other hand, the fixed effects approach will always give consistent estimates, as long as the sample size is sufficiently large, but it may not always be the most efficient one. One way to determine whether or not the fixed effects approach is preferred over the random effects approach is to perform a Hausman test. The test examines the null hypothesis that the regressor and the time invariant error term used in the random effects estimator are uncorrelated. The idea is to compare the two estimators with one another. The fixed effects estimator is consistent both under the null and the alternative hypothesis and the random effects estimator is consistent under the null hypothesis only. In other words, the random effects estimator will be consistent only if the regressor is uncorrelated with the time invariant error term. If a correlation exists, we expect the random effects coefficient to differ from the fixed effects coefficient. A significant difference between the two estimators indicates that the null hypothesis is unlikely to hold.

As for the data used in this paper, the null hypothesis was rejected at all appropriate significance levels, which suggests that the fixed effects approach is preferred. However, it should be noted that even if the correlation between the regressor and the time invariant error term is often a major reason for the observed difference in the estimated coefficients, rejecting the null hypothesis only tells us that the estimated coefficients differ significantly from one another, but do not directly reveal the underlying reasons. When working with small panels, and especially when the panel consists of only a few time observations as is the case in this paper, the estimated coefficients may differ substantially. Verbeek (2009) therefore advices that conventional tests should be read with some caution and gives the following guidelines. It makes sense to use the fixed effects approach when cross-sections are “one of a kind” and not randomly sampled from some underlying population. This interpretation is appropriate when the cross-sectional

units denote countries, large firms or industries (Verbeek 2008, pp. 367-368). With this as well as the result of the Hausman test in mind, I find it appropriate to use a fixed effects regression to estimate equation 5.

Lastly, the model is estimated using robust standard errors in order to mitigate any problems with heteroskedasticity.

4. Empirical Results

4.1 Structural Changes

Table 2 shows yearly statistics for the sample during the investigated period. As can be seen in the lower half of the table, the value of equity-based compensation as a proportion of total compensation increased during the initial years, with its peak occurring in 2008. After that, it decreased again during 2009 and 2010. Accordingly, firms took measures to make executive compensation less tied to the share price following the financial crisis of 2008. Also, during 2008 the value of equity-based compensation as a proportion of total compensation saw an significant increase compared to previous years. Equity-based compensation increased by approximately 120 percent between 2004 and 2008 and by approximately 75 percent between 2004 and 2010.

Table 2
Structural changes over time. Compensation structure, equity-based compensation and long-term incentives.

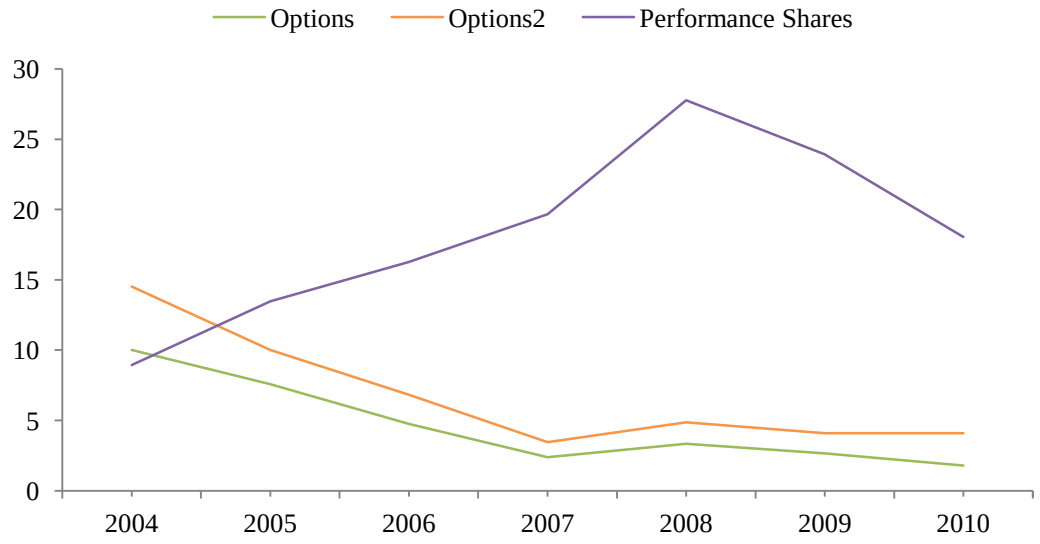
	Avg_Share_Options (25%)	*Avg_Share_Options* (BS)	*Avg_Performance_Shares*
2004	163071	283343	303425
2005	149124	251185	499125
2006	86648	134557	640398
2007	87043	147679	810879
2008	109434	204657	1189913
2009	83618	171319	870558
2010	31637	80569	753162
	Avg_Share_Options/Avg_Total_Comp (25%)	*Avg_Share_Options/Avg_Total_Comp* (BS)	*Avg_Performance_Shares/Avg_Total_Comp*
2004	10.01%	14.52%	8.93%
2005	7.58%	10.02%	13.48%
2006	4.75%	6.83%	16.28%
2007	2.38%	3.44%	19.67%
2008	3.35%	4.86%	27.77%
2009	2.65%	4.09%	23.91%
2010	1.78%	4.09%	18.04%
	Avg_Variable_Comp (25%)	*Avg_Variable_Comp* (BS)	*Avg_Proportion* (25%)
2004	797224	924896	27.18%
2005	931734	1041495	27.80%
2006	1113978	1169887	29.69%
2007	1275572	1343711	29.86%
2008	1746901	1851133	40.14%
2009	1524486	1621704	38.10%
2010	1387285	1447664	34.11%
	Avg_Proportion (BS)		
2004	31.35%		

2005	30.00%
2006	30.91%
2007	30.48%
2008	41.06%
2009	38.75%
2010	36.10%

The table shows the compensation structure and the equity-based incentives for the investigated sample over the period of 2004-2010. All figures are displayed as the sample averages for the given year and are denominated in British pounds.

