

Managerial Compensation in the Financial Service Industry

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Abstract

CEO compensation in the financial sector has been a controversial topic following the recent financial crisis. I use a new dataset with detailed information on CEO compensation of major international banks from 2000 to 2008 to explain how managerial incentives influence banks' policy choices and bank risk taking. Differently to previous studies with a focus on U.S. banks, I can show that remuneration had an impact on bank performance during the financial crisis. Banks which endowed their top management with high risk taking incentives performed worse in the period after the Lehman collapse. Banks which granted more stocks to their CEOs performed better. Moreover using simultaneous equation models I show that over time bank risk and bank policy choices have been positively correlated with CEOs risk taking incentives. From a bank policy perspective CEOs rely on riskier, fee based activities.

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Keywords: Executive Compensation, Banking, Financial Crisis

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1 Introduction

Triggered by the U.S. subprime crisis, financial institutions around the world have suffered from tremendous write downs on their assets. According to estimates of the Boston Consulting Group, the global banking industry's market capitalization dropped from \$ 9.3 trillion in October 2007 to \$ 3.1 trillion in February 2009 and since then has regained about 50% of the lost market value. A wide range of fiscal, monetary and financial polices has been implemented to cut the feedback loops between the financial sector and the real economy. Additional to central banks' effort to support liquidity in the financial industry, governments intervened heavily in the financial system. Total upfront government financing sums up to 5.8 % of GDP on average for advanced economies reaching more than 50 % of GDP when taking into account total support of the financial sector (including guarantees and central bank liquidity provisions).¹

To justify the expenditures on bailouts of those firms which are widely perceived to be responsible for the crisis, policy makers have been introducing and are planning to introduce various new financial regulations, out of which restrictions on executive compensation play a prominent role. For example the U.S. implemented the troubled assets relief program (TARP), which provides capital injections to the financial sector contingent on the compliance to limits on executive compensation. In Germany banks seeking help from the comparable SoFFin program need to limit their CEOs' remuneration to a maximum of half a million Euro per year, including bonus payments. Similar restrictions hold for banks participating in the British bank rescue package. Further regulation on bank CEOs' remuneration are discussed and range from increasing shareholder rights over stronger supervisory power to plain restrictions on the levels of CEO pay.

Ex-post we can certainly say that banks took on too much risk during the period which led to the recent financial turmoil. Many institutions shifted their business model from traditional banking to more volatile investment banking, relied heavily on loan securitization or overloaded their portfolios with mortgage backed securities whose risk was not correctly understood. High leverage ratios, both on-balance sheet and off-balance sheet, aggravated the situation even further. Kashyap et al. (2008) argue that the contamination of bank balance sheets with a great range of problematic assets was caused

¹According to IMF staff position note SPN/09/13

by the failure of incentive and risk control systems within banks. Bank CEOs are in fact key decision makers who are exposed to various forms of performance based compensation and additionally aligned to shareholders' interests via bank equity. To form an opinion about an adequate regulation of their compensation contracts several questions have to be answered:

First, are the incentives provided by CEOs' compensation packages designed to increase bank risk through risky bank policy choices? Coles et al. (2006) for U.S. firms and recently DeYoung et al. (2009) for U.S. banks study the impact executive compensation packages have on risk and policy choices. Both studies find that CEO incentives do have an impact on risk taking. My work complements this strand of literature by providing for the first time international evidence over a comparatively long sample period. The dataset comprises detailed information on base salary, bonus payments, stock ownership and option holdings of top officers of 76 banks from 18 countries² for the period 1997-2008. I investigate the effect managerial compensation has on bank risk by explaining market and accounting based risk measures (equity risk, idiosyncratic risk, systematic risk, distance-to-default), and measures of bank policies (non-interest income, leverage) with CEO incentives. The sensitivity of CEOs' portfolio³ to changes in equity volatility (vega) is used as a measure of risk taking incentives. The sensitivity of CEOs' portfolio to stock price changes (delta) is used as a proxy for the incentive alignment between shareholders and management. Though depending on option characteristics and on the leverage of the bank, typically stock options provide higher incentives to increase volatility than stocks. Therefore CEOs with a greater exposure to options would be expected to choose riskier policies leading to an increase in bank risk, while CEOs with large stock holdings would act in a more conservative fashion.

My results show that there is a strong link between CEO incentives and bank risk taking. I find that equity volatility and idiosyncratic risk increase in vega and decrease in delta. Similarly high risk taking incentives lead to a decrease of banks' distance-to-default while incentive alignment through high delta has the opposite effect. When looking at bank policies I find that the non-interest income to total income ratio is higher for CEOs with high

²Austria, Australia, Belgium, Canada, Denmark, France, Germany, Ireland, Israel, Italy, Netherlands, Norway, Singapore, Sweden, Switzerland, Spain, United Kingdom

³Options, stocks and restricted stocks

vega and low delta. A high level of non-interest income is an indicator of banks' focus on fee based activities and of the securitization of loans, two activities which have been associated with high risk. On the other hand, the total capital ratio and the tier one capital ratio are higher when banks use large option based incentive measures, which suggests a precautionary behavior of banks when increasing risk.

Second, how does remuneration policy interact with bank characteristics, different regulatory regimes and the overall legal environment? Are compensation systems comparable throughout the world and is it necessary to introduce new, potentially distortive regulations or are there already supervisory regimes in place that address the problem of excessive risk taking incentives accurately? On the one hand tough regulation may encourage shareholders to increase CEO risk taking incentives as a countermeasure. On the other hand strong supervisory authorities may be able to prevent excessive risk taking of banks which would reduce the need to launch expensive risk inducing remuneration schemes. Similarly, bank supervision may be a substitute for monitoring and could therefore decrease the necessity of tying managerial wealth to bank performance. John and Qian (2003) interpret lower pay-performance sensitivities in banks than in manufacturing firms as evidence for this hypothesis. Different to previous studies the international character of my dataset allows to assess the impact legal and regulatory environments have on the structure and the level of CEO remuneration. I measure regulatory power via the indices provided by Barth et al. (2001) (restriction on bank activities, independence, supervisory rights, capital requirements, private monitoring) and the shareholder rights via the revised anti-director-rights index by Djankov et al. (2008).

I find that the structure and level of managerial compensation in the banking sector has been converging over time. Cash compensation and bonuses have reached similar levels in most countries, long term incentive plans have been widely adapted and equity based compensation plays an increasingly important role. Nevertheless CEOs from the US rely far more on equity based compensation than banks from any other country throughout the whole sample period. When looking at the impact of regulation on CEO compensation the findings of John and Qian (2003) cannot be supported. In my sample banks from countries with strong regulators rely more on equity based compensation than those from countries with weaker shareholder protection.

Third, did managerial compensation actually play a role in the recent financial crisis? Fahlenbrach and Stulz (2009) and Beltratti and Stulz (2009) try to explain the returns of banks during the financial crisis using bank and country specific governance measures. Fahlenbrach and Stulz (2009) find no evidence that banks with a more risk inducing remuneration policy performed worse during the financial downturn, using a sample of U.S. banks. Beltratti and Stulz (2009) report that on an international level banks with shareholder friendly boards performed worse and those exposed to stricter capital regulation better. I contribute to this literature by extending the Fahlenbrach and Stulz (2009) approach to an international sample, taking into account regulation and legal environments. Furthermore my dataset allows to investigate the impact of the timeseries of CEO compensation on the banks' performance during the financial crisis.

Although I do not find any impact of managerial compensation on equity returns during the crisis, I can show that accounting based performance measures are strongly correlated with my incentive measures. Banks relying on option based compensation and on short term bonuses performed worse than banks whose CEOs held a large share in stocks.

The remainder of the paper is organized as follows. The next section summarizes the existing literature on managerial compensation. Section 3 presents and summarizes the data, gives a qualitative overview on remuneration practices and describes the variables used in the empirical analysis. Section 4 shows how the regulatory environment impacts executive compensation. Section 5 shows the result of several simultaneous equation models explaining bank risk and bank policy choices. Section 6 deals with the impact of CEO compensation on bank performance during the financial crisis and section 7 concludes.

2 Literature

Early studies in the area of managerial compensation focus on the link between remuneration and performance for firms in the U.S.⁴ They find that pay for performance sensitivities are predominantly driven by stock options and stock ownership but - though increasing over time - remain relatively

⁴See for example Murphy (1985), Jensen and Murphy (1990b) or Jensen and Murphy (1990a).

low. Murphy (1998) summarizes the literature on executive compensation in the U.S. and presents some stylized facts. Pay levels are industry dependent with lower than average remuneration in utilities and higher remuneration in financial service companies,⁵ CEO compensation is increasing in firm size and the option component accounts for the largest block of total compensation.

Due to limited data availability relatively few international comparisons have been carried out. Almost all of them using survey data from consulting companies.⁶ They confirm the conventional wisdom that CEO pay in the US exceeds pay in other countries and that the holding of stock options and stock ownership are much more developed in the US.

Managerial compensation in the financial sector has been investigated by several authors, mainly from an U.S. point of view. The literature starts with Barro and Barro (1990) who verify that CEO pay depends on stock performance. Hubbard and Palia (1995) examine the effect of deregulation in the U.S. banking system on the pay-performance relationship. They find a higher pay-performance sensitivity when competition increases. Burghof and Hofmann (2000) analyze 52 banks from 12 European countries for the years 1995-1997. They find weak evidence of an influence of pay-performance-sensitivities on banks' performances. John and Qian (2003) hypothesize that pay-performance sensitivities should be declining in debt ratios in order to restrain managers from risk shifting. Regulation and firm size could be substitutes for monitoring of banks' management and could therefore decrease the necessity to align managerial incentives via high pay-performance sensitivities. Consistently the authors document lower pay-performance sensitivities in the banking sector than in the manufacturing sector in a sample of U.S. banks between 1992 and 2000. Chen et al. (2006) use a sample of 68 American banks from 1992 to 2000 to test whether option based compensation induces risk taking in the banking industry. Using some rough proxies for CEO's exposure to stock options and solely market based risk measures the authors find evidence supporting their conjecture. Using a similar sample Mehran and Rosenberg (2007) find that an increase in bank CEOs' stock option holdings are associated with higher equity risk and a capital build up. Recently various authors have been looking at governance features of banks

⁵See Carroll and Ciscel (1982) on the effect of regulation on managerial compensation, Houston and James (1995), Hubbard and Palia (1995) or Ang et al. (2002) for an analysis of compensation in the banking industry.

⁶E.g. Abowd and Bognanno (1995).

to explain the credit crisis. Fahlenbrach and Stulz (2009) and DeYoung et al. (2009) try to explain the bank performance during the financial crisis using compensation policies as an explanatory variable. Fahlenbrach and Stulz (2009) do not find any evidence that banks with high risk taking incentives performed worse during the financial downturn. DeYoung et al. (2009) on the other hand report riskier policies for banks with a more risk inducing compensation structure. Erkens et al. (2009) and Beltratti and Stulz (2009) use an international dataset with corporate governance variables of financial firms in 2006 to explain risk taking and stock market performance in 2008 to 2009. Erkens et al. (2009) find that banks with more independent boards were more likely to raise fresh capital and disclosed greater writedowns during the crisis. Beltratti and Stulz (2009) find lower stock returns for financial institution with shareholder friendly boards. Chesney et al. (2010) show that governance features of financial firms in the US were related to writedowns in the credit crisis.

