THE LINK BETWEEN CEO INCENTIVE STRUCTURES, MANAGERIAL POWER, AND FIRM RISK IN THE FINANCIAL SERVICES INDUSTRY: A COMPREHENSIVE ANALYSIS OF US BANKING AND INSURANCE FIRMS

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Abstract

This paper aims to comprehensive insights regarding the link between CEO characteristics and investors´ risk in the financial services industry. The paper examines the relation among CEO incentive structures, CEO duality, and several measures of stockholders´ risk for samples of US banks and insurance firms. Our results provide empirical evidence that certain CEO characteristics are significantly related to equity investors´ risk: A CEO's pay sensitivity to annual base salary and yearly bonus payment is negatively related to firm risk. The value of a CEO's unvested options und unvested stock is also negatively related to firm risk. CEO duality appears to be negatively related to firm risk for banks but positively related to risk for insurance firms. Our findings have implications for shareholders who are provided by an empirical framework that takes into account CEO characteristics as non-traded human resource risk factor.

Keywords: CEO Compensation, CEO Duality, Stock Return Volatility, Firm Risk, Financial Institutions

JEL Classifications: G20, G30, G32, M52

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1 Introduction

In recent years, financial institutions have received considerable attention regarding their duty and capability to manage risk. Politicians, finance practitioners, and academics have fuelled a discussion regarding the need for further regulation and supervision of financial services firms. In particular, their executives' appetite for risk has been the focus of a very lively debate held not only in governmental and academic plenary halls but also in various media channels, attracting a wide audience. By striving to follow the dictum of shareholder value maximization, executive managers are obliged to balance risk and expected return in order to provide the best potential outcome for a firm's shareholders. Obviously, the downside of taking on additional risk can be substantial. In light of the recent financial crisis, this downside has been realized during the collapse of the financial system. The demise of AIG, the crisis of Citigroup, and recent trading scandals at large banking institutions are valid examples of the potential downside of excessive managerial risk-taking. On the other hand, individual financial firms were affected differently by past financial crises, even under similar market conditions, because they had different attitudes towards risk-taking. Amongst others, one explanatory factor for these different attitudes stems from CEOs´ characteristics and incentives. Accordingly, the role and importance of corporate governance in financial institutions has regained particular interest.

In general, the separation of ownership and control provides a basis for potential principal-agent issues. Because the principals of a firm must be concerned when the firm's agents do not act in the shareholders' best interest, research on top executive management and their impact on firm value and performance developed quickly and attracted considerable interest.

Research on managerial risk-taking incentives provides valuable insights into a firm's risk profile, which accounts for not only general firm-specific characteristics but also human resource factors, i.e. the ultimate decision makers of the firm. Consequently, research on firm risk is enriched by a further dimension. According to Goyal and Santa-Clara (2003), human capital may be interpreted as a non-traded asset that cannot be diversified and that affects overall firm risk. From an investor's perspective, risk assessment suffers from a problem of imperfect information owing to information asymmetry. Particularly with regard to managerial risk appetite, investors may not be able to gather complete information about the skills, level of risk aversion, and preferences of a firm's CEO. Consequently, investors may be forced to rely on managers' risk assessment and may prefer management teams whose level of risk aversion is similar to their own. Therefore, factors that approximate managerial attitudes toward risk add value in explaining the overall riskiness of a firm and help align investors' risk appetite with that of executive managers. Hall (1998) and Belghitar and

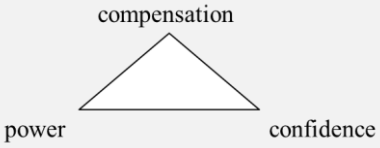
Clark (2012) argue for the use of managerial characteristics to approximate managerial risk appetite. Given that managerial power and incentive structures may affect a CEO's attitude toward risk and may influence managerial decision taking, the CEO's risk appetite is strongly interrelated with the firm's overall riskiness. More specifically, a CEO's risk-taking behavior and his or her willingness to invest in risky projects alter the company's overall risk profile.

According to these considerations we find many studies in existing literature that deal with the link between CEOs and certain corporate output variables of financial and non-financial firms. In this regard, a lot of studies focus on performance which is often defined and measured as the return to stockholders. This is also the case with respect to banks and insurance firms. On the other hand, in case research focuses on risk in particular, most studies define risk from a debtholder´s perspective. This is appropriate, if we consider the interests of depositors and bond holders as well as the perspective of regulators, deposit insurers, and, eventually, taxpayers. But we deem it worth to trace the linkage between CEO characteristics and risk from an equity investor´s perspective – especially in the financial services sector where stockholders have experienced substantial price swings and return fluctuations during past years. This is the first contribution of this paper.

The second contribution is that we follow a comprehensive approach which does not only investigate corporate governance from a managerial incentive standpoint, but also from a managerial power and confidence point of view. By doing so, this paper integrates concepts that are often separated and analyzed in isolation. Moreover, we not only look at banks but also at insurance firms, i.e. we cover the two major groups in the financial services industry. The underlying idea of this approach is that we aim to define and provide a comprehensive empirical framework and overview, before more specific aspects regarding the relation among corporate governance, managerial characteristics and firm risk in the financial services industry are analyzed in detail. With respect to this consideration, we deem it appropriate to take a long-term perspective, i.e. to use panel data computed over a long period of time.

In illustration I the contribution of this paper is outlined in a plausible but simplified way.

Figure 1. Contribution

	CEO studies of the financial services industry	
	Perspective of	
Dependent variable	Stockholders	Debtholders
Return	Evidence provided by existing literature	Not directly relevant
Risk	Limited evidence with respect to a comprehensive approach for banks and insurance firms 	Evidence provided by existing literature

We identify several managerial attributes that may provide incentives to alter one's attitude towards risk and that may be linked to firm risk in general. From these managerial attributes, we define a set of managerial characteristics that account for short- and long-term incentive measures, a major element of corporate governance. Moreover, we define CEO duality as indicator of managerial power. Third, we implement a measure of managerial overconfidence. To represent stockholders´ risk perspective from several angles, we define a set of various measures of firm risk which are derived from daily stock returns.

We focus on US financial institutions, including banking and insurance firms, for the period from 1992 to 2012. We consider a long-term perspective, covering several periods of economic downturn and prosperity.

This paper thus provides further empirical evidence of the importance of managerial risk-taking incentives for explaining stockholders´ risk. Our results provide empirical evidence that certain CEO characteristics are significantly related to investors´ risk (FIRM RISK?). In particular, we find that a CEO's pay sensitivity to annual base salary and yearly bonus payment is negatively related to firm risk. Moreover, the value of a CEO's unvested options und unvested stock is also negatively related to firm risk. CEO duality, however, appears to be negatively related to firm risk for banks but positively related to risk for insurance firms. The empirical results are robust to the use of different risk measures and carry implications for shareholders and other stakeholders.

This paper proceeds as follows: Section 2 provides a review of the most relevant literature in this field and defines the hypothesis framework. Section 3 describes the data and methodology that are used in this study. Section 4 presents our empirical findings, before a conclusion is drawn in section 5.

2 Literature and hypotheses

Empirical findings in this area stem from several research strands and have their roots in theory developed more than fifty years ago. The development of portfolio theory provided initial insights into the relation between risk and return (Markowitz (1952)). Since then, the investigation of factors influencing risk and return and the introduction of widely used asset pricing models, such as the CAPM or the Fama-French-3-Factor-Model, have provided further insights for investors (see Sharpe (1964), Lintner (1965a, b), Fama and French (1992, 1996)). In tandem with the further development of asset pricing theory and the professionalization of risk management, the investigation of other subjects, which improved asset pricing and volatility models and which provided further insights for academics, began to prosper.

In particular, topics related to corporate governance attracted attention, and the impact of CEOs and corporate boards became a widely debated research issue because of the special role of top management in the corporate hierarchy and the particular interest of the entire investment society. Generally, the characteristics and behavior of executive management are studied to account for human capital as a non-traded asset. Research regarding the impact of CEOs on various corporate output measures evolved as a distinct study area.[12] A first stream of literature within this field of research focuses on the effect of managerial compensation on firm outcomes, particularly with regard to stock- and option-based incentive structures. A second stream of literature deals with the influence of CEO confidence and firm outcomes. Third, there is an established field of research to analyze firm outcomes and CEO characteristics in the context of corporate governance.

In order to contribute to the broader public and academic discussion around the specialty of financial institutions and risk-taking in the banking and insurance industries, we follow a comprehensive approach and implement elements of all three perspectives in our study. The idea is to obtain a deeper understanding as well as integrative insights with respect to the personal, i.e. human resource related, dimension of risk-taking. However, compensation is a major focus of this study because there exists mixed evidence in both theoretic models and empirical studies. Therefore, we begin with the compensation issue to derive focused hypotheses based on the existing literature.