When it comes to the structure of long-term incentives, the use of share options decreased over the investigated period, both in real terms and as a proportion of total compensation. At the same time, the use of performance shares increased steadily between 2004 and 2008 and then decreased slightly following the crisis of 2008. As can be seen in figure 2, the value of share option exceeded that of performance shares in 2004, but the opposite is true for the rest of the years in the investigated period.

Figure 2
Comparative graphs displaying of the use of share options and performance shares over the investigated period.



The figure shows the average value of share options and performance shares as a proportion of total compensation for each year. *Options* value grants at 25 percent of their exercise price whereas *Options2* value grants using a modified version of the Black-Scholes formula. Performance shares are valued using the prevailing share price on the date of grant. The share price is multiplied with the maximum number of shares and then discounted by 20 percent in order to account for the performance conditions.

4.2 The Effects of Compensation Structure on Risk-taking

Tables 3-6 display the results of the main model. Tables 3 and 4 examine the effects of *Proportion*. In table 3, share options are valued at 25 percent of their exercise prices whereas in table 4, share options are valued using a modified version of the Black-Scholes formula. As was mentioned in section 3.5, *Proportion* serves as a proxy for the compensation structure of the firm. The coefficients are jointly significant at a 1 percent significance level for all three risk measures, which suggests that the model is relevant. However, the model fails to estimate a significant coefficient β_1, which means that there is no significant relationship between the value equity-based compensation as a proportion of total compensation and our alternative risk measures. As for the control variables, only *Trading_Frequency* and *Size* display significant coefficients, but only when the model is run with *Market_Risk* as the explanatory variable. As for the sign of the coefficients, *Trading_Frequency* shows a negative effect whereas *Size* show a positive effect. Another thing that is noteworthy is that the year dummies for 2008 and 2009 are both significant at a 5 and 1 percent significance level across all risk measures and show a positive effect on risk-taking. This result is expected – during the turbulent years of 2008 and 2009, risk-taking in general and market risk in particular increased as compared to the base year of 2004.

Table 3
Ordinary fixed-effect regression estimating the relationship between the alternative risk measures and the structure of executive compensation during the year. All share option are valued at 25 percent of their exercise price.

Models of:	*Market_Risk*	*Company_Risk*	*Total_Risk*
Proportion	0.2471	-0.0074	-0.0017
	(0.76)	(-0.79)	(-0.17)
Trading_Frequency	-5.6538	0.0523	-0.0051
	(-1.90)*	(0.52)	(-0.05)
Size	0.1363	-0.0002	0.0008
	(4.04)***	(-0.13)	(0.61)
Capital_Ratio	0.1652	0.0006	0.0024
	(0.70)	(0.07)	(0.28)
Dummy_05	0.0558	-0.0027	-0.0031
	(1.06)	(-1.01)	(-1.18)
Dummy_06	0.1781	-0.0028	-0.0026
	(2.36)**	(-0.99)	(-0.90)
Dummy_07	0.2757	-0.0010	0.0007
	(3.28)***	(-0.30)	(0.19)
Dummy_08	0.1928	0.0136	0.0167
	(2.43)**	(2.86)***	(3.32)***
Dummy_09	0.3196	0.0218	0.0248

	(2.92)***	(4.48)***	(4.72)***
Dummy_10	0.2127	0.0070	0.0076
	(2.85)***	(1.81)*	(1.94)*
Prob>F	0.0000	0.0000	0.0000
R^2	0.3273	0.4226	0.4814

The table shows the estimated coefficients and the t-statistics (in parentheses). The three risk measures are assumed to be endogenously determined and *Proportion*, *Trading_Frequency*, *Size* and *Capital_Ratio* are assumed to be exogenously given. ***, ** and * indicate significance at 1, 5 and 10 percent respectively.

The results in table 4 draws a similar picture. The model is still significant, but *Proportion_2* as well as most of the control variables are insignificant, with the exception of *Trading_Frequency* and *Size*, which are both showing significant coefficients when modeled against *Market_Risk*. In addition, the estimated coefficients show similar signs and levels of significance as those in table 3. Again, the year dummies for 2008 and 2009 show significant and positive coefficient irrespective of risk measure.

Table 4
Ordinary fixed-effect regression estimating the relationship between the alternative risk measures and the structure of executive compensation during the financial year. All share option are valued using a modified version of the Black-Scholes formula.