3 Data & Descriptive Statistics

3.1 Data

In order to conduct a panel data analysis of bank remuneration policies I select the 250 largest (by total assets) banks in 2000. This procedure guarantees a sample free of survivorship biases, which is necessary to evaluate the influence of managerial incentives on bank risk appropriately. From those I exclude banks which are not publicly held and banks which do not disclose any information on managerial compensation for at least two consecutive years. Selecting publicly traded banks allows me to calculate stock market based measures of incentives, besides that disclosure requirements are typically higher for traded companies. I then collect data from the annual reports of the remaining 94 banks⁷. The data items of interest are:

- Personal (CEO name, tenure)
- Cash remuneration (salary, bonus payments, long term incentive plans)
- Interest in the banks shares (direct or through restricted shares⁸)

⁷For American banks most of the information is taken from the Execucomp database and supplemented with detailed information from the proxy statements.

⁸Restricted shares are share grants tied to performance or vesting criteria.

- Stock options (grant date, vesting date, exercise price, exercise date, performance criteria)

Appendix A shows all the selected banks and their disclosure policies regarding total compensation, cash bonuses, stock holdings and option holdings. In countries with mandatory disclosure rules information on compensation policies is standardized and mostly complete. In all other countries the amount and detail of information disclosed varies considerably among the banks and over time. In general, disclosure improves over time, most frequently when a new CEO enters the bank. Information on the exact exercise date is rarely reported.⁹

Stock market data comes from CRSP for US banks and Compustat for all other banks. Bank balance sheet data is taken from Bureau van Dijk's Bankscope database. The indices describing the regulatory environment are constructed using the procedure developed by Barth et al. (2001). The data is available through the Worldbank for 2001, 2003 and 2007. Shareholder rights are measured via the revised anti director rights index of Djankov et al. (2008).

3.2 Structure of CEO remuneration

CEO pay in the banking industry typically consists of four different components. The base salary is usually determined according to industry and firm size benchmarks and acts as a basis for the calculation of bonuses and stock option grants.

Short term bonuses are functions of pre-specified performance measures. Bonuses are not paid below a certain level of performance and are capped above a performance threshold. Performance measures are accounting based measures of performance but can also be discretionary measures like an outstanding performance related to M&A activities. Accounting measures have the advantage of being easily verifiable, which in turn makes it easier for managers to relate their own actions to the bonus payments. On the other hand accounting measures can be manipulated and are backward looking and short-run which might lead to myopic decision making.

⁹In few cases it is possible to infer the exercise dates from the stock price at the date of exercise, otherwise the middle of the fiscal year is assumed to be the exercise date.

Stock options give the CEO the right to buy shares of the bank at the pre-specified exercise price. Although option design varies across banks, the typical option contract has a maturity of 10 years (less frequently 5-7 years) and vests after 3 years (less frequently options become exercisable gradually over time). The exercise price is usually set at the market price around the grant date or slightly above. Frequently the exercise of an option is conditional on the achievement of a pre-specified performance criteria which is either an accounting measure, a stock price hurdle or the stock performance relative to a peer group.¹⁰

Other forms of compensation include long-term incentive plans which have replaced stock option plans in some banks. Under these plans restricted shares are granted or a bonus is paid when pre-specified performance criteria are met over a horizon longer than one year (typically 3-5 years).

On top of these compensation packages CEOs typically hold shares in the bank. This stock ownership results either from the exercise of stock options and share plans, from mandatory minimum requirements on CEO shareholdings set by banks or from voluntary purchases of stocks by CEOs.

3.3 Managerial Incentives

Similar to most of the literature on managerial compensation, I construct several measures of CEO incentives based on the sensitivities of CEO wealth with respect to price and standard deviation. As in Jensen and Murphy (1990a) or Murphy (1998) Delta is the dollar change of CEO wealth for a one percent change in banks' market capitalization. It measures how aligned managerial incentives are with the interests of shareholders.

Vega on the other hand, as introduced by Guay (1999), is defined as the change in CEO wealth for a 0.01 change in annualized standard deviation of stock returns. Vega rewards managers for increasing equity risk and is therefore a counterweight to CEO risk aversion.

I compute delta and vega for all the components of managerial compensation as follows:

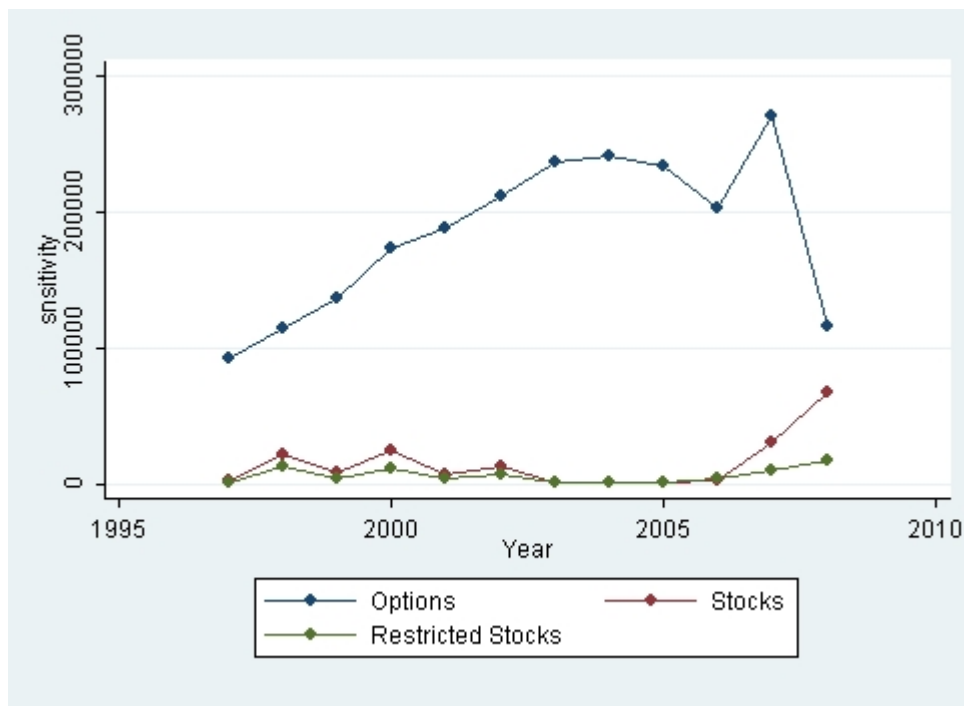
¹⁰Performance criteria vary from easy to reach and flexible to fixed and dependent on peer group performances.

- Sensitivities for option holdings can be computed directly using the Black-Scholes option pricing model modified to account for dividend payments.
- Executive wealth varies with the value of holdings of stocks and restricted stocks. Delta is defined as the change in portfolio value for a 1% change in the banks market capitalization. As shown by Black and Scholes (1973) common stock can be seen as a call option with the total value of the firm as an underlying assets and face value of debt as the exercise price. Using the KMV model the value of the banks' assets and asset volatility can be computed by solving numerically a nonlinear system of two equations. I follow Guay (1999) and compute common stocks sensitivity to a one percent change in annualized standard deviation by using the Black & Scholes model.¹¹
- Estimating a time-series of company specific pay-performance sensitivities for cash compensation is not feasible given that there is just one observation for each CEO per year. Proxies for risk taking incentives through cash compensation are constructed using ratio of bonus payments to total salary.

Most of the studies using panel data on executive compensation from the US, e.g. Coles et al. (2006) and DeYoung et al. (2009), compute sensitivities using the "one-year approximation" methodology proposed by Core and Guay (2002). Since before fiscal year 2006 no details on previous option grants had to be disclosed in the annual proxy statements, Core and Guay (2002) estimate the exercise price from the realizable values of exercisable and unexercisable options. This procedure leads to an understatement of the true exercise price because the number of out-of-the-money stock options is not disclosed. Moreover time to maturity of the options are not disclosed and are set between six and nine years. Core and Guay (2002) report that biases resulting from their methodology are severe when the price-to-strike ratios are low. My handcollected sample allows me to circumvent these im-

¹¹The equation for equity comes from Merton's model as $E_0 = V_0 N(d_1) - Fe^{-rT} N(d_2)$. Asset volatility is characterized by $\sigma_E = \frac{V_0}{E_0} N(d_1) \sigma_V$. The relation of a change in asset volatility for a given change in equity volatility is given in the model by $\sigma_E = \frac{V_0}{E_0} N(d_1) \sigma_V$, where σ_E is the standard deviation of stock returns, V_0 is the asset value, E_0 is the value of equity and σ_V the asset volatility. d_1 is specified in the usual way.

Figure 1: The development of CEO sensitivities with respect to changes in equity volatility over time. Options, stocks and restricted stocks denote the change in CEO portfolio value with respect to a 0.01 increase in volatility.



precisions and to calculate sigma and vega correctly.

Long term incentive plans (LTIP) became increasingly popular during the last five years. These LTIPs are typically composed of restricted stocks or performance stocks which vest after a pre-specified period or when achieving certain performance goals. Due to the big differences in performance criteria and vesting schedules it is not feasible to compute sensitivities of these performance stocks accurately. Like most of the literature I treat restricted stocks like normal stocks, which will most probably understate the risk taking incentives provided by them.

3.4 Descriptive Statistics

Table 1 summarizes the main sample characteristics by country and by legal origin as defined in La Porta et al. (1998). The average compensation amount

and structure vary considerably among the different countries with lower levels in the Scandinavian countries, high values of stock options and managerial stock ownership in the countries with English legal origin and above average bonus payments in German legal origin countries. The average CEO portfolio increases by \$846,472 for a one percent increase in shareholder value and by \$203,984 for a 0.01 increase in stock return volatility. Mean total compensation is about \$3.4 million dollars out of which roughly 40% is paid as bonuses. The average CEO holds 0.23% of her employers equity through stocks. The sensitivity of CEO option portfolios to a stock price change is highest in the English origin banks, sensitivities from stock and restricted stocks is highest in German legal origin countries and the Scandinavian countries exhibit low sensitivities through all means of compensation.

Table 2 and Figure 1 show the evolution of the different variables over time. Total compensation increased steadily from an average of \$2,710,087 in 2000 to \$4,470,662 in 2006 until the financial crisis melted it down below the level of 2003. Similarly sensitivities towards price changes rose until the beginning of the financial crisis when many CEOs were replaced at the same time leading to lower stock and option holdings. Moreover government interventions decreased the overall level of performance pay. For most of the years the sensitivity of stock and restricted stock portfolios to changes in volatility are low. The increase in Vega in 2007 is due to the decline in price-to-strike ratios for many banks. While a dramatic drop in prices leaves stock options out of the money with low vega and low delta, the equity options get closer to their exercise prices and risk taking incentives from stocks and restricted stocks increase.