Dittmann and Maug (2007) study the optimal structure of managerial compensation packages and argue for low base salaries and additional share ownership to lower compensation costs while keeping managerial incentives and utility levels constant. Anderson and Fraser (2000) provide empirical evidence that managerial share ownership and firm risk were positively related at the end of the 1980s but negatively related during the early 1990s; they explain the change in this relationship by a change in the legislative environment. Similarly, also Saunders et al. (1990) document a positive relationship between managerial stock ownership and firm risk, while Chen et al. (1998) document a negative relationship. In the last few decades, compensation packages have been structured to include a higher share of stock- and option based compensation. Thus, according to Bergstresser and Philippon (2008), dependence of a CEO's wealth on the firm's stock price development tripled from 1980 to 1994 and doubled again until 2000. Fahlenbrach and Stulz (2011) argue that the recent financial crisis was not anticipated by most managers given that CEOs did not reduce their shareholdings before the outbreak of the crisis, which led to substantial losses.

Regarding mergers and acquisitions (M&A), Loderer and Martin (1997) cannot confirm that stock ownership drives corporate performance of firms engaged in M&A. On the other hand, Hagendorff and Vallascas (2011) document that higher pay-risk sensitivity induces risk-taking in M&A situations. Bauguess et al. (2009) report a positive connection between inside (managerial) equity holdings of acquisition target firms and the targets' stock returns.

With respect to financial institutions the results are not less ambiguous. For example, Saunders et al. (1990) form models based on market-based risk measures and show that banks with high managerial equity ownership exhibit greater risk-taking than banks with low managerial equity ownership. In contrast, Chen et al. (1998), who use a similar methodology over a different time period, find a negative relation between managerial ownership and risk-taking, suggesting that managerial ownership decreases the level of risk-taking. Houston and James (1995) examine whether executive compensation in the banking industry is structured to promote risk-taking and find evidence inconsistent with the hypothesis that compensation policies promote risk-taking. Chen et al. (2006) examine the impact of option-based compensation on several market-based measures of bank risk: total, systematic, idiosyncratic, and interest rate risks. They find that the structure of executive compensation (measured by stock options as a percentage of total compensation) induces risk-taking in the banking industry. Mehran and Rosenberg (2007) study the relation between option-based compensation and a firm's investment policy and

[12] Many studies investigate the relation between CEO characteristics and various corporate output metrics: For instance, Barker and Mueller (2002) study the link between CEOs and R&D spending. Similarly, Shen and Zhang (2013) study the connection among risk-taking incentives, firm performance, and R&D spending. Bebchuk and Grinstein (2005) investigate the effect of managerial compensation on firms' expansion decisions. Murphy and Zábojník (2004, 2007) study the importance of general and firm-specific competencies for top executive management members. Kuang and Qin (2013) investigate the link between a firm's credit ratings and managerial risk-taking incentives. A general overview of the magnitude of CEO studies is provided by Wang et al. (2011). Pan et al. (2013) argue that information on CEOs is used to evaluate the CEOs' ability to generate cash flows. The authors document that new information releases, which lead to more transparency regarding CEOs' skill set, reduce stock volatility, as the investment society learns about CEOs' skills over time.

capital ratios for financial institutions and present evidence that high option-based compensation is linked to both a CEO's choice to make riskier investment decisions and higher capital ratios, as options are contingent liabilities that must be financed upfront. Generally, these authors document that option-based compensation is linked to higher equity volatility. Rajgopal and Shevlin (2002) document that option-based incentives drive managerial risk-taking in the oil and gas industry and that such incentives foster the willingness to invest in risky projects and the failure to hedge oil prices. Chok and Sun (2007) provide empirical evidence that board member age and option-based compensation are positively related to the idiosyncratic risk of biotech firms. The positive link between firm risk and option-based compensation is further confirmed by Agrawal and Mandelker (1987) and DeFusco et al. (1990). Acrey et al. (2011) document that option holdings are negatively correlated with short-term firm risk. Armstrong and Vashishtha (2012) report that CEOs' option payoff sensitivity relative to firms' return volatility (vega) provides incentives to increase firm risk. Other compensation-related studies focus on deferred compensation and annual bonuses. For instance, Wei and Yermack (2010) document that firms with high deferred CEO compensation experience an increase in bond prices and a decrease in stock prices, while the volatilities of both decrease at announcement. Das et al. (2012) argue that corporate earnings are smoothed to benefit from the expected advantages of reporting a steady income stream, which affects CEO bonuses.

Based on these quite ambiguous previous findings, we formulate our hypotheses and aim to provide arguments regarding the expected relationship between the underlying CEO characteristic and firm risk. Our idea is to differentiate between short-term compensation and long-term compensation.

CEOs that are incentivized by short-term compensation structures may be incentivized to take on additional risk to reach corporate performance targets. Consequently, high bonus prospects relative to the actual base salary may induce risk-taking. Similarly, we argue that managers with a relatively high fixed compensation are less dependent on the variable portion of their compensation in terms of future consumption opportunities. Instead of striving to increase their firm's performance to earn additional variable compensation, well-paid managers prefer to secure their position and thus take on less risk. Accordingly, CEOs with a relatively low base salary have greater incentive to take on additional risk in order to increase their firm's performance and their own future payout stream than CEOs with a relatively high base salary.

H1: Managerial short-term compensation is positively related to firm risk.

Further, long-term compensation structures provide an incentive to limit a firm's risk in order to avoid risking a reduction in the firm's future payout. Therefore, the higher the value of a CEO's long-term compensation is, the lower the CEO's incentive will be to risk a decrease in the firm's stock price by engaging in high risk actions.

H2: Managerial long-term compensation is negatively related to firm risk.

According to the second stream of research, CEO confidence may be an important driver of risk-taking, also in the financial services industry. The assumption is that managerial confidence is an important indicator of a manager's beliefs about the firm's future development. Confidence may provide positive signals to financial markets. However, confidence may lead to inefficient decision making when managers overestimate their own skills and information quality. When a CEO's confidence is very pronounced, managers may be unable to correctly assess the corporate situation. Because of this overconfidence, inadequate information may be acquired, and investment returns may be overestimated, which may lead to inefficient investment decisions. Hence, overconfident CEOs may be less sensitive to signals of risk, which may lead to high firm risk.

H3: Managerial overconfidence is positively related to firm risk.

By enunciating this hypothesis we follow Campbell et al. (2011) and Malmendier and Tate (2005), who provide insights using mixed samples. More specifically, Belghitar and Clark (2012) investigate the return volatility of UK financial firms and approximate CEO risk appetite by using several CEO variables, including age, tenure, wealth, the number of educational degrees, and the time spent on other firms' boards; they conclude that managerial risk appetite affects firm risk. While age and wealth are positively linked to volatility, the number of academic degrees, the time spent on other companies' boards, and time spent in the CEO role are negatively related to volatility. In a similar study, Hoffmann et al. (2012) provide empirical evidence that CEO salary is negatively related to firm risk, while the value of vested and unvested options and the value of vested and unvested stock are positively related to firm risk.

To obtain a broad understanding of the relationship between CEO characteristics and equity holders´ risk we also implement the third stream of relevant literature by taking a more general corporate governance aspect into account. A widely discussed argument is that CEO duality does not constitute an effective corporate governance mechanism, as the chairman's monitoring role is not performed sufficiently. According to this consideration firms that exhibit a high degree of managerial power and freedom may be subject to monitoring issues and may suffer from ineffective control mechanisms. Therefore, the potential for agency conflicts might increase, which may be linked to firm risk.

H4: Managerial power is positively related to firm risk.

Grinstein and Valles (2008) document that an increasing number of companies separate the CEO and board chairman roles. In 2000, only 26% of the firms separated both roles, while in 2004, this number rose to 31%. Further, the number of independent non-CEO

chairmen has increased significantly in recent years, which is related to increased monitoring concerns. Dey et al. (2011) provide evidence that a separation of the CEO and board chairman roles due to investor pressure is linked to lower announcement returns and lower subsequent performance. Lewellyn and Muller-Kahle (2012) investigate the effect of managerial power on risk appetite during the subprime mortgage crisis and find that a CEO's power within the firm is positively related to excessive risk-taking.

To build a sound empirical framework we control for firm specific characteristics. Therefore, we apply three corporate control variables. In line with previous literature on financial and non-financial firms we control for size and leverage of the respective firm. Moreover we include the trading liquidity of the respective shares.

3 Data and methodology

3.1 Data selection

The two samples that are used in this study are based on all banks and insurance firms that have been part of the S&P 1500 from 1992 to 2012. "Banks" and "insurance firms" are defined according to the Fama-French 48-industry cluster. All companies have been assigned one industry code, ranging from 1 to 48, based on their SIC code. In this study, a bank is defined as a company whose Fama-French industry code is 44, whereas an insurance firm is defined as a company whose Fama-French industry code is 45. Firms for which the security status is defined as "bankrupt", for which the trading status is defined as "suspended" or "halted" according to CRSP, and for which only one observation year is available during the entire period are excluded. Finally, the first sample covers 2,222 company-year observations of US listed banking firms for the 1992–2012 period, while the second sample covers 1,445 company-year observations of US listed insurance firms for the same period. Both panels are unbalanced, i.e., there is not always one observation per firm and year, as some companies engaged in corporate restructurings (M&A, taken private) or went bankrupt. However, we deem the overall number of observations to be sufficient to perform a valid empirical analysis. The banking sample contains 246 banks, with, on average, 9.0 observations per company and year. The insurance sample contains 139 insurance firms, with, on average, 10.4 observations per company and year. Data on CEOs are taken from Execucomp, whereby each company-year observation is assigned to the CEO who served in this role for the majority of the year. Yearly accounting data are taken from Compustat North America Fundamentals Annual, while daily stock and trading data are compiled from CRSP.