Models of:	*Market_Risk*	*Company_Risk*	*Total_Risk*
Proportion_2	0.3904	-0.0014	0.0038
	(1.26)	(-0.14)	(0.39)
Trading_Frequency	-5.1365	0.0479	-0.0016
	(-1.81)*	(0.50)	(-0.02)
Size	0.1299	-0.0002	0.0007
	(4.10)***	(-0.13)	(0.58)
Capital_Ratio	0.1491	0.0002	0.0020
	(0.68)	(0.02)	(0.23)
Dummy_05	0.0644	-0.0027	-0.0031
	(1.24)	(-1.04)	(-1.16)
Dummy_06	0.1883	-0.0030	-0.0026
	(2.44)**	(-1.08)	(-0.92)
Dummy_07	0.2893	-0.0012	0.0007
	(3.37)***	(-0.39)	(0.20)
Dummy_08	0.1928	0.0127	0.0161
	(2.75)**	(2.77)**	(3.34)***
Dummy_09	0.3240	0.0210	0.0244
	(3.42)***	(4.51)***	(4.88)***
Dummy_10	0.2196	0.0064	0.0073
	(3.53)***	(1.77)*	(2.00)*
Prob>F	0.0000	0.0000	0.0000
R^2	0.3407	0.4192	0.4822

The table shows the estimated coefficients and the t-statistics (in parentheses). The three risk

measures are assumed to be endogenously determined and *Proportion_2*, *Trading_Frequency*, *Size* and *Capital_Ratio* are assumed to be exogenously given. ***, ** and * indicate significance at 1, 5 and 10 percent respectively.

4.3 The Effects of Variable Income on Risk-taking

Tables 5 and 6 display the results of the main model when *Acc_Incentive* is used as the explanatory variable. As was discussed in section 3.5, *Acc_Incentive* is a measure of executives' variable income during the year. As can be seen in tables 5 and 6, there is no measurable relationship between this variable and any of the alternative risk measures. All estimated coefficients are close to zero and none of them are significant at a 10 percent significance level. Again, *Trading_Frequency* and *Size* show significance when modeled against *Market_Risk* and the signs are similar to those estimated in tables 3 and 4. The year dummies for 2008 and 2009 continue to show positive and significant signs across all risk measures. Looking at column for *Market_Risk*, the dummies for 2007 and 2010 are also highly significant and show positive effects.

Table 5
Ordinary fixed-effect regression estimating the relation between alternative risk measures and the variable income during the financial year. All share option are valued as 25 percent of their exercise price.

Models of:	*Market_Risk*	*Company_Risk*	*Total_Risk*
Acc_Incentive	0.0000	0.0000	0.0000
	(-0.35)	(-1.60)	(-0.65)
Trading_Frequency	-5.6143	0.0416	-0.0092
	(-1.72)*	(0.43)	(-0.09)
Size	0.1390	0.0001	0.0009
	(3.73)***	(0.05)	(0.67)
Capital_Ratio	0.1985	0.0020	0.0032
	(0.73)	(0.23)	(0.35)
Dummy_05	0.0588	-0.0025	-0.0030
	(1.12)	(-0.93)	(-1.13)
Dummy_06	0.1878	-0.0025	-0.0024
	(2.51)**	(-0.84)	(-0.81)
Dummy_07	0.2901	-0.0003	0.0010
	(3.34)***	(-0.09)	(0.28)
Dummy_08	0.2401	0.0144	0.0173
	(2.91)***	(2.71)**	(3.06)***
Dummy_09	0.3583	0.0223	0.0253
	(3.27)***	(4.28)***	(4.54)***
Dummy_10	0.2381	0.0073	0.0079
	(3.09)***	(1.88)*	(1.99)
Prob>F	0.0000	0.0000	0.0000
R^2	0.3212	0.4269	0.4826

The table shows the estimated coefficients and the t-statistics (in parentheses). The three risk

measures are assumed to be endogenously determined and *Acc_Incentive*, *Trading_Frequency*, *Size* and *Capital_Ratio* are assumed to be exogenously given. ***, ** and * indicate significance at 1, 5 and 10 percent respectivily.

Table 6
Ordinary fixed-effect regression estimating the relation between alternative risk measures and the equity-based income during the financial year. Share options are valued using a modified version of the Black_scholes formula.

Models of:	*Market_Risk*	*Company_Risk*	*Total_Risk*
Acc_Incentive_2	0.0000	0.0000	0.0000
	(0.44)	(-0.55)	(0.13)
Trading_Frequency	-5.3088	0.0399	-0.0034
	(-1.72)*	(0.45)	(-0.04)
Size	0.1330	0.0000	0.0007
	(3.56)***	(-0.02)	(0.57)
Capital_Ratio	0.1605	0.0009	0.0021
	(0.62)	(0.10)	(0.23)
Dummy_05	0.0560	-0.0026	-0.0031
	(1.06)	(-0.99)	(-1.18)
Dummy_06	0.1803	-0.0029	-0.0027
	(2.38)**	(-0.99)	(-0.92)
Dummy_07	0.2760	-0.0009	0.0005
	(3.21)***	(-0.28)	(0.15)
Dummy_08	0.2097	0.0132	0.0163
	(2.69)**	(2.63)**	(3.07)***
Dummy_09	0.3363	0.0214	0.0245
	(3.34)***	(4.32)***	(4.66)***
Dummy_10	0.2242	0.0067	0.0074
	(3.11)***	(1.77)*	(1.94)*
Prob>F	0.0000	0.0000	0.0000
R^2	0.3222	0.4206	0.4813

The table shows the estimated coefficients and the t-statistics (in parentheses). The three risk measures are assumed to be endogenously determined and *Acc_Incentive_2*, *Trading_Frequency*, *Size* and *Capital_Ratio* are assumed to be exogenously given. ***, ** and * indicate significance at 1, 5 and 10 percent respectivily.