Table 3 shows the evolution of different components of executive compensation over time and by country. CEOs from the US and Canada rely far more on equity based compensation than banks from any other country throughout the whole sample period. Nevertheless there seems to be some convergence in terms of the structure and the level of compensation. Base salaries and bonus payments reach similar levels in most countries during the last three-year period. Longterm incentive plans have been implemented in most countries which can be seen both from LTIP payments in 2004-2006 and from higher levels of restricted stocks. Vesting criteria are used predominantly in Australia and the UK.

Table 1: Summary Statistics

The data covers CEO characteristics and ranges from 2000 to 2008. All variables are expressed in 2008 dollars. Salary is the non-performance related part of CEO wage, bonus payments is typically related to achievements of short-term accounting-based performance measures. Option value is the value of CEOs' option package computed with the Black&Scholes formula adjusted for dividends. Value of Stockholdings includes CEO stockholdings and restricted shares. Total Compensation consists of base salary, bonus payments, long-term incentive plans and share-based payments. N is the number of bank-year observations and banks is the number of banks in each country.

	Salary (mean)	Bonus pay- ments (mean)	Ownership	Option value (mean)	Value of Stock- hold- ings (mean)	Total Com- pen- sation (mean)	# Banks	N
Australia	1,412,222	1,467,435	0.05%	5,414,394	14,574,638	4,045,817	4	36
Austria	2,210,110	2,338,893	0.04%	244,949	5,639,211	2,861,019	1	9
Belgium	1,026,466	1,228,267	0.00%	1,511,168	754,209	2,657,857	2	18
Canada	1,121,391	1,713,328	0.09%	25,107,008	12,266,942	5,151,086	6	54
Denmark	1,110,102	124,984	0.00%	2,325,283	398,038	1,132,101	1	8
France	1,100,597	1,027,559	0.00%	9,399,172	2,615,025	2,003,806	6	43
Germany	1,246,741	3,771,062	0.03%	307,862	7,481,155	4,929,990	6	30
Hong_Kong	884,816	349,589	0.00%	15,978	344,444	1,482,452	1	7
Ireland	1,043,791	686,566	0.05%	655,199	4,802,427	2,042,810	3	27
Israel	756,228	765,863	0.00%	148,455	1,662	1,575,742	3	22
Italy	1,874,052	1,324,738	0.06%	6,552,383	13,690,664	3,053,391	3	22
Malaysia	588,045		0.01%	134,798	1,092,920	287,179	1	5
Netherlands	1,270,757	1,130,998	0.01%	1,847,495	4,636,616	3,650,697	2	17
Norway	640,837	122,839	0.00%	19,112	373,820	763,676	1	9
Singapore	881,404	2,373,989	0.34%	1,676,550	47,146,625	2,622,851	3	25
South_Africa	583,031	1,210,674	0.02%	5,789,451	1,746,818	1,893,407	2	18
Spain	2,816,842	4,010,996	0.02%	686,401	8,415,386	6,090,909	4	28
Sweden	953,803	168,541	0.00%	1,356,815	702,137	1,092,589	4	36
Switzerland	1,283,072	635,929	0.05%	5,928,851	23,095,602	6,046,685	2	4
Thailand			0.73%	0	41,608,115	179,597	1	4
UK	1,560,954	1,701,083	0.03%	2,984,300	7,269,063	4,016,978	12	83
USA	974,715	3,034,545	0.59%	37,179,589	113,540,684	4,656,411	30	244
legal_origin								
English	1,097,342	2,267,144	0.33%	21,024,913	59,063,769	3,991,215	17	525
French	1,573,546	1,703,409	0.02%	4,891,754	5,794,295	3,388,961	4	128
German	1,379,872	3,323,326	0.03%	817,577	8,548,138	4,600,828	5	43
Scandinavian	906,161	155,812	0.00%	1,275,842	600,484	1,042,700	3	53
Total	1,177,380	2,089,885	0.23%	15,710,280	42,923,290	3,714,651	94	749

Table 2: Managerial compensation over time
 Total Compensation consists of base salary, bonus payments, long-term incentive plans and sharebased payments. Bonus denotes the average fraction of bonus payments and total compensation. Ownership is the percentage of shares of the company held by the CEO through stocks or restricted shares. Delta is the sensitivity of CEOs' option portfolio to a \$ 1000 change in shareholder value. Vega is the total change in CEO wealth with respect to a 0.01 change in Volatility.

	total comp	bycomp bonus	ownership	delta option	delta stock	delta restricted	vega option	vega stock	vega restricted
2000	2,710,087	42.63%	0.37%	289,380	378,170	76,543	143,549	31,482	16,925
2001	2,230,445	40.68%	0.33%	241,802	349,796	73,948	167,248	8,237	3,850
2002	2,462,292	41.96%	0.28%	222,003	284,440	63,716	197,664	15,802	7,653
2003	3,220,080	46.72%	0.27%	310,687	400,113	77,368	216,629	431	612
2004	3,916,151	48.75%	0.24%	340,625	436,023	94,657	212,152	224	868
2005	4,018,144	47.87%	0.20%	342,136	600,149	118,173	204,533	368	682
2006	4,470,662	38.57%	0.12%	438,011	612,572	122,400	170,090	1,129	1,541
2007	4,418,998	33.51%	0.21%	278,230	722,493	103,270	227,283	14,573	5,086
2008	2,693,602	16.29%	0.12%	137,833	338,850	44,053	94,351	76,501	12,569
Total	3,406,104	39.71%	0.23%	292,071	466,399	88,002	183,514	15,413	5,057

Country	Bonus	Salary	Option Value	Longterm	Options	Vesting criteria	Stocks	Restricted	# Banks	N
<i>2000 - 2002</i>										
Australia	731,028	927,491	6,298,950	0	0.1483%	20.77%	0.0266%	0.0003%	4	12
Austria			184,034	0	0.0797%	50.00%			1	3
Belgium	542,752	846,161	1,461,991	367,897	0.0376%	0.00%	0.0012%	0.0000%	2	6
Canada	1,666,081	822,909	19,359,836	68,062	1.4081%	1.18%	0.1272%	0.0500%	6	18
Denmark			492,298		0.0124%	0.00%		0.0007%	1	2
France	987,586	819,645	9,292,250	16,363	0.1093%	2.55%	0.0074%	0.0002%	6	12
Germany			2,340,821		0.0175%	0.00%		0.0000%	6	1
Hong Kong			29,914		0.0002%	0.00%	0.0000%	0.0000%	1	1
Ireland	280,880	675,830	757,876	0	0.0218%	0.00%	0.0527%	0.0019%	3	9
Israel			0		0.0000%				3	4
Italy	477,665	1,093,731	876,314	0	0.0281%	0.00%	0.0011%	0.0000%	3	6
Netherlands	436,216	868,211	2,151,262		0.0142%	0.00%	0.0005%	0.0093%	2	6
Norway	29,891	453,844	33,446	0	0.0026%	11.11%	0.0048%	0.0000%	1	3
Singapore	1,265,870	376,908	1,714,128		0.0702%	0.00%	0.5235%	0.0000%	3	8
South Africa	561,208	413,000	1,789,411		0.1327%	0.00%	0.0114%	0.0000%	2	6
Spain	4,091,739	3,098,634	34,520		0.0005%	0.00%	0.0560%	0.0071%	4	5
Sweden	116,916	727,804	712,179	0	0.0345%	0.00%	0.0007%	0.0000%	4	12
UK	870,485	1,155,725	2,840,864	230,113	0.0441%	12.06%	0.0050%	0.0177%	12	30
USA	3,294,258	1,005,942	41,549,993	877,009	0.4846%	0.51%	0.6048%	0.1678%	30	83
<i>2003 - 2005</i>										
Australia	1,855,160	1,443,723	6,055,097	109,844	0.1385%	23.73%	0.0494%	0.0115%	4	12
Austria	1,613,077	2,147,538	443,588	1,001,385	0.0301%	0.00%	0.0758%	0.0000%	1	3
Belgium	1,317,195	1,097,015	2,004,918	416,784	0.0398%	0.00%	0.0018%	0.0019%	2	6
Canada	1,917,529	1,198,394	26,497,101	452,301	0.3244%	0.35%	0.0212%	0.0421%	6	18
Denmark	136,271	868,730	2,104,013		0.0443%	0.00%	0.0019%	0.0019%	1	3
France	1,191,844	938,774	7,612,422	108,985	0.2659%	5.37%	0.0083%	0.0000%	6	16
Germany	4,957,501	1,213,009	626,822	0	0.0083%	0.00%	0.0195%	0.0188%	6	11
Hong Kong	177,294	868,966	27,310		0.0001%	0.00%	0.0000%	0.0000%	1	3
Ireland	752,958	1,094,593	749,598	58,600	0.0349%	11.59%	0.0283%	0.0129%	3	9
Israel	1,050,387	630,811	0		0.0000%				3	9
Italy	1,248,018	1,875,743	11,036,575	0	0.2207%	0.00%	0.0141%	0.0000%	3	9
Malaysia			45,758		0.0103%	0.00%	0.0087%	0.0000%	1	2
Netherlands	1,141,289	1,402,017	1,214,425	568,613	0.0182%	0.00%	0.0010%	0.0112%	2	6
Norway	206,836	697,847	23,890	0	0.0007%	0.00%	0.0039%	0.0000%	1	3
Singapore	2,503,008	994,859	1,173,129		0.0528%	0.00%	0.3591%	0.0000%	3	9
South Africa	1,390,611	633,199	6,769,785		0.1415%	0.00%	0.0140%	0.0000%	2	6
Spain	4,271,152	3,155,358	360,714		0.0051%	0.00%	0.0020%	0.0111%	4	11
Sweden	174,912	978,822	1,695,303	0	0.0453%	0.61%	0.0007%	0.0000%	4	12
Thailand			0		0.0000%		0.6780%	0.0000%	1	1
UK	2,029,242	1,663,863	3,281,937	1,178,870	0.0554%	12.20%	0.0079%	0.0419%	12	29
USA	3,716,884	982,367	33,622,682	762,878	0.4647%	0.09%	0.5173%	0.0981%	30	85
<i>2006 - 2008</i>										
Australia	1,816,117	1,865,451	3,889,135	0	0.0508%	24.07%	0.0306%	0.0214%	4	12
Austria	2,822,770	2,251,825	107,225	0	0.0019%	0.00%	0.0501%	0.0000%	1	3
Belgium	1,710,603	1,106,170	1,066,594	849,000	0.0211%	0.00%	0.0000%	0.0033%	2	6
Canada	1,547,143	1,342,871	29,464,088	1,164,957	0.2543%	0.87%	0.0231%	0.0471%	6	18
Denmark	121,221	1,190,559	3,768,543		0.0691%	0.00%	0.0031%	0.0031%	1	3
France	909,163	1,420,203	11,390,577	142,985	0.0506%	6.30%	0.0102%	0.0000%	6	15
Germany	3,046,016	1,267,355	0	141,101	0.0004%		0.0515%	0.0610%	6	18
Hong Kong	521,884	900,666	0	333,617	0.0000%		0.0026%	0.0000%	1	3
Ireland	1,025,861	1,360,949	458,124		0.0195%	6.69%	0.0347%	0.0336%	3	9
Israel	595,148	807,554	362,890		0.0596%	20.00%	0.0013%	0.0000%	3	9
Italy	2,028,430	2,429,251	5,652,194	0	0.0357%	0.00%	0.1595%	0.0000%	3	7
Malaysia			194,158		0.0182%	0.00%	0.0138%	0.0000%	1	3
Netherlands	1,952,388	1,596,299	2,242,661	444,683	0.0172%	0.00%	0.0018%	0.0111%	2	5
Norway	131,792	770,819	0	0	0.0000%		0.0021%	0.0000%	1	3
Singapore	2,660,516	957,134	2,205,321		0.0529%	0.00%	0.1952%	0.0000%	3	8
South Africa	1,571,958	674,555	8,809,159	2,589,622	0.0162%	0.00%	0.0191%	0.0120%	2	6
Spain	3,824,101	2,567,681	1,256,564	4,397,849	0.0060%	0.00%	0.0028%	0.0127%	4	12
Sweden	217,684	1,172,379	1,662,962	0	0.0207%	8.39%	0.0043%	0.0001%	4	12