3.2 Definition of variables

Two important factors that influence an investor's investment decision are the expected return and the risk of a financial asset. The investor's task is to assess the expected return and risk associated with an asset, to balance both, and to choose a portfolio that offers the optimal risk-return profile. Asset pricing theory generally assumes that investors want to be compensated for bearing risk. Therefore, investors are confronted with a maximization issue, i.e., the expected return must be maximized for a given level of risk or the risk must be minimized for a given level of expected return. In analyzing certain CEO characteristics that are deemed to reflect a non-traded part of firm risk, which investors should care about and consider when assessing a financial asset's risk, we do not aim to provide an asset pricing model that helps predict asset returns or that explains the trade-off between risk and return. Consequently, we do not implement (expected) return measures into the model. Instead, we aim to extend the discussion of effective risk management and assessment by providing empirical evidence for non-traded human resource risk that is linked to overall firm risk.

Considering the definition of the dependent variable we have to keep in mind that financial services firms are often excluded from finance studies because they are highly regulated and do business in the very specific financial intermediation environment. The debt of banks and insurance companies is borrowed from small, private, and uninformed depositors. If we take the debtholders´ or the regulators´ point of view we should apply sector-specific risk measures such as capital ratios, charge-offs, distance to default, or Z-score. But in this study the perspective of equity holders is taken. Therefore we must apply risk measures which are reflected by the stock market. For this reason we perform a volatility study which is deemed beneficial as it provides in a stockholder´s perspective further insights for the investigation of firm risk and focuses on risk as an *independent control mechanism*.

Hence the dependent risk metrics are based on daily log returns and are categorized as measures of total volatility, measures of up- and downside volatility, measures of systematic and idiosyncratic risk, and measures of extreme risk. Nine risk metrics are applied in this study.

Except for systematic risk, average return of the worst 10% trading days, and minimal average return, the natural logarithm of the respective risk metric is used in the regression framework.

To measure CEOs' incentive structures and to operationalize the hypotheses, five independent CEO variables are defined.

- For short-term incentives, a CEO's pay sensitivity (PAYSEN) to his or her base salary and annual bonus is used. This pay sensitivity is defined as the annual bonus received per year divided by the sum of annual base salary and yearly bonus; this measure provides an indication of the bonus compensation weight.
- For long-term incentives, the value of unvested in-the-money stock options (OPTUNV) and the value of restricted stock (STOCKUNV), both in millions of US dollars, attributable to each CEO per company and year, are included in the analysis.

Table 1. Definition of variables

(1) Total volatility		TOTVOL	Standard deviation of all daily log returns per company and year
Downside volatility	(2) Negative volatility	NEGVOL	Standard deviation of all below-zero, i.e., negative, daily log returns per company and year
	(3) Below average volatility	BELAVOL	Standard deviation of all below-average daily log returns per company and year
Upside volatility	(4) Positive Volatility	POSVOL	Standard deviation of all non-negative daily log returns per company and year
	(5) Above average volatility	ABAVOL	Standard deviation of all above-average daily log returns per company and year
(6) Systematic risk		SYSVOL	Firm's market beta, calculated from regressing the stock's daily returns on the daily returns of the S&P500 index. Consequently, SYSVOL is the slope coefficient from this regression
(7) Idiosyncratic risk		IDIOVOL	Standard deviation of the residuals from the SYSVOL regression
Extreme risk	(8) Average return of the worst 10% trading days	ARL10	Average log return of the worst 10% of trading days per company and year, i.e., the return of the 10% of all trading days for which the average log return is minimized in the respective year
	(9) Average return of the worst five consecutive trading days	MR5C	Average log return for the five consecutive trading days per company and year for which the average log return is minimized

- To describe a CEO's confidence, the value of his or her vested unexercised in-the-money options (OPTV) in millions of US dollars is used.
- Furthermore, one additional CEO variable is included in the model: a dummy variable to describe the phenomenon of CEO duality (DUALITY), which equals 1 if the CEO is also chairman of the board in the respective year and 0 otherwise. Information regarding whether the CEO has also been the chairman of the board in the respective year is taken from Execucomp's description of the manager's annual title.

Additionally, three corporate control variables are defined as follows:

- We measure the firm size by SIZE. It describes the natural logarithm of the average daily market capitalization per company and year.
- As a measure of the degree of financial leverage, EQR is defined as the natural logarithm of the firm's equity ratio, i.e., the book value of equity divided by the book value of total assets at year-end. Finally, to describe the stock's trading liquidity,
- To take the trading liquidity into account, LIQ is measured as the natural logarithm of the average daily trading turnover relative to all shares outstanding per company and year.

3.3 Methodology

For panel data analysis, the most common estimation methods include fixed-effects (FE) models, random-effects (RE) models, and pooled OLS regressions. RE models assume that variation across firms is random and not correlated with the independent variables. FE models, on the other hand, assume that the firm's error term is correlated with the explanatory variables. To choose between a FE model and pooled OLS, we test whether all FE intercepts are zero (H_0). The F-statistic is highly significant ($p<0.01$) for each risk metric and sample. Consequently, we reject the null hypothesis and conclude that an FE model is preferred to pooled OLS. Further, to choose between a RE model and pooled OLS, we test whether the variance across entities is zero (H_0), i.e., we test whether there is no significant difference across units (i.e., no panel effect), by conducting a Breusch-Pagan Lagrange Multiplier (LM) test. The LM test is highly significant ($p<0.01$) for each risk metric and sample, and we reject the null hypothesis and conclude that a RE model is preferred to pooled OLS. To choose between FE and RE models, we apply a Hausman test for each firm risk measure and test whether the difference in both models' regression coefficients ($\hat{\beta}_{FE}$ vs. $\hat{\beta}_{RE}$) is statistically significant:

$$H = (\hat{\beta}_{RE} - \hat{\beta}_{FE})'[\mathrm{Var}(\hat{\beta}_{FE}) - \mathrm{Var}(\hat{\beta}_{RE})]^{-1}(\hat{\beta}_{RE} - \hat{\beta}_{FE}) \quad (1)$$

The null hypothesis is that the error term is not correlated with the independent variables. With a p-value < 0.05, the null hypothesis is rejected, and the FE model applied. Solely for SYSVOL in the bank sample, we document a p-value of 0.14, but we still apply the FE model to render the results comparable among panels and risk metrics. Because we investigate a 21-year time period, which includes periods of economic downturn and prosperity, we control for time-specific effects by including year dummies in the regression model. To test whether the time-specific effects are indeed needed, we test whether all year dummies are jointly equal to zero. With a p-value < 0.01 for each risk metric and sample,

we reject the null hypothesis that all year coefficients are jointly equal to zero, and we keep the dummies to account for time-specific effects. Consequently, the empirical framework is based on a panel regression model with firm FE and year dummies and is described as follows:

$$VOL_{iy} = \beta CEO_{iy} + \gamma CONTROL_{iy} + \delta_i + \lambda_y + \xi_{iy} \quad (2)$$

$VOL_{iy} \in \{\ln(TOTVOL_{iy}), \ln(NEGVOL_{iy}), \ln(BELAVOL_{iy}), \ln(POSVOL_{iy}), \ln(ABAVOL_{iy}), SYSVOL_{iy}, \ln(IDIOVOL_{iy}), ARL10_{iy}, MR5C_{iy}\}$ describes the vector of volatility measures for company i in year y. $CEO_{iy} \in \{PAYSEN_{iy}, OPTUNV_{iy}, STOCKUNV_{iy}, OPTV_{iy}, DUALITY_{iy}\}$ describes the vector of CEO variables. $CONTROL_{iy} \in \{SIZE_{iy}, EQR_{iy}, LIQ_{iy}\}$ describes the vector of corporate control variables. β and γ are the slope coefficient vectors for the CEO and corporate control variables. δ_i denotes unobserved company-specific effects, and λ_y denotes the year dummy variables that account for time-specific effects. ξ_{iy} describes the model's error term. The FE model includes robust standard errors to account for any potential heteroscedasticity issues, clustered at the firm level.

4 Empirical findings

First, we will report and discuss the summary statistics, which are presented in table 2; then, we will interpret the regression results. Total volatility is 2.3% on average for both banks and insurance firms. Additionally, up- and downside volatility is very similar across both panels, with 1.6% on average for banks and 1.6–1.7% on average for insurance firms. Similar results are also obtained for idiosyncratic volatility (1.9% vs. 2.0%) and both measures of extreme risk: banks exhibit an average daily negative return of 4.0% during the worst 10% of trading days and an average daily negative return of 3.2% during the worst five consecutive trading days per year. For insurance firms, these returns are 4.1% and 3.6%, respectively. With regard to systematic risk, banks exhibit an average market beta of 1.1, while the average market beta of insurance firms is 0.9; the difference in means is significantly different from zero. We attribute the lower market beta of insurance firms to the nature of their business activities, which are expected to provide more stable cash flows, given that insurance products may be deemed more of a basic need than banking products, even in times of financial crises.