4.4 Endogeneity Issues

Up to this point, I have used equation 5 to analyze the impact of executive compensation on firm risk-taking. The results displayed in tables 3-6 suggest that the model is relevant. However, the estimated relationship may be associative rather than causative.. In other words, executive compensation and firm risk-taking may be endogenously determined. This poses a potential problem in the analysis. As emphasized by Chen, Steiner and Whyte (2005), agency theory predicts that equity-based compensation should be a decreasing function of the standard deviation of the returns. If this is the case, risk-averse

executives would prefer fixed compensation in place of equity-based compensation. One the other hand, firm risk-taking can be viewed as an indicator of investment opportunity – riskier institutions signal better opportunities to profit from asymmetric information, which would then cause executives to prefer equity-based compensation.

In order to incorporate the endogeneity issue into the model, I used a simultaneous equations model, in which all compensation variables and risk measures are treated as endogenous. When compensation is endogenous, one of the assumptions of the model, stating that all explanatory variables are uncorrelated with the error term, is violated, which produces biased and inconsistent coefficient estimates in the regular regression. Running a simultaneous equations model requires that one of the endogenous variables can be effectively estimated using appropriate instruments. In order to qualify as such, an instrument must have the following qualities. First, it must be correlated with the endogenous variable (preferably as high correlation as possible) and secondly, it must be uncorrelated with the residuals of the original model (exogeneity). Whether or not it makes sense to assume that the instruments are uncorrelated with the error term, one has to use common sense and economic theory. This quality cannot be tested because we do not have an unbiased estimator of the error term.

When running the simultaneous equations model, the risk equation will be equivalent to equation 5. Referring to the study of Chen, Steiner and Whyte (2005) and Houston and James (1995), I specify the compensation equation as follows:

$$Compensation_{ij} = f(Risk_{ij}, Size_{ij}, Share\_Price_{ij}, Year\_Rate_{ij}, Tenure_{ij}) \quad (6)$$

, where

$Compensation_{ij} \in \{Proportion_{ij}, Acc\_Incentive_{ij}\}$

$Risk_{ij} \in \{Market\_Risk_{ij}, Firm\_Risk_{ij}, Total\_Risk_{ij}\}$

$Size_{ij}$ equals the natural logarithm of the firm's total assets.

$Share\_Price_{ij}$ is the average share price for year j.

$Year\_Rate_j$ is a dummy variable that controls for the risk-free rate in a given year and is defined as the UK gilt rate for the year of the observation and zero otherwise.

$Tenure_{ij}$ is the number of years as chief executive.

This specification of the compensation equation incorporates three additional determining factors of executive compensation. *Share_Price* is a proxy for the recent performance of the firm and is assumed to have a positive effect on compensation. *Year_Rate* takes into

account the negative effect of the risk-free rate on the value of share options. Lastly, tenure is assumed to have a positive effect on variable compensation, both in real and relative terms. However, Rosen (1990) emphasizes that executives are more likely to receive large awards of shares and share options during their initial years as chief executive.

The strength of the instruments can be tested in the first-stage regression. As a simple rule-of-thumb, the F statistics for the joint test of all instruments should exceed 10. If so, one should not have to worry about weak instruments (Verbeek 2009, pp. 157). When testing the instruments above, the F statistics ranged from 2.60 to 10.89 depending on which compensation variable was instrumented, which suggests that the instruments used are somewhat weak. However, finding strong instruments is in general quite difficult, and due to the time limit as well as the data availability, no other instruments were considered.

In order to test for the endogeneity of the regressor, the Durbin-Wu-Hausmann test was used. The idea is to test whether or not the coefficients from the fixed effects regression differ significantly from those estimated using the instrumental variables approach. If so, the test suggests that the coefficients from the fixed effects estimator were not estimated consistently and that the regressor is endogenous. When performing the Durbin-Wu-Hausmann test on the data used in this paper, the null hypothesis was rejected at all appropriate significance levels, suggesting that the equation contains endogenous variables. However, in this case the test is at best a weak indicator of endogeneity since it relies on the validity of the instruments, that is, if the instruments are weak or otherwise invalid, so is the test result. It should also be noted that the outcome of the test may be affected by the small sample size, again making it hard to examine the soundness of the results. In any case, I found it appropriate to include an instrumental variables regression in the analysis. The results are presented in Appendix I. Looking at the tables A1-A4, we see that the model is significant across all risk measures. However, the instrumental variables approach did not estimate any significant relationships between the alternative risk measures and the compensation variables and therefore added little to the result of the main model. By comparing the result in tables 3-6 to those in tables A1-A4, we see that the estimated coefficients exhibit greater similarities when the regression is run with *Acc_Incentive*. This is somewhat expected since the validity of the instruments was stronger for *Acc_Incentive*.

4.5 Allowing for the Effects of Compensation to Vary over Time

When estimating equation 5, the effects of *Proportion* and *Acc_Incentive* are assumed to be stable over the investigated period. However, the effects of compensation may differ

from year to year, which is something that equation 5 does not account for. In order to control for this possibility, I define two new explanatory variables and incorporate them into equation 5;

$$Time\_Proportion = Time \times Proportion \quad (7)$$

$$Time\_Acc\_Incentive = Time \times Acc\_Incentive \quad (8)$$

The results are presented in Appendix II. As can be seen in table A5 and A6, the model is again significant and the estimated coefficients for *Proportion* and *Acc_Incentive* remain insignificant when modeled against *Market_Risk* but turn significant at a 10 percent significance level when modeled against *Company_Risk* and *Total_Risk*. The estimated effects are negative but very close to zero for both *Proportion* and *Acc_Incentive*, with *Proportion* showing a somewhat larger effect than *Acc_Incentive*.