4 Determinants of managerial compensation and bank regulation

Strong regulatory authorities may reduce banks' incentive to implement high vega contracts, since expensive risk inducing contracts are less valuable for shareholders if supervisors do not allow banks to increase the riskiness of their business model. At the same time a powerful regulatory system is likely to reduce the demand for incentive alignment of CEOs because monitoring through the regulator would reduce the need to align incentives. Less stock based compensation would be the consequence. John and Qian (2003) interpret lower pay-performance sensitivities in banks than in manufacturing firms as evidence for this hypothesis. On the other hand one might argue that tough regulation incentivises shareholder to give higher risk taking incentives to the CEO as a countermeasure. Similarly strong regulation may be perceived as a guarantee against a systemic instability leading to less caution when incentivising CEOs. Strong shareholder should make it easier to align CEOs to the incentives and to the risk appetite of shareholders.

To understand the effect of regulation on managerial incentives I regress several characteristics of CEO compensation contracts on indices representing the supervisory and legal environment. The indices are taken from Djankov et al. (2008) and Barth et al. (2001). Barth et al. (2001) conduct three cross-country surveys of how banks are regulated and supervised. The surveys have been completed in 2001, 2003 and 2007 respectively and I construct the following indices of regulatory power as described in Barth et al. (2004): *official* is an index of supervisory power, *restrict* is an index of regulatory restrictions on bank activities, *independence* measures to which degree supervisory authorities are independent from the government and legally protected from the banking system, *capital* is an index of regulatory capital restrictions. *private monitoring* is an index which measures the extent to which supervisory agencies encourage private monitoring. *rights* measures shareholder protection with the revised anti-director rights index for each country as described in Djankov et al. (2008). The control variables are drawn from the large body of literature that addresses the determinants of managerial compensation.¹² Bank size for opaqueness and firm complexity. Opaque banks may have a higher need for aligning CEOs' incentives because of high monitoring costs. The market-to-book ratio is connected to banks' investment opportu-

¹²In particular Guay (1999).

nity set. Bank with more investment opportunities are more likely to provide managers with risk taking incentives to reduce costs from forgone high risk investment projects.¹³ *Tenure* and *salary* represent both CEOs' possibility to diversify their wealth and managerial entrenchment. Diversified CEOs are less exposed to firm specific risk and therefore less averse to an increase of risk. Moreover banks will most likely adjust gradually to their CEOs target incentive levels. *cooperative & savings, investment, mortgage* are dummy variables for banks with a specialisation different from a commercial bank or bank holding company, as reported by Bankscope.¹⁴

The results in Table 4 show a positive correlation between the incentive measures and regulation. Strong supervision and restrictions on bank activities seem to increase the necessity of aligning incentives through compensation, which contradicts the findings of John and Qian (2003), who state that regulation and CEO incentives are substitutes. There is however some evidence that when private monitoring is encouraged banks reduce incentives. As expected CEO tenure and bank size have a positive impact on the incentive measures. Cooperative and savings banks seem to use less incentive pay in general and investment banks align their CEOs through high delta contracts but with less risk taking incentives from options. Which is surprising when looking at Table 5, which shows that investment banks grant more stock options, more stocks and restricted stocks, pay higher bonuses but lower cash compensation. Moreover Table 5 shows that bonus payments, stock holdings and the value of option packages are higher in countries with strong regulators. Since not only delta but also vega is increasing in regulatory power and in restrictiveness of bank activities it seems reasonable to suspect that when restrictions and supervision are higher banks try to counterbalance this by inducing managers to take on more risk.

In general large banks pay higher salaries, grant more valuable stock options but endow their CEOs with a smaller fraction of equity.

¹³E.g. Coles et al. (2006) find that firms with high R&D expenses implement high vega contracts. Hubbard and Palia (1995) report high delta contracts in deregulated banking markets.

¹⁴I make the following adjustments to the Bankscope classification: Goldman Sachs and Natixis are considered investment banks, Northern Rock a Mortgage bank.

Table 4: Regression of CEO incentive measures on variables defining the legal and regulatory environment and control variables. Delta is the sensitivity of CEOs' portfolio to a one percent change in stock price. Vega is the sensitivity to a 0.01 increase in volatility. The portfolios considered include stocks, restricted stocks, options or a combination of those. Rights measures shareholder protection with the anti-director rights index, official is an index of supervisory power, restrict is an index of regulatory restrictions on bank activities, independence measures to which degree supervisory authorities are independent from the government and legally protected from the banking system, capital is an index of regulatory capital restrictions, private monitoring is an index which measures the extent to which supervisory agencies encourage private monitoring. The control variables are CEO tenure, the market-to-book ratio, total cash compensation, the logarithm of total assets. *cooperative & savings*, *investment*, *mortgage* are dummies for the different types of banks. All regressions include year dummies.

Variable	Total delta	Delta stock & option	Delta option	Total vega	Vega stock & option	Vega option
CEO tenure	72926.637*** (13298.20)	37370.959*** (18362.46)	11435.997** (5741.43)	7804.725** (3073.56)	3879.117 (2417.45)	4553.470** (2268.53)
Market-to-book	128210.031** (51936.44)	23335.370 (16303.63)	17190.708 (12063.27)	39305.352* (22064.78)	5827.296 (6623.68)	7146.574 (5724.70)
Salary	-0.211*** (0.06)	-0.139*** (0.04)	-0.011 (0.02)	-0.027 (0.02)	-0.025 (0.02)	-0.024 (0.02)
ln(total assets)	249965.592*** (42925.78)	166739.021*** (37984.15)	125586.034*** (17676.82)	126647.138*** (18021.07)	112286.171*** (15789.54)	101386.450*** (12922.10)
Rights	-25418.245 (58973.03)	-43814.096 (51624.64)	-19297.874 (21875.11)	-13686.420 (20873.88)	-3072.527 (19062.66)	-31310.960** (13305.86)
Official	74614.091*** (12597.35)	71434.919*** (9921.65)	34694.173*** (5234.47)	28545.463*** (5299.27)	32308.266*** (4312.94)	29915.069*** (3325.82)
Restrict	74474.366*** (20822.42)	90493.396*** (18265.32)	58824.065*** (7900.09)	46107.282*** (7322.63)	48386.791*** (7030.99)	40325.985*** (4917.50)
Capital	-14718.010 (20273.55)	7958.682 (20166.58)	-472.890 (9309.43)	-3001.858 (7905.74)	452.185 (6909.66)	5175.378 (5532.95)
Private monitoring	-79570.242* (42983.22)	-41620.246 (33699.95)	-35390.543* (19089.08)	-28066.421* (15359.98)	-27413.072** (13626.78)	-9889.748 (11457.65)
Independence	110369.682*** (42064.49)	58557.043 (35629.45)	95743.317*** (18198.34)	73114.345*** (17176.52)	73070.159*** (14884.55)	64765.819*** (11773.56)
Cooperative & Savings bank	-152452.638 (116414.82)	-260642.381*** (99198.55)	-196302.143*** (44023.56)	-76067.533** (34380.51)	-129017.640*** (41349.91)	-127433.950*** (33027.60)
Investment bank	2924501.018*** (33547.68)	2339026.662*** (311477.56)	2290.194 (86315.66)	-29204.411 (75612.22)	-63934.611 (67975.58)	-185184.687*** (42602.50)
Mortgage bank	-66202.010 (100714.67)	-100086.304 (95705.40)	47326.709 (52896.14)	83521.121* (48012.15)	75379.411* (44016.82)	84118.349** (35492.09)
Constant	-5130053.515*** (1255874.64)	-5314523.364*** (1111949.28)	-4156341.259*** (510345.39)	-3832810.354*** (529936.89)	-3454374.866*** (471714.38)	-3370689.424*** (375480.91)
R^2	0.637	0.554	0.344	0.396	0.379	0.407
N	503	546	623	501	544	623

Table 5: Regression of CEO compensation characteristics on variables defining the legal and regulatory environment and control variables. Bonus is the dollar amount of bonus payments, restricted stock and stock is the percentage of equity held in the bank, option value is the Black&Scholes value of option holdings, total compensation is the total value of cash compensation and cash compensation is the non-performance related part. Rights measures shareholder protection with the anti-director rights index, official is an index of supervisory power, restrict is an index of regulatory restrictions on bank activities, independence measures to which degree supervisory authorities are independent from the government and legally protected from the banking system, capital is an index of regulatory capital restrictions, private monitoring is an index which measures the extent to which supervisory agencies encourage private monitoring. The control variables are CEO tenure, the market-to-book ratio, total cash compensation, the logarithm of total assets. *cooperative & savings*, *investment*, *mortgage* are dummies for the different types of banks. All regressions include year dummies.