The timely evolvement of volatility during the 1992–2012 period for both samples is presented in figures 2-10. We document that all total, upside, downside, and idiosyncratic volatility measures exhibit a similar pattern over time. These six risk metrics exhibit an initial peak in 2000 and a subsequent recovery until the outbreak of the recent financial crisis in 2008. We attribute this initial peak to the burst of the dotcom bubble, which affected not only technology firms but also the global financial markets. For these six risk metrics, banks and insurance firms exhibit very similar patterns and average levels of volatility. As shown in figure 8, systematic volatility is higher for banks than for insurance firms throughout the entire observation period. From 2000 until 2008, both industries experience a steady increase in systematic risk, while the overall risk gap between both industries remains relatively constant over time. We attribute this increase in systematic risk to an increase in the economy-wide interrelatedness of financial market participants, particularly among firms in the financial services industry. Through the further globalization of financial markets, financial goods and services become increasingly more borderless, which creates a widely connected financial system that operates beyond regional and national borders.

Therefore, systematic risk may accumulate when financial services or products become more dependent on and linked to other financial services or products. Consequently, the potential for a concentration of risk and bulk risk among larger financial institutions that operate globally rises. This phenomenon could be observed during the recent financial crisis, when several leading financial institutions experienced financial trouble and required rescue by the government. Most of these institutions heavily engaged in mortgage lending activities and trading with asset-backed securities as well as collateralized debt obligations. Not surprisingly, extreme risk also increased in line with the other risk metrics. As presented in figures 9 and 10, average daily returns during the worst 10% of trading days and during the worst five consecutive trading days decreased at the beginning of the millennium and experienced a second negative peak in 2008.

Regarding the summary statistics for CEOs, we document that the average bank CEO earns a base salary that is 2.2 times higher than his or her annual bonus, which corresponds to an average pay sensitivity of 31.2%. The average CEO holds unvested in-the-money options and stock worth USD2.7 million and USD2.6 million, respectively, while the average value of vested in-the-money options held by a CEO is USD9.1 million.

In 65% of all company-year observations, the roles of CEO and supervisory board chairman are combined. Regarding firm characteristics, the average bank in our sample has a daily market capitalization of USD9.4 billion, an equity ratio of 10.3%, and a daily stock turnover of 0.6% relative to total shares outstanding.

Average CEO data for insurance firms are relatively similar to those for the banking sample. Average pay sensitivity is slightly higher for insurance firms than for banks, at 31.9%. The value of unvested and vested in-the-money options is also slightly higher for insurance firms, at USD3.5 million and USD13.1 million, respectively. The value of unvested stock is slightly lower for insurance firms, however, at USD2.5 million.

Figure 2. Average TOTVOL

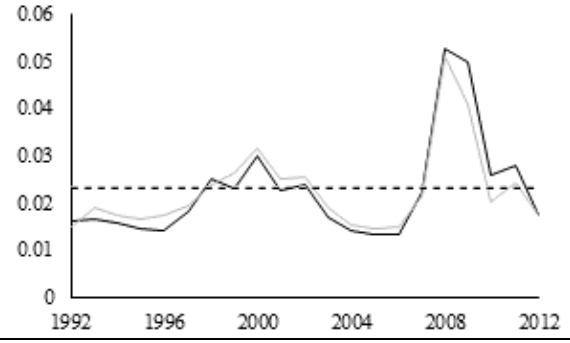


Figure 3. Average NEGVOL

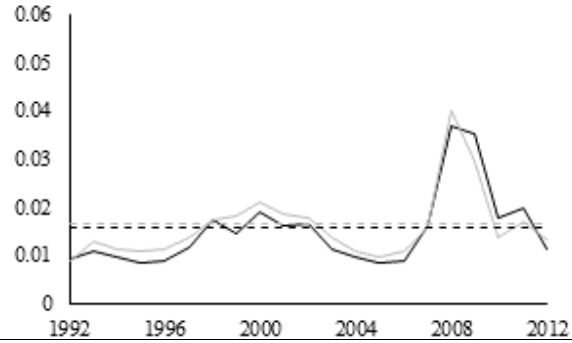


Figure 4. Average BELAVOL

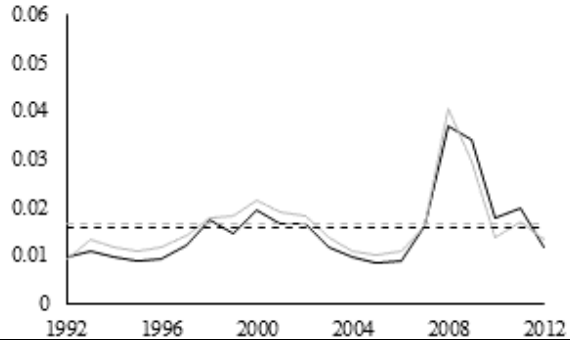


Figure 5. Average POSVOL

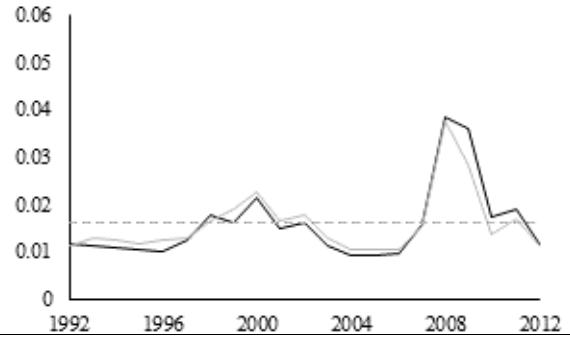


Figure 6. Average ABAVOL

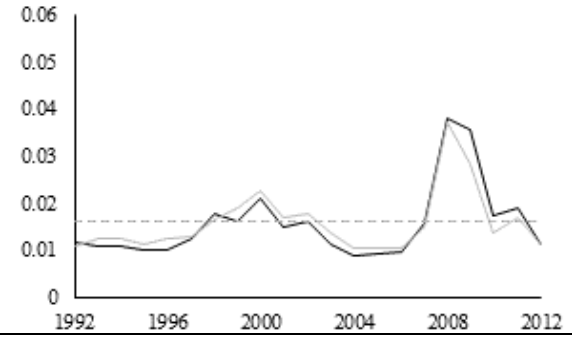


Figure 7. Average SYSVOL

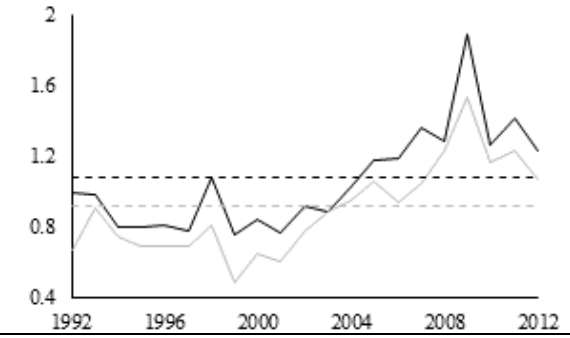


Figure 8. Average IDIOVOL

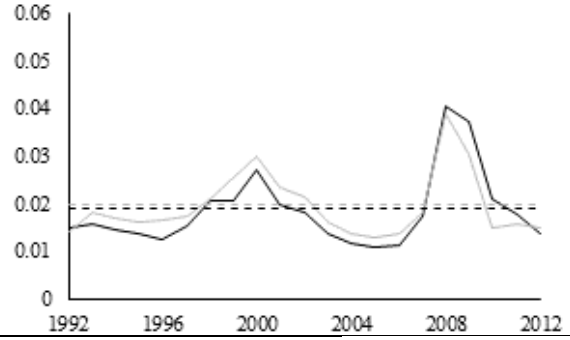


Figure 9. Average ARL10

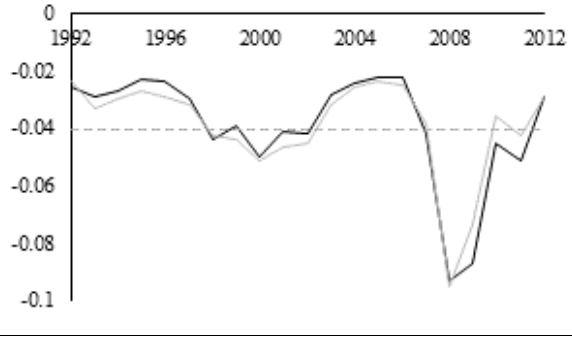
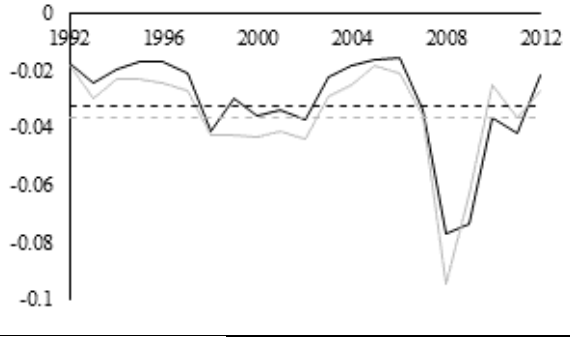