The effects of *Time_Proportion* and *Time_Acc_Incentive* are close to zero and are insignificant for all risk measures except for *Total_Risk*. Noteworthy is that *Time_Proportion* show a positive and significant effect when modeled against *Total_Risk*.

5. Analysis

5.1 Analysis of the Regression Results

The results of the main model suggest merely a weak relationship between the structure of executive compensation and risk-taking and no measurable relationship between the value of variable compensation and risk-taking.

Looking first at the estimated coefficients for *Proportion*, the structure of executive compensation shows a positive but insignificant effect on firm risk-taking when modeled against *Market_Risk*. As for *Company_Risk* and *Total_Risk*, the effects are negative but very close to zero and also insignificant, leaving little support for either of the two hypotheses discussed in section 2.1.2. When *Time_Proportion* was included in equation 5, the effects remained much the same – the effect on *Market_Risk* is still positive and insignificant and the effects on *Company_Risk* and *Total_Risk* are still negative and close to zero. The difference lies in the significance of the coefficients of *Company_Risk* and *Total_Risk*, which are now both significant at a 10 percent significance level. This gives some support to the contradicting hypothesis, although the estimated coefficients suggest only a small effect. In conclusion, the results for *Proportion* show significance when *Time_Proportion* is included in the risk equation and give some support for the contradicting hypothesis. This suggests that the diversification effect is strong the industry and gives no support to the claim that executive compensation is structured to promote risk-taking.

The effects of *Acc_Incentive* are similar to those of *Proportion*. All of the estimated coefficients are slightly negative but very close to zero, again showing little evidence for either of the two hypotheses. When *Time_Acc_Incentive* was added to the regression, the coefficients for *Company_Risk* and *Total_Risk* turned significant at a 10 percent significance level but all effects remained close to zero. In conclusion, the effects of *Acc_Incentive* are significant when *Time_Acc_Incentive* is included in the risk equation and again give some support for the contradicting hypothesis. However, the effects are small.

My first thought was that the small effects could be partly explained by the fact that remuneration practices shifted over the investigated period. As can be seen in table 2, the value of equity-based compensation as a proportion of total compensation increased over time but at the same time, the use of share options decreased considerably and the use of performance shares became the dominating form of long-term incentive. As was discussed in section 2.2.3, the use of performance shares is expected to constitute a

weaker incentive for risk-taking than share options.[6] I therefore suspected that the incentives for risk-taking associated with the increasing use of equity-based compensation had been reduced as a result of this shift in the compensation variable.

In this respect, adding time varying compensation to the equation generated some interesting results. The estimated coefficients for *Time_Proportion* were all positive but close to zero and the coefficients for *Time_Acc_Incentive* were practically equal to zero and non of the them were significant except when modeled against *Total_Risk*. A positive and significant coefficient means that the marginal effects of compensation is increasing with time and a negative coefficient that the marginal effects is decreasing. Judging from the results in tables A5-A6, we see that the effects of compensation were increasing when modeled against *Total_Risk,* which *ceteris paribus* suggests that the incentives for risk-taking per unit of award became stronger over time. Accordingly, the results suggest that the use of performance shares worked as a stronger incentive for risk-taking than share options. This indeed contradicts the argument that the use of performance shares constitutes a weaker incentive for risk-taking than share options. Looking at the same column, we see that the coefficient for *Proportion* is also significant at a 10 percent significance level and negative, which suggests that *Proportion* had a negative effect in the beginning of the period but turned positive over time. As for the other risk measures, we cannot conclude whether or not the marginal effects were increasing or decreasing, that is, we cannot tell whether or not the change in the composition of incentives had an increasing or decreasing effect on risk-taking.

Trading_Frequency and *Size* show significant coefficients in all four regressions when modeled against *Market_Risk*. The negative coefficient for *Trading_Frequency* indicates that the speed with which information is processed has a clear and negative effect on the volatility of the share price. *Size* had a slightly positive effect on risk-taking when modeled against *Market_Risk*. This is interesting since it contradicts the claim that larger financial institutions should associate with smaller risk-taking due to their superior abilities to diversify. Instead, the result suggest that the "too big to fail" argument holds for the investigated sample. The small sample size as well as any flaws in the specification of the model may of course bias the results. However, the indicated effect is quite plausible since all firms in the sample belonged to the 500 largest quoted firms in the UK as of 2011. Accordingly, one should expect the "too big to fail" effect to be quite prevalent in the investigated sample.

[6] Looking at the reports used in this paper, the most common argument for changing long-term incentive plans from share options to performance shares is that the use of share options have become associated with bad remuneration practices, which in turn relates to the fact that they may cause excessive risk-taking.

The clearest and most significant relationship is that between the risk measures and the year dummies for 2008 and 2009. In all of the regressions, the "year effect" for 2008 and 2009 was positive, which means that the financial crisis had a clear effect on the volatility of the share price. This result is of course expected. Also, the dummy for 2010 was significant and positive in many cases, which suggests that the risk exposure continued to some extent during 2010.

Lastly, it can be concluded that the two valuation approaches for share options used in this paper do not alter the results. Note however that the value of share options as a proportion of total compensation decreased steadily over the investigated period, thereby marginalizing the choice of valuation method for share option somehow. Accordingly, it is hard to draw any clear conclusions about the importance of the choice of valuation method for share options.