Variable	Bonus	Restricted stock	Option value	Stock	Total compensation	cash compensation
CEO tenure	.0032551 (.0029262)	.0047405*** (.016047)	559227.7* (332303.6)	.030982** (.0155093)	18209.66 (16941.63)	-570.8708 (2736.313)
market-to-book	.000286 (.0043298)	-.0165805 (.0103903)	1237625* (731955.2)	-.011249 (.00923)	40439.8 (56223.24)	6419.438 (8177.837)
Salary	2.45e-08 (1.85e-08)	-5.10e-09 (1.14e-08)	.0826047 (1.247833)	-9.05e-08** (3.57e-08)		
ln(total assets)	.047632*** (.0122621)	-.0053063 (.0071693)	5565589*** (906834.9)	-.0620961** (.0296219)	1404869*** (121252.8)	215108.7*** (23688.73)
Rights	-.0024814 (.0169692)	-.0031666 (.0101328)	-891364.4 (1094041)	-.0362827 (.0340241)	366237.2** (182980.1)	122132.6*** (40796.28)
Official	.0063875 (.0041141)	-.0077886** (.003082)	180106*** (267293.6)	.0311704*** (.008306)	184323.9*** (37384.3)	-430.512 (9189.602)
Restrict	.0042947 (.0064303)	-.0066012** (.0032908)	2953229*** (410701.4)	-.0126237 (.0114408)	130856.9** (60074.91)	-2154.1 (14525.43)
Capital	.0257574*** (.0065878)	-.0006426 (.0032916)	-507199.5 (488855.9)	.0131229 (.0136776)	176.6044 (63136.56)	28823.11 (24129.09)
Independence	-.0609004*** (.0145184)	.0157439* (.0092719)	4523278*** (962755.8)	.0279255 (.0285897)	8311.437 (150610.1)	-108438.9*** (41401.62)
private monitoring	.0326387** (.0147248)	-.0065379 (.0075857)	-1628538* (973478.4)	-.0179379 (.0206417)	155190.3 (181996.8)	4872.009 (39373.44)
Cooperative & Savings bank	-.1145246*** (.0380474)	-.0202766 (.0226157)	-8490667*** (1890199)	.1123778** (.056196)	-1625366*** (404622.5)	-213643.9** (98633.95)
Investment bank	.177651*** (.0575823)	.4715324*** (.120936)	1.16e+07*** (5354103)	1.195198*** (.2757704)	2582926*** (915101.2)	-483908.1*** (74693.73)
Mortgage bank	-.1493861*** (.0412371)	.0164078 (.01237)	3062620 (2684808)	-.0948081** (.0387439)	-126080.6 (724743.9)	-303654.6*** (62759.39)
Constant	-1.538171*** (.35433)	.1466916 (.2177175)	-1.90e+08*** (.262e+07)	4.557527*** (.851716)	-3.90e+07*** (725263.7)	-4916880*** (23263.7)
R^2	0.278	0.281	0.315	0.294	0.339	0.343
N	645	555	655	566	772	655

5 The effect of managerial incentives on bank risk and bank policy variables

Agency conflicts between managers and shareholders are typically mitigated by tying managers' wealth to firm performance using bonus programs and stock option schemes. On the one hand high sensitivity of compensation packages with respect to equity returns guarantee a better alignment of shareholders' interests with managerial incentives. On the other hand high pay-performance sensitivities increase managers' exposure to equity risk. Managerial wealth in the form of stocks, options, bonus payments and human capital is linked to firm performance and is in general not diversifiable such that managers are exposed to more risk than diversified shareholders. The resulting agency conflict can induce managers to forgo profitable investment projects as has been shown for example by Smith and Stulz (1985).

As a consequence securities whose value is increasing in equity volatility like options or bonus programs are used to induce managerial risk taking. Guay (1999) uses the vega of managers' stock option portfolios as a measure of convexity and finds that it is positively correlated with stock return volatility. Coles et al. (2006) argue that shareholders set their CEO's delta and vega such that shareholder value is maximized. They find that higher vega leads to riskier policy choices¹⁵ while an increase in delta leads to the implementation of more conservative corporate policies. Therefore I expect that banks implement riskier strategies when CEO incentives are aligned through high vega.

The effect of delta on risk shifting behavior is not clear. On the one hand managers are exposed to more risk the higher delta, on the other hand alignment to shareholders' incentives could lead to the acceptance of high risk but positive net present value projects which would increase firm risk.

Endogeneity is clearly an issue when analyzing the relationship between incentives and risk measures. The principal agent model predicts that managerial compensation structure is dependent on firm risk. Managers of risky firms would want higher fixed salaries and less performance related pay. Shareholders of high risk firms may prefer to reduce firm risk by implementing low vega contracts. I use a system of equation to address this point. In the model executive compensation and equity risk are jointly determined

¹⁵Measured through R&D expenditures, leverage and capital expenditures

and dependent on bank balance sheet data and on regulatory and legal characteristics.

The independent variables used to explain delta and vega are the same as in the previous section.

To test the hypotheses several market and accounting based measures of bank risk and bank policy are employed. The first variable is the annualized standard deviation of equity returns measured over a 120 trading day window. To control for market wide effects I use an industry CAPM model with the *STOXX Global 1800 Banks* index as market index. The resulting Beta is used as a proxy for systematic risk and the standard errors of the regression are used as proxies for the idiosyncratic component of risk. The fourth measure of bank risk employed is the distance-to-default, defined as the number of standard deviations the value of assets is away from default. As default point I use the face value of debt and I assume a one year maturity. An advantage of the distance-to-default over the beforementioned risk measures is, that it includes information on asset volatility, the market value of assets and on leverage. Gropp et al. (2002) argue that a distance-to-default measure is in fact a leading indicator of bank fragility.

When looking at bank policy variables three variables are used: The ratio of equity to total assets represents the leverage decision of bank managers. Although tied by regulation banks do have some discretion when setting their capital structure. A similar measure is the Tier 1 ratio, which also takes into account the riskiness of assets. DeYoung and Roland (2001) and Stiroh (2006) find that fee based activities are associated with higher risk than traditional lending activities. Stiroh (2006) links various components of non-interest income (revenues from investment banking, loan sales, other non-interest income, sale of assets and net securitization) with risk. The last proxy for risky policy choices is therefore total Non-interest income scaled by net income.

I first report results of 3SLS regressions of bank risk measures on CEO incentives and control variables for the period 2000 to 2006. I focus on the pre-crisis part of the sample to get an idea of how bank risk reacts to incentives in normal times. The control variables and their hypothesized effect on bank risk are: (1) The market-to-book ratio is considered a measure of banks' franchise value. The franchise represents the banks service business which is in general riskier than banks' asset portfolio. High market to book ratios may also result when many of the loans originated are not retained

in the bank. Accordingly I expect a positive correlation between market-to-book ratios and bank risk. (2) The capital ratio is defined as total equity divided by total assets. High capital ratios are expected to lead to lower risk. Alternatively I use the risk weighted Tier 1 ratio. (3) High levels of deposit financing make banks less dependent on refinancing their activities on the capital markets and might prove a more stable source of capital when markets freeze up. I would therefore expect banks with high levels of deposit to total assets to be less risky. (4) Large banks are more diversified than small banks but may take on higher risks because of implicit “too big to fail” guarantees. (5) GDP growth as a measure of economic stability in the economy.

Table 6 and Table 7 show the results of the estimations of the simultaneous equation models. In each specification the jointly determined variables are the measure of risk, vega and delta. Bank risk and CEO incentives are thought to be chosen simultaneously, depending on bank characteristics and on the legal and regulatory environment. Panel A in Table 6 shows the results for the model with the standard deviation of equity as proxy for bank risk, the specification in Panel B uses systematic risk as a proxy for risk. Table 7 contains two systems’ specifications. Panel A shows the specification with systematic risk, in Panel B the distance-to-default is the measure of bank risk. The identifying restrictions should be clear from the tables.

I find that high vega contracts lead to higher volatilities and higher systematic risk. The results for idiosyncratic risk and the distance-to-default are just marginally insignificant, which might be due to the small sample. The effect of delta on bank risk goes in the opposite direction. These findings are in line with the hypotheses formulated above and with the findings in the literature on US firms (Coles et al. (2006)) and on US banks (DeYoung et al. (2009)). Option based compensation leading to high vega contracts induces managers to increase bank risk whereas stock holdings make CEOs more vulnerable to stock price decreases and therefore reduce their incentive to increase risk.

5.1 CEO incentives and bank policy

In this sub-section I will focus on the channels through which banks increase risk. 8 shows the results of three simultaneous equation models with non-interest income, tier 1 ratio and total capital ratio as bank policy variables.

Table 6: Simultaneous equation model of bank risk and CEO incentives for the period 2000 to 2006. Bank risk is represented by the standard deviation of daily stock returns (Panel A) and idiosyncratic risk (Panel B) derived from an industry CAPM model. CEO incentives are the sensitivity of CEOs' stock and option portfolio to a one percent change in stock price (delta) and to a 0.01 increase in volatility (vega). All equations contain year dummies.

	Panel A: Sigma			Panel B: Idiosyncratic risk		
	lnsigma	vega	delta	lnidiosyn	vega	delta
lnsigma		-15.751 (20.81)	0.481 (2.88)			
lnidiosyn				-10.179 (12.86)		-0.131 (2.20)
ln(Delta stock & option)	-0.049 (0.03)	-0.244 (1.43)		-0.050* (0.03)	-0.085 (1.16)	
ln(Vega stock & option)	0.023* (0.01)		0.251*** (0.05)	0.018 (0.01)		0.252*** (0.05)
ln α_{t-1}	-0.019 (0.02)	0.264 (0.72)	0.362*** (0.13)	-0.029* (0.02)	0.200 (0.66)	0.344*** (0.13)
ln(mtb) $_{t-1}$	0.124** (0.05)	-3.555*** (1.07)	0.880*** (0.27)	0.095** (0.04)	-3.803*** (0.85)	0.902*** (0.23)
capital ratio $_{t-1}$	-2.602** (1.17)	-89.866 (72.54)	18.333 (11.46)	-2.944*** (0.95)	-72.005 (49.22)	16.195 (10.04)
GDP growth $_t$	0.029** (0.01)			0.034*** (0.01)		
Rights	-0.004 (0.03)	-0.235 (1.13)	-0.201 (0.21)	0.055** (0.03)	0.356 (1.49)	-0.169 (0.29)
Restrict	0.020 (0.01)	1.012 (0.94)	0.084 (0.10)	0.040*** (0.01)	1.013 (0.87)	0.102 (0.13)
Independence	-0.154*** (0.03)	-0.163 (2.30)	-0.190 (0.36)	-0.112*** (0.03)	0.788 (1.14)	-0.254 (0.21)
Official	-0.001 (0.01)	0.653* (0.34)	-0.032 (0.05)	-0.007 (0.01)	0.511** (0.21)	-0.029 (0.05)
Capital	0.009 (0.01)			0.013 (0.01)		
Private monitoring	-0.052** (0.03)	-0.915 (1.53)	0.274 (0.26)	-0.073*** (0.02)	-0.791 (1.31)	0.226 (0.25)
Cooperative & Savings bank	-0.054 (0.13)	-5.843 (6.10)	-1.807** (0.71)	-0.117 (0.11)	-5.670 (5.34)	-1.819** (0.72)
Investment bank	0.319*** (0.10)	3.264 (7.01)	2.018*** (0.68)	0.320*** (0.08)	1.858 (4.96)	2.137*** (0.58)
Mortgage bank	-0.088 (0.06)	0.161 (2.64)	-0.174 (0.44)	-0.033 (0.05)	1.017 (2.04)	-0.211 (0.39)
lnsalary		4.084** (1.96)			3.615** (1.41)	
tenure			0.056*** (0.01)			0.055*** (0.01)
Constant	0.000 (.)	-82.172* (45.66)	-1.847 (3.65)	-2.738*** (0.40)	-89.328* (53.46)	0.000 (.)
N	409			409		

Table 7: Simultaneous equation model of bank risk and CEO incentives for the period 2000 to 2006. Bank risk is represented by systematic risk (Panel A) and the distance-to-default (Panel B). CEO incentives are the sensitivity of CEOs' stock and option portfolio to a one percent change in stock price (delta) and to a 0.01 increase in volatility (vega). All equations contain year dummies.