Figure 10. Average MR5C



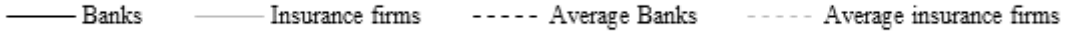


Table 2. Summary statistics

Variable	No. of obs.	Mean	Median	Lower quartile	Upper quartile	Std. dev.	Min.	Max.
Summary statistics for banks								
Volatility measures [13]								
TOTVOL	2,222	0.023	0.019	0.015	0.026	0.015	0.006	0.162
NEGVOL	2,222	0.016	0.012	0.009	0.018	0.012	0.004	0.167
BELAVOL	2,222	0.016	0.013	0.009	0.018	0.011	0.004	0.120
POSVOL	2,222	0.016	0.013	0.010	0.018	0.011	0.004	0.092
ABAVOL	2,222	0.016	0.013	0.010	0.018	0.011	0.004	0.085
SYSVOL	2,222	1.075	1.041	0.769	1.345	0.462	-0.310	3.315
IDIOVOL	2,222	0.019	0.015	0.012	0.021	0.012	0.005	0.156
ARL10	2,222	-0.040	-0.033	-0.046	-0.025	0.026	-0.214	-0.010
MR5C	2,222	-0.032	-0.024	-0.036	-0.017	0.027	-0.261	-0.005
CEO variables								
PAYSEN	2,222	0.312	0.335	0.000	0.532	0.278	0.000	1.000
OPTUNV	2,222	2.667	0.234	0.000	1.850	8.309	0.000	156.125
STOCKUNV	2,222	2.567	0.179	0.000	2.260	6.447	0.000	100.132
OPTV	2,222	9.142	1.580	0.072	6.802	28.844	0.000	521.064
DUALITY	2,222	0.65	1.00	0.00	1.00	0.48	0.00	1.00
Corporate control variables [2]								
SIZE	2,222	9,431	1,900	821	6,600	24,409	17	247,140
EQR	2,222	0.1034	0.0862	0.0722	0.1065	0.0817	0.0027	0.8429
LIQ	2,222	0.0062	0.0042	0.0027	0.0074	0.0065	0.0002	0.1205
Summary statistics for insurance firms								
Volatility measures [2]								
TOTVOL	1,445	0.023	0.019	0.015	0.027	0.015	0.007	0.128
NEGVOL	1,445	0.017	0.013	0.009	0.019	0.013	0.004	0.114
BELAVOL	1,445	0.017	0.013	0.009	0.019	0.013	0.005	0.124
POSVOL	1,445	0.016	0.013	0.010	0.019	0.011	0.005	0.117
ABAVOL	1,445	0.016	0.013	0.010	0.019	0.011	0.005	0.110
SYSVOL	1,445	0.915	0.849	0.640	1.076	0.482	-0.108	3.578
IDIOVOL	1,445	0.020	0.016	0.012	0.023	0.012	0.006	0.109
ARL10	1,445	-0.041	-0.034	-0.046	-0.025	0.027	-0.232	-0.013
MR5C	1,445	-0.036	-0.026	-0.040	-0.018	0.036	-0.429	0.004
CEO variables								
PAYSEN	1,445	0.319	0.351	0.000	0.556	0.290	0.000	0.984
OPTUNV	1,445	3.489	0.557	0.000	2.923	10.318	0.000	174.889
STOCKUNV	1,445	2.531	0.000	0.000	2.408	6.289	0.000	79.564
OPTV	1,445	13.054	2.253	0.088	8.987	65.303	0.000	1,601.658
DUALITY	1,445	0.57	1.00	0.00	1.00	0.50	0.00	1.00
Corporate control variables [2]								
SIZE	1,445	6,930	2,700	898	6,800	15,837	69	196,999
EQR	1,445	0.2724	0.2416	0.1447	0.3725	0.1651	0.0147	0.9431
LIQ	1,445	0.0069	0.0052	0.0029	0.0085	0.0074	0.0004	0.1382

[13] Summary statistics for volatility measures and corporate control variables are presented for their underlying values, not for the logarithmic values.

Strikingly, CEO duality seems to be less common in the insurance industry; in only 57% of all company-year observations, the firm opted to combine the roles of CEO and board chairman. Regarding firm characteristics, the average insurance firm is slightly smaller than the average bank, with a daily market capitalization of USD6.9 billion. On the other hand, insurance firms in our sample have an average equity ratio of 27.2% and an average daily stock turnover of 0.7% relative to total shares outstanding. As shown in figures 11 and 12, both industries experienced a steady increase in annual base salaries, while average bonuses decreased during the second half of the last decade.

Figure 11. Average CEO base salary

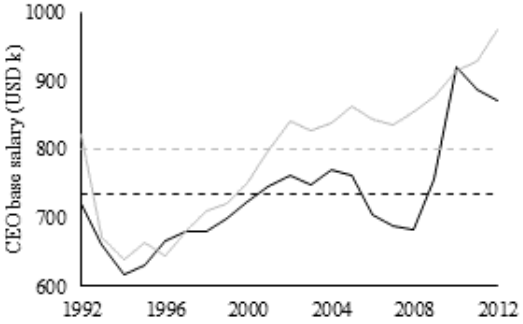
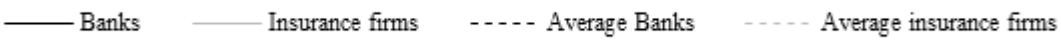


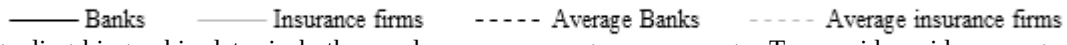
Figure 12. Average CEO annual bonus



Because of the decrease in annual bonuses, CEO pay sensitivity decreased sharply during the mid-2000s (figure 13). The difference between banks and insurance firms is marginal and in line with the evolution of yearly base salaries and bonuses. We argue that compensation structures are similar within the financial services industry and support the finding of Murphy (1999) that base salaries among CEOs are determined through benchmarking and are based on broader industry standards. Regarding CEO duality, we confirm Grinstein and Valles' (2008) findings of a decrease in CEO duality. Over time, more firms chose to separate the role of CEO and supervisory board chairman in both our samples (figure 14). Until 2000, the phenomenon of CEO duality was more pronounced for banks than for insurance firms, which is also reflected by the fact that, on average, banks were more likely to have combined CEO and board chairman roles during the entire observation period.

Figure 13. Average pay sensitivity

Figure 14. Average CEO duality



Regarding biographic data, in both samples, we find that the CEO is male in more than 98% of all company-year observations. Gender diversification appears to be slightly more pronounced in the banking industry than in the insurance industry, as among all CEOs during the entire observation period, 2% are female in the banking sample, whereas, only 1% are female in the insurance industry. Further, gender diversification has intensified since the early 2000s. Concerning CEO age, we report a relatively steady average age between 55 and 58 years and we do not see any significant increase in CEO age. Either CEOs do not stay longer in their position during the observation period, i.e., average tenure stays rather constant, or when CEOs do stay, "new" CEOs are younger on average. To provide evidence regarding whether CEOs are younger when they are recruited, we search our data samples for all CEO-year observations for which the CEO is in the first year of his or her tenure. We thus delete the first company-year observations since we have no data on whether the CEO has been in his or her position before that particular year. We then take the average age of all first-year CEOs and report the results in figure 16. We document an up- or downward trend in the entry age of a CEO in neither sample. Finally, we present the timely evolvement of total assets and document a rather steady increase, which is in line with the growth of the financial services industry as a whole.

Figure 15. Percentage of male CEOs

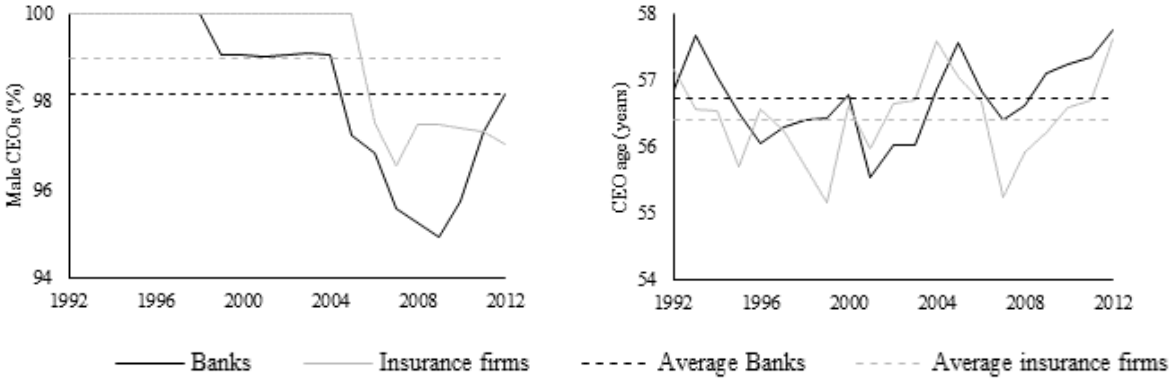


Figure 16. Average CEO age

Figure 17. Average CEO entry age

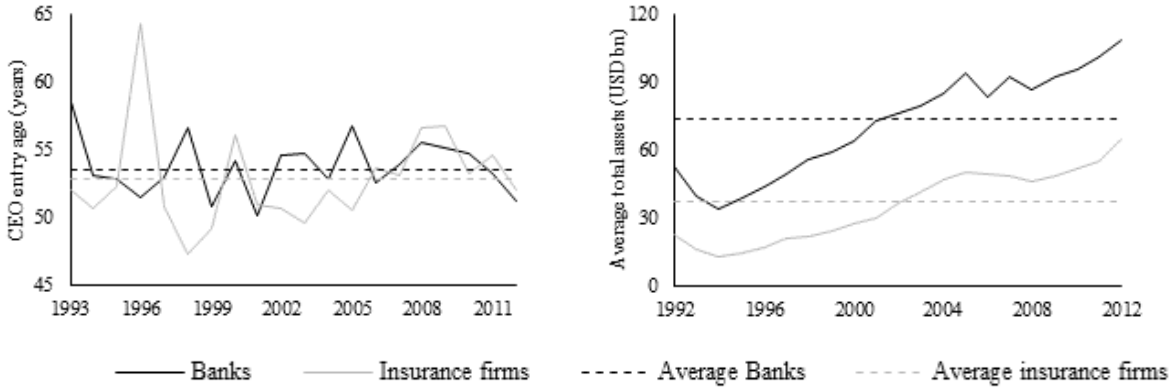


Figure 18. Average total assets

The regression results for banks are presented in table 3.