5.2 Analysis of the Regression Model

In this section I discuss the model further and point at some factors that may affect the regression result. In this study, I used the market-based risk measures in equation 4 as dependent variables. However, these risk measures are not necessarily the best approximations of firm risk-taking. An obvious limitation is that they are solely based upon fluctuations in the share price, which may be influenced by other factors than just executive decision-making. In other words, if the share price is sufficiently governed by factors other than managerial decision-making, the explanatory effect of executive compensation may be reduced (and other important explanatory variables may be omitted), which may in turn lead to biased results. Bolton, Mehran and Shapiro (2011) recognize the difficulties of finding a clean risk measure and use the CDS spread instead to describe the riskiness of the firm. However, CDS spread data is not available to the same extent as share price data and due to the time limit of this paper, using this risk measure was never considered.

Another drawback with this type of study is that the compensation variables only include the compensation of the highest paid executive in the firm, whom is obviously not alone responsible for the managerial decision-making nor the risk-taking of the firm. Accordingly, if the remuneration package of the highest paid director is not representative for other key managers of the firm, such as the CFO or the CRO, then the compensation variables will not accurately describe compensation, that is, the remuneration of individuals responsible for the risk-taking of the firm. It could even be argued that different compensation structures of executives and individual traders may strip the compensation variable from explanatory power, which may again lead to biased results.

However, being a widely used approach in the literature and due to limitations in the remuneration data provided in annual reports, a different approach was not possible.

A final issue is the accuracy of the factors included in the model – do they measure the things that they are intended to control for and do they include all of the vital determinants of the dependent variable? Garen (1994) emphasizes that prior empirical studies on executive compensation often fail to specify an accurate model on which theory can be tested. Failure to include important variables may lead to omitted variables bias. Also, the fact that the variables are constructed using raw data rather than collected from a database, inherit both advantages and drawbacks. On the advantage side, this approach associates with greater freedom of choice since it enables the author to construct the compensation variable as she prefers. This may be especially appealing if the alternative includes a variety of sources with differing approaches on how to measure the relevant data. On the disadvantage side, data availability is often limited and variables may be measured with simplistic methods.

6. Concluding Remarks

6.1 Conclusions

On the question whether or not executive compensation in the UK financial industry has been structured to promote firm risk-taking during the past decade, I find no confirming evidence. The results show some evidence for the contradicting hypothesis but the level of significance is weak throughout the analysis. In light of the scope and limitations of this paper, I therefore find little or no justifying evidence for the growing critique of executive remuneration practices in the UK. However, the reader should note that the results of this paper do not rule out possibility that such critique is justified, they merely do not provide proof for the risk-taking hypothesis for the investigated sample.

On the question whether or not compensation practices in the UK financial industry has undergone any structural changes during the past decade, I find that the value of variable income as a proportion of total compensation and the relative importance of performance shares compared to share options has increase over the investigated period. The results indicate that *ceteris paribus*, the use of performance shares do not constitute a weaker incentive for risk-taking than share options. Contrary to what was expected, the effects of equity-based compensation on risk-taking seems to have been increasing over time, which suggests that the use of performance shares worked as a stronger incentive than share options. The separate effects of performance shares and share options on firm risk-taking was never investigated in this paper, leaving the question open how these components may separately affect firm risk-taking.

6.2 Contributions

This paper contributes to the extant literature by shedding light on the British financial industry over the period from 2004 to 2010. Much of the earlier research on the subject has been conducted using US samples and is often limited to include only industrial firms. It is also recognized that much of the research on executive compensation focus only on a single component of the long-term incentive plan, thereby failing to capture the full incentive effect of the utilized remuneration package. In this paper, I try to fill that gap by including awards of share options, performance shares as well as ordinary shares. It is also my hope that the discussion held in this paper concerning the difficulties of collecting the relevant compensation data for firms registered outside the US will highlight the need for further transparency as well as the need for more databases on executive compensation in Europe.

6.3 Suggestions for Future Research

Earlier studies on the relationship between executive compensation and firm performance could arguably have been improved if the method for measuring executive compensation had been another. As was mentioned on several places in this paper, there is little agreement among researchers on how to measure executive compensation, which can be partly explained by a lack of transparency in corporate reports. An interesting approach would be to measure long-term incentives as the market value on the date of release, that is, on the date when the performance conditions have been "fulfilled" and the award is actually transferred to the receiver. This approach would be especially interesting for UK firms since it is common practice to include performance conditions. However, conducting such a study would require more transparency. Not seldom, firms change incentive plans during the investigated period and when they do, the expiring incentive plan is often only reported in summative terms in future reports, making it impossible to extract the needed information. Another problem is that many reports only include the date of grant and not the date of release. This makes it impossible to pinpoint the exact share price at the date of release, which leaves the researcher to guessing games. This is perhaps a minor problem in most cases, but given a turbulent year, such lack of information could have a severe impact on the calculated value of the award. In any case, if such an approach could be effectively adopted, the author would not have to discount the value of performance shares and share options.

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Appendix I

Table A1
2SLS fixed effects regression estimating the relation between alternative risk measures and the structure of executive compensation during the financial year. Share options are valued at 25 percent of their exercise price.