	Panel A: Systematic risk			Panel B: Distance-to-default		
	beta	vega	delta	distance	vega	delta
lnbeta		0.140 (5.40)	2.558 (2.11)			
distance					0.727 (1.16)	-0.403 (0.27)
ln(Delta stock & option)	-0.234** (0.10)	0.366 (1.16)		0.402 (0.34)	0.312 (0.83)	
ln(Vega stock & option)	0.097** (0.04)		0.178* (0.09)	-0.195 (0.14)		0.249*** (0.06)
ln α_{t-1}	0.038 (0.06)	0.445 (0.62)	0.442*** (0.16)	0.094 (0.20)	0.327 (0.58)	0.415*** (0.13)
L.lnmtb	0.446*** (0.16)	-3.953*** (0.81)	0.358 (0.55)	2.126*** (0.55)	-6.018* (3.40)	2.030*** (0.79)
capital ratio $_{t-1}$	0.218 (3.41)	-39.376 (35.33)	29.002** (12.22)	20.152* (11.86)	-63.368 (44.73)	29.856*** (10.68)
GDP growth $_{t-1}$	0.000 (0.03)			-0.165 (0.14)		
Rights	-0.077 (0.09)	-0.564 (1.08)	-0.046 (0.25)	0.413 (0.33)	-0.819 (0.91)	-0.074 (0.20)
Restrict	0.055 (0.04)	0.445 (0.57)	0.013 (0.11)	0.117 (0.13)	0.363 (0.39)	0.144* (0.09)
Independence	-0.519*** (0.09)	1.521 (2.08)	0.868 (0.94)	0.683** (0.32)	1.279* (0.71)	-0.128 (0.19)
Official	0.036 (0.02)	0.474 (0.44)	-0.142 (0.11)	0.022 (0.08)	0.508*** (0.19)	-0.038 (0.05)
Capital	-0.054* (0.03)			0.269** (0.11)		
Private monitoring	-0.211*** (0.07)	0.112 (1.38)	0.951 (0.61)	-0.335 (0.26)	0.184 (0.70)	0.191 (0.16)
Cooperative & Savings bank	-0.148 (0.38)	-3.807 (4.24)	-2.506** (1.06)	1.210 (1.34)	-4.416 (4.20)	-1.545** (0.78)
Investment bank	0.779*** (0.30)	-1.361 (3.78)	1.514** (0.71)	-1.475 (1.04)	-0.924 (2.58)	1.997*** (0.44)
Mortgage bank	-0.336* (0.19)	1.299 (2.14)	0.496 (0.79)	-0.181 (0.64)	1.327 (1.83)	-0.300 (0.43)
lnsalary		3.032* (1.74)			3.195*** (1.16)	
tenure			0.087*** (0.03)			0.061*** (0.01)
Constant	2.188 (1.42)	-51.781** (21.55)	-8.836 (6.86)	0.000 (.)	-52.708*** (19.46)	0.000 (.)
N	408			409		

Bank policies, vega and delta are thought to be chosen simultaneously taking into account lagged bank characteristics and the legal and regulatory environment. The results show that banks with high vega CEOs obtain a higher proportion of total income from non-interest activities, which are presumably riskier than the traditional lending business. Similarly high vega low delta contracts are associated with lower capital ratios, which is in line with the risk taking hypothesis. There is no effect of CEO incentives on Tier 1 capital, most likely because compliance to capital regulation prevents banks from lowering Tier 1 ratios.

6 Managerial compensation and the financial crisis

Beltratti and Stulz (2009) try to explain bank returns after the Lehman collapse by looking at bank-level governance, country level regulation and bank balance sheets. On the bank-governance side they find that banks with shareholder friendly boards performed worse during the crisis, but they cannot identify an effect of compensation policy proxies on bank returns. Fahlenbrach and Stulz (2009) use US-data on CEO compensation to identify the effect of stock and option based CEO compensation on banks' performance during the recent financial crisis. They find not only that high risk taking incentives and strong alignment with shareholders' interests had no impact on a bank's performance during the crisis, but also that CEOs' portfolio values declined considerably. There seems to be no evidence of CEOs foreseeing the financial downturn and reducing their exposure to stocks.

In general we would expect banks to perform better in a stricter regulatory environment, with CEOs well aligned to bank performance and with little risk taking incentives. A compensation structure rewarding long-term performance rather than short term profits would be considered favorable.

I follow the approach of Fahlenbrach and Stulz (2009) and try to explain stock market returns and accounting measures of performance (ROA and ROE) during the financial crisis in my international sample. Different to Fahlenbrach and Stulz (2009) I use four different measures of risk taking incentives. The option vega, vega from stocks and options and vega from stocks, options and restricted stocks. To take into account that most likely risky bank policies have not been implemented just before the crisis but that

Table 8: Simultaneous equation model of bank policies and CEO incentives for the period 2000 to 2006. Bank policies are represented by the ratio of non-interest income to total income (Panel A), the Tier 1 ratio (Panel B) and the total capital ratio (Panel C). CEO incentives are the sensitivity of CEOs' stock and option portfolio to a one percent change in stock price (delta) and to a 0.01 increase in volatility (sigma). All equations contain year dummies.

	Panel A: Non-interest income			Panel B: Tier 1			Panel C: Total Capital		
	non-interest	vega	delta	Tier 1	vega	delta	Total Capital	vega	delta
noninterest									
T1 ratio		50.863** (25.91)	-16.781* (9.17)		-2.097 (2.18)	0.745 (0.85)			
capital ratio									
ln(Delta stock & option)	-0.055** (0.03)	2.796*** (0.98)		0.127 (0.54)	0.710 (1.26)		0.003 (0.00)	-84.508 (115.08)	-11.723 (29.23)
ln(Vega stock & option)	0.018 (0.01)		0.324*** (0.11)	-0.125 (0.23)			-0.001 (0.00)	0.395 (0.80)	
ln _{t-1}	0.002 (0.02)	-0.058 (0.69)	0.060 (0.26)	-0.453 (0.34)	-0.542 (1.42)		-0.005*** (0.00)	0.206 (0.75)	0.234*** (0.06)
L.lnmtb	0.126*** (0.05)	-6.685*** (1.72)	2.176*** (0.79)	-0.259 (1.03)	-3.794*** (1.32)	1.296** (0.63)	-0.003 (0.00)	-3.924*** (0.71)	0.240* (0.15)
Capital ratio _{t-1}	1.759* (1.07)	-92.420*** (37.56)	30.949*** (13.55)						0.820*** (0.24)
<i>GDPgrowth</i> _t	0.000 (0.01)			0.183 (0.26)			0.001 (0.00)		
Rights	-0.055** (0.03)	2.721 (1.82)	-0.930 (0.57)	-0.675 (0.58)	-1.331 (1.53)	0.237 (0.55)	0.002 (0.00)	-0.399 (0.99)	-0.038 (0.21)
Restrict	-0.015 (0.01)	0.801 (0.58)	-0.243 (0.24)	-0.041 (0.22)	0.177 (0.61)	0.125 (0.15)	0.004*** (0.00)	0.689 (0.70)	0.252 (0.18)
Independence	-0.047* (0.03)	2.500** (1.07)	-0.803* (0.43)	-0.667 (0.60)	0.200 (1.95)	-0.013 (0.57)	-0.007*** (0.00)	1.063 (1.13)	-0.429* (0.25)
Official	-0.012* (0.01)	0.665** (0.27)	-0.209 (0.13)	0.127 (0.12)	0.536 (0.35)	-0.115 (0.15)	0.003*** (0.00)	0.599* (0.34)	0.055 (0.10)
Capital	0.001 (0.00)			-0.029 (0.10)			0.002*** (0.00)		
Private monitoring	0.025 (0.02)	-1.243 (1.00)	0.432 (0.31)	0.368 (0.47)	0.420 (1.29)	0.089 (0.41)	0.001 (0.00)	0.153 (0.67)	0.290* (0.15)
Cooperative & Savings bank	-0.208* (0.12)	10.177 (6.81)	-3.620** (1.76)	-1.099 (2.21)	-3.988 (6.73)	-0.838 (1.99)	-0.006 (0.01)	-4.199 (4.02)	-2.193*** (0.81)
Investment bank	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	-0.041*** (0.00)	-3.089 (5.03)	1.092 (1.16)
Mortgage bank	-0.431*** (0.06)	22.023*** (11.04)	-7.247* (3.92)	-0.634 (1.54)	1.278 (4.45)	-0.504 (1.30)	-0.027*** (0.00)	-0.245 (3.91)	-1.050 (0.92)
lnsalary		0.325 (1.16)		2.049 (1.91)				3.026*** (1.10)	
tenure			0.005 (0.02)			0.047** (0.02)			0.060*** (0.01)
Constant	1.106** (0.43)	0.000 (.)	0.000 (.)	19.896** (9.25)	0.000 (.)	0.000 (.)	0.081*** (0.03)	-46.733** (23.12)	-0.161 (3.51)
N	382			359					409

exposure to risk has been implemented over several years I take not only the level of vega in 2006 but also the average vega over the years 2001 to 2006 into account. Additionally the ratio of cash bonus to salary is taken as a proxy for short term risk taking incentives. Bonus payments are typically based on accounting measures and related to the previous fiscal year, which makes this a backward looking measure. However it is interesting to include because different to options, short term bonus programs may give incentives to increase short-term profits while reducing long-term returns.

Control variables are chosen to represent the regulatory environment (Rights, Official, Capital, Independence, Private Monitoring) and bank characteristics (Size, Market-to-book ratio, Deposit ratio, Capital ratio). Banks with higher deposit ratios and high levels of capital are thought to be less dependent on outside financing when markets freeze up. The stock market return during CEOs' tenure controls for the possibility that high delta and vega are a result of good past performance which proxies for some bank or CEO characteristics that influence performance during the crisis.

In line with the findings of Fahlenbrach and Stulz (2009) the results in Table 9 show that CEO risk taking incentives had little effect on the equity returns of banks during July 2007 and December 2008 in an international sample. For most of the specifications neither high vega contracts, nor low delta contracts, nor high bonuses had a negative influence on returns. There seems to be some evidence that banks with high levels of vega in the year before the collapse of Lehman performed worse. Banks with higher deposits and lower capital ratios did better.

Table 10 and Table 11 on the other hand show a different picture. Accounting performance seems to depend strongly on the incentives provided to the CEO. For almost all the specifications. Return on equity and return on assets have been higher for banks with CEOs with high delta contracts in 2006. Almost all of the relevant coefficients are either significant or marginally significant. An explanation for these results might be that stock markets overreacted and undervalued banks which were in fact healthier than their competitors. To elaborate further on this hypothesis I repeat the above analysis, but using stock market returns from July 2007 to March 2009 as a performance measure.

Table 12 depicts the development of CEO wealth during the years 2006-2008. While portfolio values were still increasing until 2007 they fell dramatically in 2008. To disentangle wealth loss from a drop in portfolio value because of a change in the position of the CEO I report also the portfolio

Table 9: Regression of the stock market returns between July 2007 and December 2008 on bank characteristics, indices representing the legal and regulatory environment and on variables describing CEO incentives. The only bank-year considered is 2006. Means are the averages over the period 2001-2006. Deposit is ratio the ratio of deposits to total assets. Rights the anti-director rights index, official is an index of supervisory power, restrict is an index of regulatory restrictions on bank activities, independence measures to which degree supervisory authorities are independent from the government and legally protected from the banking system, capital is an index of regulatory capital restrictions, private monitoring is an index of the extent to which supervisory agencies encourage private monitoring.