We find that the CEOs´ pay sensitivity (PAYSEN) is significantly negatively related to most volatility measures (except for systematic risk) and significantly positively related to the measures for extreme risk (ARL10 and MR5C). Empirical evidence suggests that banks whose CEOs earn high bonuses relative to their annual base salary exhibit lower levels of stock return volatility and extreme risk. Such evidence contradicts our expectation that high bonus potential may increase managerial risk appetite and may therefore positively relate to firm risk. Furthermore our results are in contrast to most previous studies. From an ex-post perspective, we argue that banks that exhibit high average return volatilities are less likely to pay high bonuses, given that they cannot provide risk-averse shareholders with an adequate risk premium. The recent financial crisis provides evidence that in times of crisis, base salaries increase while bonuses decrease. Consequently, we observe low pay sensitivity in times of economic downturn, when overall market volatility may be particularly high, and high pay sensitivity in times of economic prosperity, when overall market volatility may be low. Based on this reasoning, we can rationally assume that compensation structures with regard to short-term incentives, i.e., with regard to base salaries and annual bonuses, are altered relative to the overall economic condition.

Long-term incentive structures, approximated by the value of unvested in-the-money options (OPTUNV) and by the value of restricted stock (STOCKUNV), are also significantly related to firm risk.

The value of unvested in-the-money stock options (OPTUNV) is statistically significant and negatively related to both measures of downside volatility (NEGVOL, BELAVOL) and to the idiosyncratic risk (IDIOVOL) at the 0.05 level. Further, value of unvested in-the-money stock options is significantly and positively related to the measures of extreme risk (ARL10, MR5C) at the 0.01 level. Consequently, the higher the value of unvested in-the-money options is, the lower the bank's extreme risk is for the present bank sample.

Similarly, the value of restricted stock (STOCKUNV) is significantly and negatively related to downside risk (NEGVOL, BELAVOL) and systemic risk (SYSVOL). Given that stock- and option-based compensation structures may be used to better align the interests between CEOs and shareholders, the use of long-term incentive structures may coincide with a reduction of firm risk.

The value of unvested in-the-money stock options is calculated based on the difference between a company's stock price and the option's exercise price. Similarly, the value of restricted stock is calculated based on the number of restricted stock held by the CEO multiplied by the company's stock price at year-end. Therefore, executive managers with high restricted option and stock holdings may be interested in minimizing firm risk until the vesting date to avoid risking a deterioration of the firm's stock price.

Table 3. Regression results for banks

Variables	ln(TOTVOL)	ln(NEGVOL)	ln(BELAVOL)	ln(POSVOL)	ln(ABAVOL)	SYSVOL	ln(IDIOVOL)	ARL10	MR5C
PAYSEN	**-0.091**	**-0.148**	**-0.147**	**-0.082**	**-0.083**	-0.073	**-0.111**	**0.007**	**0.012**
	(2.97)**	**(3.98)****	**(3.91)****	**(2.28)***	**(2.33)***	(1.74)	**(3.21)****	**(3.26)****	**(3.12)****
OPTUNV	-0.001	**-0.003**	**-0.002**	-0.000	-0.001	0.001	**-0.002**	**0.000**	**0.000**
	(0.99)	**(2.06)***	**(2.02)***	(0.64)	(0.73)	(0.47)	**(2.01)***	**(2.73)****	**(4.93)****
STOCKUNV	-0.001	**-0.002**	**-0.002**	-0.001	-0.001	**-0.006**	-0.001	0.000	-0.000
	(1.46)	**(2.37)***	**(2.33)***	(0.81)	(0.66)	**(2.73)****	(1.36)	(0.03)	(0.28)
OPTV	0.000	-0.000	-0.000	0.000	0.000	-0.001	0.000	-0.000	0.000
	(0.22)	(0.11)	(0.10)	(0.58)	(0.61)	(1.30)	(0.84)	(0.31)	(0.04)
DUALITY	-0.030	**-0.049**	**-0.050**	-0.018	-0.024	0.014	-0.045	0.002	0.003
	(1.39)	**(1.98)***	**(2.06)***	(0.80)	(1.04)	(0.44)	(1.87)	(1.28)	(1.90)
SIZE	**-0.129**	**-0.110**	**-0.115**	**-0.159**	**-0.165**	-0.003	**-0.176**	**0.009**	**0.008**
	(6.14)**	**(5.06)****	**(5.43)****	**(6.16)****	**(6.22)****	(0.10)	**(7.24)****	**(6.45)****	**(3.85)****
EQR	**-0.068**	**-0.083**	**-0.084**	-0.061	-0.059	-0.069	**-0.081**	**0.011**	**0.009**
	(2.39)*	**(2.55)***	**(2.60)****	(1.74)	(1.62)	(1.26)	**(2.43)***	**(5.53)****	**(2.33)***
LIQ	**0.215**	**0.258**	**0.243**	**0.207**	**0.197**	**0.215**	**0.242**	**-0.011**	**-0.013**
	(8.74)**	**(9.02)****	**(8.80)****	**(7.90)****	**(7.41)****	**(6.52)****	**(8.72)****	**(7.43)****	**(7.37)****
CONS	-2.144	-2.561	-2.572	-2.294	-2.312	1.887	-1.691	-0.125	-0.125
	(10.78)**	(11.22)**	(11.03)**	(10.14)**	(9.71)**	(6.24)**	(7.43)**	(9.07)**	(5.68)**
N	2,222	2,222	2,222	2,222	2,222	2,222	2,222	2,222	2,222
No. of groups	246	246	246	246	246	246	246	246	246
Av. obs. per group	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
F-statistic	222.27	174.81	161.63	186.63	179.03	45.64	153.88	102.13	46.23
R^2	0.881	0.843	0.841	0.859	0.854	0.700	0.854	0.821	0.673
Adj. R^2	0.864	0.821	0.819	0.840	0.834	0.658	0.834	0.796	0.628
Adj. R^2 (CC+FE)	0.863	0.816	0.815	0.839	0.833	0.654	0.831	0.793	0.620
Adj. R^2 (FE)	0.809	0.762	0.761	0.788	0.784	0.617	0.754	0.718	0.548

*Note: The above table presents the regression results for the banking sample. Coefficients, which are significant at least at the 0.05 level, and the corresponding t-statistic are highlighted in bold. Each regression model includes firm fixed effects and year dummies as well as robust standard errors clustered at the firm level. The F-statistic is calculated based on 28 explanatory variables, i.e., including the 20 year dummies (the coefficients for the dummy variables are not reported in the output tables). Adj. R^2 (CC+FE) reflect adjusted R^2 when the regression model includes corporate control variables, company fixed effects, and year dummies but not CEO variables. Adj. R^2 (FE) reflects adjusted R^2 when the regression model includes both company fixed effects and year dummies but not CEO and corporate control variables. The absolute value of t-statistics is listed in parentheses; *, p<0.05; **, p<0.01.*

On the other hand, the value of vested unexercised in-the-money options (OPTV) is not significantly related to firm risk. Consequently, we cannot confirm our hypothesis that managerial overconfidence, measured by this variable, and firm risk are significantly related.

CEO duality, however, is statistically significant and negatively related to downside volatility (NEGVOL, BELAVOL) at the 0.05 level. Given this result, banks that combine the role of CEO and chairman of the board generally exhibit less downside volatility. CEO duality may be thus considered a tool to lead a company more efficiently. Therefore, risk-averse CEOs may be better able to limit their firm's risky activities to secure their own position, which may be reflected in a reduction in downside firm risk.

Regarding the firm-specific characteristics of banks, our empirical findings are generally in line with arguments proposed in previous research.

The regression results for insurance firms (table 4) are mostly, but not all similar to those obtained for the banking sample.

The CEOs´pay sensitivity (PAYSEN) is highly significant and negatively related to total volatility (TOTVOL), downside volatility (NEGVOL, BELAVOL), and idiosyncratic risk (IDIOVOL). It is positively related to the extreme risk (ARL10, MR5C).