Models of:	*Market_Risk*	*Company_Risk*	*Total_Risk*
Proportion	-1.7355	-0.0356	-0.0393
	(-0.44)	(-0.29)	(-0.29)
Trading_Frequency	-4.8598	0.0636	0.0100
	(-0.81)	(0.34)	(0.05)
Size	0.1420	-0.0001	0.0009
	(2.65)***	(-0.05)	(0.49)
Capital_Ratio	0.3089	0.0026	0.0052
	(0.73)	(0.20)	(0.36)
Dummy_05	0.0679	-0.0025	-0.0029
	(0.63)	(-0.73)	(-0.79)
Dummy_06	0.2246	-0.0022	-0.0017
	(1.57)	(-0.48)	(-0.35)
Dummy_07	0.3366	-0.0001	0.0018
	(2.07)**	(-0.02)	(0.33)
Dummy_08	0.4622	0.0174	0.0218
	(0.84)	(1.01)	(1.17)
Dummy_09	0.5478	0.0251	0.0292
	(1.17)	(1.70)*	(1.82)*
Dummy_10	0.3587	0.0090	0.0104
	(1.14)	(0.92)	(0.97)
Cons	-2.1445	0.0263	0.0063
	(-1.53)	(0.60)	(0.13)
Prob>F	0.0000	0.0000	0.0000
R^2	0.3374	0.4071	0.4774

The table shows the estimated coefficients and the t-statistics (in parentheses). The three risk measures as well as the compensation variables are assumed to be endogenously determined and *Trading_Frequency*, *Size* and *Capital_Ratio* are assumed to be exogenously given. ***, ** and * indicate significance at 1, 5 and 10 percent respectivily.

Table A2
2SLS fixed-effect regression estimating the relation between alternative risk measures and the structure of executive compensation during the financial year. Share options are valued according to a modified version of the Black-Scholes formula.

Models of:	*Market_Risk*	*Company_Risk*	*Total_Risk*
Proportion_2	-2.4401	-0.2586	-0.2641
	(-1.00)	(-1.41)	(-1.38)
Trading_Frequency	-8.1697	-0.2278	-0.2887
	(-1.07)	(-0.40)	(-0.48)
Size	0.1815	0.0045	0.0056

	(2.30)**	(0.76)	(0.90)
Capital_Ratio	0.3954	0.0225	0.0253
	(0.90)	(0.68)	(0.73)
Dummy_05	0.0130	-0.0074	-0.0079
	(0.09)	(-0.71)	(-0.73)
Dummy_06	0.1560	-0.0059	-0.0057
	(1.14)	(-0.57)	(-0.52)
Dummy_07	0.2457	-0.0052	-0.0035
	(1.77)*	(-0.50)	(-0.32)
Dummy_08	0.4362	0.0348	0.0392
	(1.74)*	(1.84)*	(1.99)**
Dummy_09	0.4984	0.0369	0.0409
	(2.44)**	(2.39)**	(2.55)**
Dummy_10	0.3016	0.0139	0.0151
	(1.89)*	(1.16)	(1.20)
Cons	-2.7261	-0.0088	-0.0301
	(-1.78)*	(-0.08)	(-0.25)
Prob>F	0.0000	0.0000	0.0000
R^2	0.3374	0.4071	0.4774

The table shows the estimated coefficients and the t-statistics (in parentheses). The three risk measures as well as the compensation variables are assumed to be endogenously determined and *Trading_Frequency*, *Size* and *Capital_Ratio* are assumed to be exogenously given. ***, ** and * indicate significance at 1, 5 and 10 percent respectivily.

Table A3
2SLS fixed effects regression estimating the relation between alternative risk measures and the variable income during the financial year. Share options are valued at 25 percent of their exercise price.

Models of:	*Market_Risk*	*Company_Risk*	*Total_Risk*
Acc_Incentive	0.0000	0.0000	0.0000
	(-0.92)	(-1.28)	(-1.23)
Trading_Frequency	-6.8371	-0.0383	-0.0962
	(-1.21)	(-0.14)	(-0.32)
Size	0.1786	0.0027	0.0037
	(2.65)***	(0.80)	(1.04)
Capital_Ratio	0.5151	0.0227	0.0257
	(1.10)	(0.99)	(1.04)
Dummy_05	0.0880	-0.0006	-0.0010
	(0.83)	(-0.12)	(-0.17)
Dummy_06	0.2694	0.0029	0.0034
	(1.94)*	(0.42)	(0.46)
Dummy_07	0.4311	0.0089	0.0110
	(2.26)**	(0.95)	(1.09)
Dummy_08	0.5223	0.0328	0.0374
	(1.54)	(1.97)**	(2.08)**
Dummy_09	0.5691	0.0361	0.0403

	(2.17)**	(2.79)***	(2.89)***
Dummy_10	0.3864	0.0170	0.0184
	(1.92)*	(1.72)*	(1.73)*
Cons	-3.2144	-0.0320	-0.0543
	(-2.26)**	(-0.46)	(-0.72)
Prob>F	0.0000	0.0000	0.0000
R^2	0.3374	0.4071	0.4774

The table shows the estimated coefficients and the t-statistics (in parentheses). The three risk measures as well as the compensation variables are assumed to be endogenously determined and *Trading_Frequency*, *Size* and *Capital_Ratio* are assumed to be exogenously given. ***, ** and * indicate significance at 1, 5 and 10 percent respectivily.

Table A4
2SLS fixed-effect regression estimating the relation between alternative risk measures and the variable income during the financial year. Share options are valued according to a modified version of the Black_scholes formula.