Variable	Return July 2007 - March 2008					
ln(delta option)	0.061*					
	(0.04)					
ln(vega option)	-0.061***					
	(0.02)					
ln(delta option & stock)		0.015				
		(0.03)				
ln(vega option & stock)		-0.013*				
		(0.01)				
ln(delta option & stock & rights)			0.010			
			(0.03)			
ln(vega option & stock & rights)			-0.013			
			(0.01)			
mean(ln delta option)				0.013		
				(0.02)		
mean(ln vega option)				-0.008**		
				(0.00)		
mean(ln delta option & stock)					-0.013	
					(0.02)	
mean(ln vega option & stock)					0.003	
					(0.00)	
mean(ln delta option & stock & right)						0.008
						(0.02)
mean(ln vega option & stock & right)						-0.000
						(0.00)
bonus ratio	0.001	0.004	0.005			
	(0.00)	(0.00)	(0.01)			
mean(bonus ratio)				0.008	0.014	0.013
				(0.01)	(0.01)	(0.01)
Tenure return	-0.007	-0.007	-0.007	0.007	0.008	0.009
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
deposit ratio	0.807**	0.989***	1.089***	0.429	0.690*	0.738**
	(0.30)	(0.33)	(0.36)	(0.26)	(0.34)	(0.38)
capital ratio	-4.622**	-4.896**	-4.497*	1.893	-1.409	-1.705
	(2.12)	(2.30)	(2.37)	(2.21)	(3.36)	(3.39)
roaa	17.127	18.966**	13.800	3.660	13.708	13.008
	(11.16)	(8.11)	(12.23)	(11.82)	(11.31)	(11.61)
mtb	0.017	-0.003	0.039	0.029	0.010	0.018***
	(0.07)	(0.01)	(0.06)	(0.06)	(0.01)	(0.01)
ln(ta)	0.035	0.039	0.051	0.032	0.013	0.008
	(0.05)	(0.05)	(0.05)	(0.06)	(0.05)	(0.05)
Rights	0.077*	0.022	0.048	0.079*	0.062	0.074
	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)
Official	0.002	-0.018	-0.010	-0.029**	-0.019	-0.007
	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)
Restrict	0.036	0.049*	0.040	0.026	0.035	0.014
	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)
Capital	0.032	0.013	0.034	0.010	-0.006	0.017
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Independence	0.058	-0.023	0.050	0.049	-0.048	0.027
	(0.05)	(0.07)	(0.08)	(0.04)	(0.09)	(0.10)
private monitoring	0.028	0.100	0.054	0.076	0.086	0.051
	(0.06)	(0.07)	(0.06)	(0.05)	(0.06)	(0.05)
Constant	-2.951*	-3.059**	-3.482**	-2.790*	-2.021	-2.149
	(1.49)	(1.33)	(1.55)	(1.65)	(1.54)	(1.52)
R^2	0.523	0.474	0.491	0.534	0.466	0.509
N	55	61	57	55	56	52

Table 10: Regression of the return on assets between the 3rd quarter 2007 and the 4th quarter 2008 on bank characteristics, indices representing the legal and regulatory environment and on variables describing CEO incentives. The only bank-year considered is 2006. Means are the averages over the period 2001-2006. Deposit is ratio the ratio of deposits to total assets. Rights the anti-director rights index, official is an index of supervisory power, restrict is an index of regulatory restrictions on bank activities, independence measures to which degree supervisory authorities are independent from the government and legally protected from the banking system, capital is an index of regulatory capital restrictions, private monitoring is an index of the extent to which supervisory agencies encourage private monitoring.

Variable	Return on Assets 3rd quarter 2007 - 4th quarter 2008					
ln(delta option)	0.004 (0.00)					
ln(vega option)	-0.004** (0.00)					
ln(delta option & stock)		0.003* (0.00)				
ln(vega option & stock)		-0.001** (0.00)				
ln(delta option & stock & rights)			0.001 (0.00)			
ln(vega option & stock & rights)			-0.001* (0.00)			
mean(ln delta option)				0.001 (0.00)		
mean(ln vega option)				-0.000*** (0.00)		
mean(ln delta option & stock)					0.002* (0.00)	
mean(ln vega option & stock)					-0.000 (0.00)	
mean(ln delta option & stock & right)						0.002* (0.00)
mean(ln vega option & stock & right)						-0.000 (0.00)
bonus ratio	0.000 (0.00)	-0.000 (0.00)	0.000 (0.00)	-0.000 (0.00)	-0.000 (0.00)	-0.000 (0.00)
mean(bonus ratio)						
Tenure return	-0.000 (0.00)	-0.000 (0.00)	-0.000 (0.00)	-0.001 (0.00)	-0.001 (0.00)	-0.000 (0.00)
deposit ratio	0.018 (0.02)	-0.007 (0.02)	0.012 (0.02)	-0.017 (0.02)	-0.024 (0.02)	-0.022 (0.02)
capital ratio	-0.193 (0.19)	-0.150 (0.25)	-0.150 (0.21)	0.129 (0.11)	0.104 (0.12)	0.090 (0.13)
mtb	0.007** (0.00)	0.000 (0.00)	0.006*** (0.00)	0.004** (0.00)	0.001 (0.00)	0.001* (0.00)
ln(ta)	0.001 (0.00)	-0.003 (0.00)	-0.001 (0.00)	-0.003 (0.00)	-0.006** (0.00)	-0.007** (0.00)
Rights	0.006** (0.00)	0.005** (0.00)	0.006** (0.00)	0.006** (0.00)	0.005** (0.00)	0.006** (0.00)
Official	0.001 (0.00)	-0.001 (0.00)	-0.000 (0.00)	-0.001* (0.00)	-0.001 (0.00)	-0.000 (0.00)
Restrict	0.001 (0.00)	0.002 (0.00)	0.002 (0.00)	0.001 (0.00)	-0.000 (0.00)	-0.001 (0.00)
Capital	0.002 (0.00)	0.001 (0.00)	0.001 (0.00)	0.001 (0.00)	0.001 (0.00)	0.002 (0.00)
Independence	0.004 (0.00)	0.002 (0.01)	0.004 (0.01)	0.004 (0.00)	0.003 (0.00)	0.009** (0.00)
private monitoring	0.000 (0.00)	0.003 (0.00)	0.000 (0.00)	0.001 (0.00)	0.002 (0.00)	-0.001 (0.00)
Constant	-0.080 (0.09)	0.027 (0.08)	-0.051 (0.09)	0.034 (0.08)	0.131* (0.07)	0.136* (0.07)
R^2	0.468	0.346	0.452	0.508	0.425	0.450
N	50	57	53	51	54	51

Table 11: Regression of the return on equity between the 3rd quarter 2007 and the 4th quarter 2008 on bank characteristics, indices representing the legal and regulatory environment and on variables describing CEO incentives. The only bank-year considered is 2006. Means are the averages over the period 2001-2006. Deposit is ratio the ratio of deposits to total assets. Rights the anti-director rights index, official is an index of supervisory power, restrict is an index of regulatory restrictions on bank activities, independence measures to which degree supervisory authorities are independent from the government and legally protected from the banking system, capital is an index of regulatory capital restrictions, private monitoring is an index of the extent to which supervisory agencies encourage private monitoring.

Variable	Return on Equity 3rd quarter 2007 - 4th quarter 2008					
ln(delta option)	0.054 (0.05)					
ln(vega option)	-0.029 (0.03)					
ln(delta option & stock)		0.063* (0.04)				
ln(vega option & stock)		-0.017* (0.01)				
ln(delta option & stock & rights)			0.043 (0.03)			
ln(vega option & stock & rights)			-0.014 (0.01)			
mean(ln delta option)				0.036 (0.02)		
mean(ln vega option)				-0.007** (0.00)		
mean(ln delta option & stock)					0.044 (0.04)	
mean(ln vega option & stock)					-0.003 (0.01)	
mean(ln delta option & stock & right)						0.056 (0.04)
mean(ln vega option & stock & right)						-0.007 (0.01)
bonus ratio	-0.001 (0.00)	-0.004 (0.00)	-0.001 (0.00)			
mean(bonus ratio)				-0.004 (0.01)	-0.004 (0.01)	-0.000 (0.01)
Tenure return	-0.002 (0.01)	-0.006 (0.01)	-0.004 (0.01)	-0.003 (0.01)	-0.005 (0.01)	-0.001 (0.01)
deposit ratio	-0.074 (0.41)	-0.321 (0.31)	-0.127 (0.35)	-0.460 (0.29)	-0.576 (0.35)	-0.525 (0.34)
capital ratio	-0.862 (3.03)	-0.214 (3.03)	0.026 (2.89)	1.986 (2.23)	1.962 (2.94)	1.864 (3.09)
mtb	0.066 (0.05)	-0.005 (0.01)	0.061* (0.03)	0.041 (0.03)	0.009 (0.01)	0.018* (0.01)
ln(ta)	-0.018 (0.07)	-0.061 (0.05)	-0.033 (0.06)	-0.059 (0.04)	-0.118** (0.05)	-0.129** (0.05)
Rights	0.119* (0.07)	0.087 (0.05)	0.109* (0.06)	0.159* (0.08)	0.118* (0.06)	0.144* (0.08)
Official	-0.036 (0.04)	-0.050* (0.03)	-0.046 (0.03)	-0.043* (0.02)	-0.045* (0.03)	-0.032 (0.03)
Restrict	0.042 (0.03)	0.030 (0.02)	0.029 (0.03)	0.030 (0.02)	0.002 (0.02)	-0.017 (0.02)
Capital	0.023 (0.03)	0.032 (0.03)	0.037 (0.04)	0.011 (0.02)	0.020 (0.03)	0.041 (0.03)
Independence	0.091 (0.08)	0.156* (0.09)	0.181 (0.11)	0.089** (0.04)	0.114 (0.09)	0.210** (0.10)
private monitoring	0.055 (0.11)	0.088 (0.07)	0.053 (0.09)	0.022 (0.07)	0.051 (0.06)	-0.008 (0.09)
Constant	-0.876 (1.61)	0.188 (1.28)	-0.551 (1.57)	0.627 (1.31)	2.296* (1.20)	2.430* (1.23)
R^2	0.416	0.435	0.453	0.488	0.443	0.468
N	50	57	53	54	55	51

Table 12: CEO wealth and CEO options characteristics after 2006. Stockholding is the dollar value of CEO stockholdings, Restricted is the dollar value of all restricted stocks, Option is the Black-Scholes value of option holdings. In-the-money denotes the percentage of options in-the-money, vested the percentage of options vested and vested & in-the-money the percentage of options both in-the-money and vested.