Additionally, similarly to the results for the banking sample, the value of unvested in-the-money stock options (OPTUNV) is statistically significant and negatively related to the negative volatility (NEGVOL). The value of restricted stock (STOCKUNV) is not significantly related to any metric, while the value of vested unexercised in-the-money options (OPTV) is negatively related to the average return of the worst 10% trading days (ARL10), indicating a positive relationship with extreme risk. While we do not find any significant relation between overconfidence and firm risk for the banking sample, we document a positive relationship between overconfidence and firm risk for the insurance sample, which is in line with our expectation stated earlier. Contrary to the result for the banking sample, CEO duality is positively related to firm risk for the insurance sample. Overall, the empirical results suggest that incentive and managerial power structures are not entirely congruent in both sub-industries, i.e., between banking and insurance firms.

Regarding firm-specific characteristics of insurance firms, all in all we document the same types of relationships between all three corporate control variables and firm risk as already documented for the banking sample which is in line with literature.

As a robustness check, we run a second model and change the setup to account for any time lag. We apply a one-year lag structure and lag all CEO variables by one year to account for the potential lagged effect of risk-taking driven by managerial incentives on firm risk.[14]

For the banking sample, the results are generally in line with the non-lagged results; however, statistical significance is less pronounced.[15] For insurance firms, only PAYSEN and DUALITY are statistically significant (with the coefficient signs being in line with those for the non-lagged model).[16]

A summary of expected results in comparison with observed findings is presented in table 5. Generally, the empirical evidence provides two major surprising results with regard to CEO characteristics. First, the CEO pay sensitivity was not expected to be negatively related to firm risk. Second, the difference between banks and insurance firms with regard to CEO duality provides certain empirical evidence that managerial power structures and risk-taking incentives may differ among those two sub-industries.

5 Discussion and conclusions

This study examines the relation among CEO characteristics, firm characteristics, and stock return volatilities for 246 US listed banks and 139 US listed insurance companies for the period from 1992 to 2012.

As we take a comprehensive and long-term perspective, our paper provides further empirical evidence of the importance of managerial risk-taking incentives for explaining overall firm risk, in particular for stockholders in financial services firms which are often excluded in other studies or analyzed from a debtholder´s or regulatory perspective. Certainly, investors—as well as CEOs—consider not only risk but also the potential return in making decisions. Nevertheless, our analysis interprets risk-taking of CEOs as an independent concept that must not be directly related to (expected) returns. We aim to find support for the perspective that CEO characteristics reflect a non-traded part of firm risk that investors should account for when assessing the risk of investing in shares of financial services firms. Therefore, we do not aim to provide or to confirm an asset pricing model that helps predict asset returns or that explains the trade-off between risk and return. Given the results of our empirical study, we find significant support for the appropriateness of this perspective. Accordingly, investors should not neglect CEO characteristics and incentive structures as explanatory factors of stock return volatility.

14 Except for EQR, the corporate control variables are not lagged, as they are based on market trading data, are reflective of all current information, and are observable to everyone immediately. EQR is lagged by one year because investors mostly rely on the last available balance sheet information

15 While PAYSEN and STOCKUNV are significant in three cases, OPTUNV, OPTV, and DUALITY are no longer significant.

16 OPTUNV, STOCKUNV, and OPTV are no longer significant. Regarding the corporate control variables, the findings are in line with those for the non-lagged model.

Table 4. Regression results for insurance firms

Variables	ln(TOTVOL)	ln(NEGVOL)	ln(BELAVOL)	ln(POSVOL)	ln(ABAVOL)	SYSVOL	ln(IDIOVOL)	ARL10	MR5C
PAYSEN	**-0.081**	**-0.241**	**-0.221**	-0.016	-0.009	0.072	**-0.113**	**0.007**	**0.021**
	(2.13)*	**(4.39)****	**(3.94)****	(0.41)	(0.24)	(1.27)	**(3.06)****	**(2.66)****	**(4.01)****
OPTUNV	-0.001	**-0.002**	-0.002	0.000	0.000	-0.000	-0.001	0.000	0.000
	(1.19)	**(2.15)***	(1.95)	(0.38)	(0.19)	(0.07)	(1.48)	(1.77)	(1.89)
STOCKUNV	0.000	-0.001	-0.001	-0.000	0.000	0.001	-0.001	0.000	0.000
	(0.04)	(0.35)	(0.30)	(0.14)	(0.09)	(0.64)	(0.83)	(0.82)	(1.66)
OPTV	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**-0.000**	-0.000
	(1.10)	(0.65)	(0.48)	(0.58)	(0.57)	(0.15)	(1.41)	**(2.10)***	(0.84)
DUALITY	**0.055**	**0.056**	0.052	**0.066**	**0.072**	0.054	**0.057**	**-0.003**	-0.003
	(2.67)**	**(2.02)***	(1.81)	**(3.27)****	**(3.43)****	(1.59)	**(2.76)****	**(2.05)***	(1.44)
SIZE	**-0.136**	**-0.095**	**-0.102**	**-0.175**	**-0.182**	**-0.105**	**-0.143**	**0.009**	0.004
	(6.43)**	**(3.20)****	**(3.54)****	**(8.23)****	**(8.18)****	**(3.08)****	**(6.60)****	**(5.53)****	(1.55)
EQR	**-0.154**	**-0.179**	**-0.188**	**-0.148**	**-0.147**	**-0.174**	**-0.199**	**0.015**	**0.024**
	(3.87)**	**(3.49)****	**(3.65)****	**(3.75)****	**(3.73)****	**(2.55)***	**(4.48)****	**(5.01)****	**(3.62)****
LIQ	**0.335**	**0.410**	**0.399**	**0.316**	**0.315**	**0.296**	**0.351**	**-0.016**	**-0.022**
	(9.09)**	**(8.40)****	**(8.30)****	**(8.97)****	**(8.89)****	**(5.83)****	**(9.83)****	**(7.71)****	**(7.08)****
CONS	-1.325	-1.650	-1.626	-1.492	-1.456	2.907	-1.229	-0.170	-0.155
	(4.66)**	(4.09)**	(4.12)**	(5.43)**	(5.17)**	(6.84)**	(4.71)**	(9.63)**	(5.44)**
N	1,445	1,445	1,445	1,445	1,445	1,445	1,445	1,445	1,445
No. of groups	139	139	139	139	139	139	139	139	139
Av. obs. per group	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4
F-statistic	72.80	83.36	77.08	65.18	68.28	20.02	54.25	24.98	23.10
R^2	0.836	0.778	0.776	0.800	0.794	0.628	0.827	0.762	0.571
Adj. R^2	0.815	0.749	0.747	0.774	0.767	0.579	0.805	0.731	0.516
Adj. R^2 (CC+FE)	0.813	0.740	0.739	0.772	0.765	0.578	0.801	0.727	0.499
Adj. R^2 (FE)	0.672	0.612	0.610	0.637	0.631	0.472	0.644	0.571	0.359

*Note: The above table presents the regression results for the insurance sample. Coefficients, which are significant at least at the 0.05 level, and the corresponding t-statistic are highlighted in bold. Each regression model includes firm fixed effects and year dummies as well as robust standard errors clustered at the firm level. The F-statistic is calculated based on 28 explanatory variables, i.e., including the 20 year dummies (the coefficients for the dummy variables are not reported in the output tables). Adj. R^2 (CC+FE) reflect adjusted R^2 when the regression model includes corporate control variables, company fixed effects, and year dummies but not CEO variables. Adj. R^2 (FE) reflects adjusted R^2 when the regression model includes both company fixed effects and year dummies but not CEO and corporate control variables. The absolute value of t-statistics is listed in parentheses; *, p<0.05; **, p<0.01.*

Table 5. Summary of expected vs. observed results

Variable of interest	Expected sign / expected relationship with firm risk	Observed sign	
		Banks	Insurance firms
CEO pay sensitivity	+	–	–
Value of unvested in-the-money options	–	–	–
Value of unvested stock	–	–	ns
Value of vested in-the-money options (confidence)	+	ns	+
CEO duality	+	–	+

+: significant, positive relationship in at least one case (at the 0.05 level)
–: significant, negative relationship in at least one case (at the 0.05 level)
ns: not significant

Overall, our results provide empirical evidence that CEO characteristics are statistically relevant for explaining firm risk. Specifically, we find that CEO pay sensitivity to annual base salary and yearly bonus payment is negatively related to firm risk. In light of theory and findings reported in the literature, this finding is surprising at first glance. An explanation for this finding may be that investors do not like high volatility; therefore, the bonuses of CEOs who assume substantial risk may be lower than the bonuses of CEO who provide more stable stock returns. Moreover, we find that non-vested stock holdings and non-vested stock options are negatively linked to a CEO's risk appetite with respect to return volatility. Therefore we find evidence that long-term compensation schemes reduce risk-taking which is in line with previous studies. For the insurance sector, we find empirical evidence for interpreting the value of vested in-the-money options as a signal of CEO (over)confidence. These results are in line with theoretical modelling and empirical research in the literature.

As mentioned above, the evidence for a link between CEO duality and stock return volatility remains somewhat unclear. We find a significant relationship in both sectors—banking and insurance—but different coefficient signs. For insurance companies, we document a positive relation, which can be expected based on previous studies. For banks, we find a negative relation, which may indicate that the risk incentives of the board structure depend on the industry. This result may be of interest to regulators as well as to investors; however, future research is required to obtain a deeper understanding of the mechanisms underlying this relation.