Models of:	*Market_Risk*	*Company_Risk*	*Total_Risk*
Acc_Incentive_2	0.0000	0.0000	0.0000
	(-1.16)	(-1.64)*	(-1.59)
Trading_Frequency	-9.7807	-0.3283	-0.3928
	(-1.37)	(-0.73)	(-0.83)
Size	0.2069	0.0061	0.0072
	(2.52)**	(1.17)	(1.31)
Capital_Ratio	0.5709	0.0347	0.0378
	(1.21)	(1.17)	(1.21)
Dummy_05	0.0806	-0.0006	-0.0010
	(0.71)	(-0.09)	(-0.13)
Dummy_06	0.2448	0.0025	0.0029
	(1.93)*	(0.31)	(0.35)
Dummy_07	0.4082	0.0099	0.0120
	(2.59)***	(1.00)	(1.15)
Dummy_08	0.5124	0.0381	0.0427
	(1.87)*	(2.21)**	(2.34)**
Dummy_09	0.5492	0.0389	0.0431
	(2.61)***	(2.94)***	(3.08)***
Dummy_10	0.3449	0.0166	0.0179
	(2.19)**	(1.68)*	(1.71)
Cons	-3.7790	-0.0984	-0.1220
	(-2.19)**	(-0.91)	(-1.07)
Prob>F	0.0000	0.0000	0.0000
R^2	0.3374	0.4071	0.4774

The table shows the estimated coefficients and the t-statistics (in parentheses). The three risk measures as well as the compensation variables are assumed to be endogenously determined and *Trading_Frequency*, *Size* and *Capital_Ratio* are assumed to be exogenously given. ***, ** and * indicate significance at 1, 5 and 10 percent respectivily.

Appendix II

Table A5
Ordinary fixed-effect regression estimating the relation between alternative risk measures and the structure of executive compensation during the financial year. Share options are valued at 25 percent of their exercise price and *Time_Proportion* is included to enable the effects compensation to vary over time.

Models of:	*Market_Risk*	*Company_Risk*	*Total_Risk*
Proportion	0.2019	-0.0235	-0.0228
	(0.42)	(-1.93)*	(-1.93)*
Time_Proportion	0.0095	0.0034	0.0044
	(0.15)	(1.49)	(1.92)*
Trading_Frequency	-5.5400	0.0918	0.0472
	(-2.05)**	(0.91)	(0.45)
Size	0.1361	-0.0005	0.0004
	(3.98)***	(-0.44)	(0.36)
Capital_Ratio	0.1731	0.0023	0.0048
	(0.71)	(0.24)	(0.50)
Dummy_05	0.0535	-0.0034	-0.0041
	(1.05)	(-1.17)	(-1.42)
Dummy_06	0.1736	-0.0043	-0.0045
	(1.97)*	(-1.24)	(-1.30)
Dummy_07	0.2685	-0.0033	-0.0024
	(2.68)**	(-0.77)	(-0.55)
Dummy_08	0.1840	0.0106	0.0128
	(1.90)*	(1.96)*	(2.29)**
Dummy_09	0.3073	0.0176	0.0193
	(2.72)**	(2.70)**	(2.86)***
Dummy_10	0.1970	0.0016	0.0006
	(1.79)*	(0.24)	(0.08)
Cons	-2.4856	0.0315	0.0127
	(-3.00)***	(1.29)	(0.49)
Prob>F	0.0000	0.0000	0.0000
R^2	0.3275	0.4347	0.4980

The table shows the estimated coefficients and the t-statistics (in parentheses). The three risk measures are assumed to be endogenously determined and *Proportion*, *Time_Proportion*, *Trading_Frequency*, *Size* and *Capital_Ratio* are assumed to be exogenously given. ***, ** and * indicate significance at 1, 5 and 10 percent respectivily.

Table A6
Ordinary fixed-effect regression estimating the relation between alternative risk measures and the variable income during the financial year. Share options are valued at 25 percent of their exercise price and *Time_Acc_Incentive* is included to enable the effects of compensation to vary over time.

Models of:	*Market_Risk*	*Company_Risk*	*Total_Risk*
Acc_Incentive	0.0000	0.0000	0.0000
	(-0.62)	(-1.87)*	(-1.91)*
Time_Acc_Incentive	0.0000	0.0000	0.0000

	(0.65)	(1.19)	(1.79)*
Trading_Frequency	-4.2709	0.1055	0.0869
	(-1.51)	(0.98)	(0.79)
Size	0.1348	-0.0002	0.0006
	(3.56)***	(-0.14)	(0.45)
Capital_Ratio	0.2213	0.0030	0.0046
	(0.78)	(0.31)	(0.47)
Dummy_05	0.0560	-0.0026	-0.0032
	(1.08)	(-0.96)	(-1.19)
Dummy_06	0.1819	-0.0027	-0.0028
	(2.34)**	(-0.92)	(-0.94)
Dummy_07	0.2790	-0.0008	0.0003
	(3.17)***	(-0.23)	(0.07)
Dummy_08	0.2239	0.0136	0.0161
	(2.67)**	(2.57)**	(2.90)***
Dummy_09	0.3284	0.0209	0.0231
	(3.27)***	(3.82)***	(4.02)***
Dummy_10	0.1956	0.0054	0.0049
	(2.27)**	(1.11)	(1.00)
Cons	-2.3752	0.0216	0.0065
	(-2.60)**	(0.79)	(0.22)
Prob>F	0.0000	0.0000	0.0000
R^2	0.3256	0.4326	0.4929

The table shows the estimated coefficients and the t-statistics (in parentheses). The three risk measures are assumed to be endogenously determined and *Acc_Incentive*, *Time_Acc*_Incentive, *Trading_Frequency*, *Size* and *Capital_Ratio* are assumed to be exogenously given. ***, ** and * indicate significance at 1, 5 and 10 percent respectivily.