Date	Stockholding	Restricted	Option	In-the-money	Vested	Vested & in-the-money	Options held	N
2006	40,073,125	12,688,208	18,105,449	94%	60%	55%	1,310,686	90
2007	48,506,246	11,045,357	14,102,868	70%	67%	51%	1,198,738	90
2008	17,390,679	3,812,689	10,155,500	53%	70%	43%	1,176,397	79
CEOs that stayed throughout the whole period								
2006	48,600,850	18,873,018	20,490,457	96%	57%	55%	1,248,429	48
2007	55,943,651	16,058,169	18,897,213	78%	69%	55%	1,323,659	46
2008	19,035,089	4,643,415	11,908,784	55%	77%	44%	1,321,344	44

values of CEO who stayed with their bank until 2009. Out of 67 CEOs in 2006 34 left their company during the period 2006-2009. The portfolio values of those staying dropped on average by around \$ 65 million between 2006 and 2008 while the number of options outstanding even increased through new grants. Clearly CEOs did either not foresee the events or if they did they did not react to this insider information by selling their assets.

7 Conclusion

This paper uses a new hand-collected dataset to address the topic of managerial compensation in the financial sector throughout the world.

First I describe the development of structure and level of executive compensation. The main findings are that cash compensation and bonuses have reached similar levels in most countries, long term incentive plans have been widely adapted and equity based compensation plays an increasingly important role. CEOs from the US rely far more on equity based compensation than banks from any other country throughout the whole sample period. When looking at the impact of regulation on CEO compensation the findings of John and Qian (2003) cannot be supported. Regulation and equity incentives are not substitutes. In my sample banks from countries with strong regulators rely stronger on equity based compensation than those from countries with weaker shareholder protection.

After describing the main features of the dataset I try to explain bank risk taking with the structure of a CEO's compensation contract. My results show that there is a strong link between CEO incentives and bank risk taking. I find that equity volatility and idiosyncratic risk increase in vega and decrease in delta. When looking at bank policies I find that the non-interest

income to total income ratio is higher for CEOs with high vega and low delta. Banks with higher risk taking incentives choose higher leverage but leave the Tier 1 ratio unchanged.

This general result leads to the conjecture that bank performance during the financial crisis could be explained with the level of executive compensation. Although I do not find little impact of managerial compensation on equity returns during the financial crisis I can show that accounting based performance measures are strongly correlated with my incentive measures. Banks relying on option based compensation performed worse than banks whose CEOs held a large share in stocks. An explanation for this result could be that stock markets overreacted and undervalued banks which were in fact healthier than their competitors.

A Sample banks

Table 13: Columns two to five show the period when information was disclosed on total compensation, cash bonuses, stock holdings and option holdings respectively.

Bank name	Total compensation	Bonus	Stock holdings	Option holdings
Aareal Bank Ag	2005-2008	2005-2008	NA	2005-2008
Abbey National Plc	1998-2004	1998-2004	1998-2004	1998-2004
ABN Amro Holding NV	2000-2007	2000-2007	2002-2006	1998-2007
Absa Group Ltd	2002-2008	2002-2008	2000-2008	2005-2008
Alliance & Leicester Plc	2002-2007	2002-2007	2002-2007	2000-2007
Allied Irish Banks plc	1999-2008	1999-2008	1997-2008	1997-2008
American Express Company	1997-2008	1997-2008	1997-2008	1997-2008
Amsouth Bancorporation	2000-2005	2000-2005	2000-2005	2000-2005
Australia and New Zealand Banking Group	1998-2008	1998-2008	1998-2008	1998-2008
BB&T Corporation	1997-2008	1997-2008	1997-2008	1997-2008
BNP Paribas	1999-2008	1999-2008	1999-2008	1997 -2008
Banca Intesa	2001-2006	2001-2006	2002-2006	2001-2006
Banca Nazionale del Lavoro SpA	1998-2005	1998-2005	NA	1998-2005
Banco Popular Espanol	2005-2008	2005-2008	2000-2008	2000-2008
Banco Bilbao Vizcaya Argentaria SA	2003-2008	2002-2008	2002-2008	NA
Banco Santander SA	2002-2008	2002-2008	2001-2008	2000-2008
Bangkok Bank Plc	2005-2008	NA	2005-2008	2005-2008
Bank Hapoalim BM	2003-2008	2003-2008	2008	NA
Bank Leumi Le Israel BM	2001-2008	2008	NA	2001-2008
Bank of America Corporation	1997-2008	1997-2008	1997-2008	1997-2008
Bank of Ireland	2001-2008	2001-2008	1997-2008	1997-2008
Bank of Nova Scotia	1997-2008	1997-2008	1997-2008	1997-2008
Bank of Scotland Plc	1997-2001	1997-2001	1997-2001	1997-2001
Bank of Montreal	1997-2008	1997-2008	1997-2008	1997-2008
Barclays Plc	1997-2008	1997-2008	1997-2008	1997-2008
Bear Stearns Companies Inc.	2000-2007	2000-2007	2000-2007	2000-2007
Bradford & Bingley Plc	2000-2007	2000-2007	2000-2007	2000-2007

Canadian Imperial Bank of Commerce	1997-2008	1997-2008	1999-2008	1997-2008
Charter One Financial Inc.	2000-2003	2000-2003	2000-2003	2000-2003
Citigroup Inc	2000-2008	2000-2008	2000-2008	2000-2008
Comerica Inc	1997-2008	1997-2008	1997-2008	1997-2008
Commerzbank AG	2004-2008	2004-2008	NA	NA
Commonwealth Bank of Australia	1997-2008	1997-2008	1997-2008	1997-2008
Credit Suisse Group AG	2007-2008	2007-2008	2007-2008	2000-2008
Credit Agricole S.A.	2003-2008	2004-2008	2005-2008	2003-2008
Credit Industriel et Commercial	2005-2006	2005-2006	NA	2001-2006
Credit Lyonnais	1999-2003	1999-2003	NA	1999-2003
DBS Group Holding Ltd	2002-2007	2002-2007	2000-2007	1999-2007
Danske Bank A/S	2005-2008	2005-2008	NA	2001-2008
Deutsche Bank AG	2003-2008	2003-2008	2003-2008	2001-2008
Deutsche Postbank AG	2004-2008	2004-2008	NA	2004-2008
Dexia	2000-2008	2000-2008	2000-2008	2000-2008
DnB Nor ASA	1999-2008	1999-2008	1999-2008	1999-2008
Erste Group Bank AG	2004-2008	2004-2008	2003-2008	1999-2008
Federal National Mortgage Association	1997-2008	1997-2008	1997-2008	1997-2008
Fifth Third Bancorp	1997-2008	1997-2008	1997-2008	1997-2008
Fortis	2001-2008	2001-2008	2001-2008	1997-2008
Goldman Sachs Group Inc	1999-2008	1999-2008	1999-2008	1999-2008
Gruppo Monte dei Paschi di Siena	2007-2008	2007-2008	NA	2006-2008
HBOS Plc	2001-2008	2001-2008	2001-2008	2001-2008
HSCB Holdings Plc	1997-2008	1997-2008	1997-2008	1997-2008
Halifax Group Plc	1997-2000	1997-2000	1997-2000	NA
Hang Seng Bank Ltd.	2002-2008	2002-2008	2002-2008	2002-2008
Huntington Bancshares Inc	1997-2008	1997-2008	1997-2008	1997-2008
Hypo Real Estate Holding AG	2003-2008	2003-2008	NA	2003-2008
ING Groep NV	2000-2008	2000-2008	2005-2008	1998-2008
Intesa Sanpaolo	2007-2008	2007-2008	2007-2008	2007-2008
Irish Life & Permanent plc	2000-2008	2000-2008	2000-2008	2000-2008
Israel Discount Bank Ltd	2001-2008	2008	NA	2001-2008
JP Morgan Chase & Co	1997-2008	1997-2008	1997-2008	1997-2008
KeyCorp	1997-2008	1997-2008	1997-2008	1997-2008
LBB Holding AG	2006-2008	2006-2008	NA	2006-2008
Lehman Brothers Holdings Inc	1997-2007	1997-2007	1997-2007	1997-2007
Lloyds Banking Group Plc	1997-2008	1997-2008	1997-2008	1997-2008
M&T Bank Corp.	2000-2006	2000-2006	2000-2006	2000-2006
Malayan Banking BHD	2008	NA	2000-2008	2000-2008
Mediobanca Spa	2003-2008	2003-2008	2003-2008	2003-2008
Mellon Financial Corp.	2000-2006	2000-2006	2000-2006	2000-2006
Morgan Stanley	1997-2008	1997-2008	1997-2008	1997-2008
National Australia Bank Limited	1998-2008	1998-2008	1997-2008	1997-2008
National Bank of Canada	2002-2008	2002-2008	2002-2008	2002-2008
National City Corp.	2000-2007	2000-2007	2000-2007	2000-2007
Natixis	2002-2008	2003-2008	NA	2002-2008
Nordea Bank AB	2000-2008	2000-2008	2000-2008	2000-2008
Northern Rock Plc	1997-2008	1997-2008	1997-2006	1997-2000
Northern Trust Corporation	1997-2008	1997-2008	1997-2008	1997-2008
Oversea Chinese Banking	2002-2008	2002-2008	2001-2008	2001-2008
PNC Financial Corporation	1997-2008	1997-2008	1997-2008	1997-2008
Popular Inc	2000-2008	2000-2008	2000-2008	2000-2008
Regions Financial Corporation	1997-2008	1997-2008	1997-2008	1997-2008
Royal Bank of Canada	1997-2008	1997-2008	1999-2008	1997-2008
Royal Bank of Scotland Group Plc	1997-2008	1997-2008	1997-2008	1997-2008
Sanpaolo IMI	2001-2006	2001-2006	2005-2006	2001-2006
Skandinaviska Enskilda Banken AB	1997-2008	1997-2008	1998-2008	1997-2008

Societe Generale	2000-2008	2000-2008	2000-2008	1997-2008
Standard Bank Group Ltd.	2000-2008	2000-2008	2000-2008	2000-2008
Standard Chartered Plc	1997-2008	1997-2008	1997-2008	1997-2008
State Street Corporation	1997-2008	1997-2008	1997-2008	1997-2008
SunTrust Banks Inc.	1998-2008	1998-2008	1998-2008	1998-2008
Svenska Handelsbanken	1998-2007	1998-2007	1997-2008	1997-2008
Swedbank AB	2001-2008	2001-2008	2002-2008	1999-2008
Toronto Dominion Bank	1997-2008	1997-2008	1998-2008	1997-2008
Unionbancal Corp.	2000-2007	2000-2007	2000-2007	2000-2007
United Overseas Bank Ltd.	2002-2008	2002-2008	2000-2008	2000-2008
UBS AG	2008	2008	2008	2003-2008
US Bancorp	2001-2008	2001-2008	2001-2008	2001-2008
Wachovia Corp.	2000-2007	2000-2007	2000-2007	2000-2007
Washington Mutual Inc.	1997-2007	1997-2007	1997-2007	1997-2007
Wells Fargo & Company	1997-2008	1997-2008	1997-2008	1997-2008
Westpac Banking Corporation	1997-2008	1997-2008	1997-2008	1997-2008

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