The limitations of this study are threefold. First, we analyze only the significance of examined relations, not their causality. This limitation is due to our methodology, which was determined by the available data. Therefore, our results should be considered a first step in identifying the relations among CEO characteristics, firm characteristics, and the stock return volatility of financial institutions. Second, we use only generic hard facts as CEO characteristics. It may be interesting to also use more individual (e.g. industry-specific vs. general management experience) or psychological (e.g. charisma, hubris, or egoism) characteristics. Third, the analysis could be extended to the overall management board to investigate the interaction among the individual team members.

As some need for future research remains, this limited study has its particular contribution in providing an indication and understanding that links exist in the financial services industry as in the non-financial services world among CEO characteristics—arising particularly from compensation and incentive structures—and stock return volatility. As human capital is highly specific and not tradable, CEO characteristics are idiosyncratic risk factors that should be considered by investors who invest in shares of banks and insurance firms. The significance of certain elements of our comprehensive framework indicates that the very particular business model of financial intermediaries provides only for limited specialty to a certain degree with regard to the link between CEOs and investors´ risk. Even though banks and insurance firms both stems from the broader financial services industry, slight differences in the findings of our analysis indicate that especially with regard to corporate governance, the financial services industry is relatively heterogeneous. Thereby, we argue that, given our findings on CEO duality, regulation may need to distinguish more thoroughly between banks and insurance firms. Similarly this gives rise to the question whether each subindustry fosters certain governance structures. Last, we argue that CEOs matter and implementing CEO variables into an empirical volatility model improves the overall model fit. Given this, we agree that human resource risk, defined in the three-dimensional way we present in this paper, may provide for a non-traded risk factor that is linked to overall firm risk.

References

1. Acrey, J., McCumber, W. and Nguyen, T. (2011): "CEO incentives and bank risk", Journal of Economics and Business 63 (5), 456–471
2. Agrawal, A. and Mandelker, G. (1987): "Managerial incentives and corporate investment and financing decisions", Journal of Finance 42 (4), 823–837
3. Anderson, R. and Fraser, D. (2000): "Corporate control, bank risk-taking, and the health of the banking industry", Journal of Banking & Finance 24 (8), 1383–1398

4. Armstrong, C. and Vashishtha, R. (2012): "Executive stock options, differential risk-taking incentives, and firm value", Journal of Financial Economics 104 (1), 70–88
5. Barker, V. and Mueller, G. (2002): "CEO Characteristics and Firm R&D Spending", Management Science 48 (6), 782–801
6. Bauguess, S., Moeller, S., Schlingemann, F. and Zutter, C. (2009): "Ownership structure and target returns", Journal of Corporate Finance 15 (1), 48–65
7. Bebchuk, L. and Grinstein, Y. (2005): "Firm Expansion and CEO Pay", Economics and Business Discussion Paper Series, paper 533, Harvard Law School
8. Belghitar, Y. and Clark, E. (2012): "The Effect of CEO Risk Appetite on Firm Volatility: An Empirical Analysis of Financial Firms", International Journal of the Economics of Business 19 (2), 195–211
9. Bergstresser, D. and Philippon, T. (2008): "CEO incentives and earnings management", Journal of Financial Economics 80 (3), 511–529
10. Campbell, T. C., Gallmeyer, M., Johnson, S., Rutherford, J. and Stanley, B. (2011): "CEO optimism and forced turnover", Journal of Financial Economics 101 (3), 695–712
11. Chen, C., Steiner, T., and Whyte, A. (1998): "Risk-taking behavior and management ownership in depository institutions", Journal of Financial Research 21 (1), 1–16
12. Chen, C., Steiner, T., and Whyte, A. (2006): „Does stock option-based executive compensation induce risk-taking? An analysis of the banking industry", Journal of Banking & Finance, 30(3), 915–945.
13. Chok, I. and Sun, Q. (2007): "Determinant of idiosyncratic volatility for biotech IPO firms", Financial management 36 (4), 107–122
14. Das, S., Hong, K. and Kim, K. (2012): "Earnings Smoothing, Cash Flow Volatility, and CEO Cash Bonus", working paper, University of Illinois at Chicago, University of North Carolina at Charlotte, University of Missouri at Columbia
15. DeFusco, R., Johnson, R. and Zorn, T. (1990): "The effect of executive stock options on stockholders and bondholders", Journal of Finance 45 (2), 617–627
16. Dey, A., Engel, E. and Liu, X. (2011): "CEO and board chair roles: To split or not to split?", Journal of Corporate Finance 17 (5), 1595–1618
17. Dittmann, I. and Maug, E. (2007): "Lower Salaries and No Options? On the Optimal Structure of Executive Pay", Journal of Finance 62 (1), 303–343
18. Fahlenbrach, R. and Stulz, R. (2011): "Bank CEO incentives and the credit crisis", Journal of Financial Economics 99 (1), 11–26
19. Fama, E. and French, K. (1992): "The cross-section of expected stock returns ", Journal of Finance 47 (2), 427–465
20. Fama, E. and French, K. (1996): "Multifactor Explanations of Asset Pricing Anomalies", Journal of Finance 51 (1), 55–84
21. Goyal, A. and Santa-Clara, A. (2003): "Idiosyncratic Risk Matters", Journal of Finance 58 (3), 975–1008
22. Grinstein, Y. and Valles, Y. (2008): "Separating the CEO from the chairman position: determinants and changes after the new corporate governance regulation", working paper, Cornell University
23. Hagendorff, J. and Vallascas, F. (2011): "CEO pay incentives and risk-taking: Evidence from bank acquisitions", Journal of Corporate Finance 17 (4), 1078–1095
24. Hall, B. J. (1998): "The pay to performance incentives of executive stock options", NBER working paper no. 6674, Cambridge, MA
25. Hoffmann, O., Hungenberg, H. and Mammen, J. (2012): "The influence of CEO compensation structure on risk taking", working paper, IUP-Arbeitspapier 12–01, Nuremberg/Berlin
26. Houston, J. F., & James, C. (1995): "CEO compensation and bank risk Is compensation in banking structured to promote risk taking?", Journal of Monetary Economics, 36(2), 405–431.
27. Kuang, Y. and Qin, B. (2013): "Credit Ratings and CEO Risk-Taking Incentives", Contemporary Accounting Research 30 (4), 1524–1559
28. Lewellyn, K. and Muller-Kahle, M. (2012): "CEO Power and Risk Taking: Evidence from the Subprime Lending Industry", Corporate Governance: An International Review 20 (3), 289–307
29. Lintner, J. (1965a): "Security prices, risk and the maximal gains from diversification", Journal of Finance 20 (4), 587–615
30. Lintner, J. (1965b): "The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets", Review of Economics and Statistics 47 (1), 13–37
31. Loderer, C. and Martin, K. (1997): "Executive stock ownership and performance tracking faint traces", Journal of Financial Economics 45 (2), 223–255
32. Malmendier, U. and Tate, G. (2005): "CEO Overconfidence and Corporate Investment", Journal of Finance 60 (6), 2661–2700
33. Markowitz, H. (1952): "Portfolio selection", Journal of Finance 7 (1), 77–91
34. Mehran, H. and Rosenberg, J. (2007): "The Effect of Employee Stock Options on Bank Investment Choice, Borrowing, and Capital", Staff Report no. 305, Federal Reserve Bank of New York, NY
35. Murphy, K. (1999): "Executive Compensation", in: Ashenfelter, O. and Card, D. (Eds.), Handbook of Labor Economics Vol. 3, Part B, Chapter 38, 2485–2563, Elsevier Science
36. Murphy, K. and Zábojník, J. (2004): "CEO Pay and Appointments: A Market-Based Explanation for Recent Trends", American Economic Review 94 (2), 192–196
37. Murphy, K. and Zábojník, J. (2007): "Managerial Capital and the Market for CEOs", working paper no. 1110, Queen's University, Kingston, Ontario
38. Pan, Y., Wang, T. and Weisbach, M. (2013): "Learning about CEO Ability and Stock Return Volatility", NBER working paper no. 18882, Cambridge, MA
39. Rajgopal, S. and Shevlin, T. (2002): "Empirical evidence on the relation between stock option compensation and risk taking", Journal of Accounting and Economics 33 (2), 145–171

40. Saunders, A., Strock, F. and Travlos, N. (1990): "Ownership structure, deregulation and bank risk-taking", Journal of Finance 45 (2), 643–654
41. Sharpe, W. (1964): "Capital asset prices: a theory of market equilibrium under conditions of risk", Journal of Finance 19 (3), 425–442
42. Shen, C. and Zhang, H. (2013): "CEO risk incentives and firm performance following R&D increases", Journal of Banking & Finance 37 (4), 1176–1194
43. Wang, H., Tsui, A. and Xin, K. (2011): "CEO leadership behaviors, organizational performance, and employees' attitudes", Leadership Quarterly 22 (1), 92–105
44. Wei, C. and Yermack, D. (2010): "Deferred Compensation, Risk, and Company Value: Investor Reactions to CEO Incentives", Staff Report No. 445, Federal Reserve Bank of New York, NY