Executive Compensation and Policy Choices at U.S. Commercial Banks

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Abstract: In response to the huge losses taken by U.S. financial institutions in mortgage-backed securities investments, federal legislators have proposed laws that would constrain the ability of bank boards to freely set the size and terms of executive pay. Underlying these proposals is the belief that corporate risk-taking can be controlled by inserting the proper incentives into executive compensation contracts. We examine whether and how the terms of CEO compensation contracts at large, publicly traded commercial banks between 1993 and 2006 influenced the risk-profiles of these firms, and also whether and how the firms' boards responded to risk-taking by changing the terms of CEO compensation contracts. We find strong evidence linking contractual risk-taking incentives (which we proxy with standard measures of vega and delta) to financially risky business policies, including but not limited to increased investments in mortgage-backed securities and increased operating income from originate-to-securitize banking activities. We also find evidence suggesting that bank boards respond in to mismanagement and excessive risk-taking by altering the incentives in executive compensation contracts in sensible ways. These findings suggest that (a) banking executives were to some extent aware of the risks that they were taking, (b) these risks were taken at least partially in response to the incentives present in their compensation contracts, but (c) government intervention to limit risk-taking incentives in financial executive compensation contracts would at best strengthen, and at worst interfere with, the risk-mitigation behaviors already exhibited by bank boards.

1. Introduction

The historic collapse of U.S. housing values, and the subsequent losses in subprime mortgages and mortgage-backed securities, has wreaked havoc on the capital positions of financial institutions around the world. For example, the market capitalization of the ten largest U.S. commercial banks as of January 15, 2009 had declined by approximately $630 billion from their January 2007 levels, a collective 65% reduction in value (Reuters 2009). To encourage affected banks to continue lending—and to prevent the most affected banks from collapsing—the U.S. Treasury injected over $300 billion in preferred and common equity capital into commercial banking companies between Autumn 2008 and Spring 2009 through its Troubled Asset Relief Program (TARP). Large non-bank financial institutions such as American International Group (AIG), Fannie Mae, Freddie Mac, and Bear Stearns have received even larger amounts of aid in the form of equity injections, loans, and loss guarantees from Treasury and the Federal Reserve.

Predictably, it did not take long for politicians and policymakers to seek to limit executive compensation in the banking companies that received aid. To qualify for additional capital injections from TARP in 2009, banks must limit executive compensation to $500,000 per year. More dramatically, on March 16 President Obama instructed the Treasury Department to "pursue every legal avenue" to block $165 million in bonuses due to executives and other financial professionals at AIG:[1]

> "This is a corporation that finds itself in financial distress due to recklessness and greed… Under these circumstances, it's hard to understand how derivative traders at AIG warranted any bonuses, much less $165 million in extra pay. How do they justify this outrage to the taxpayers who are keeping the company afloat?"

A few days later, the House of Representatives did the President one better by passing a bill placing a 90% tax surcharge on compensation above $250,000 at any financial institution that received more than $5 billion from TARP.

[1] "Obama Asks Geithner to Find Way to Rescind AIG Payouts," Wall Street Journal Online, March 16, 2009, http://online.wsj.com/article/SB123721970101743003.html?mod=djemalertNEWS.

Government interference in private executive compensation is not unprecedented in the U.S., but it is rare.[2] However, the "bailing out" of large financial firms with taxpayer dollars has generated substantial public support for intervention. The language of the President's statement plays to this public. His reference to "greed" reflects the populist notion that executive pay in general is simply too high at large public corporations, while "recklessness" invokes an image of irresponsible (i.e., principal-agent) behavior for which discipline should be meted out. Along these lines, many voters are asking their representatives for punitive actions against the Wall Street executives that "caused this mess." But still, the widest base of political support likely flows from the common belief that executive pay should reflect the absolute level of company financial performance.

One can think of company financial performance as being driven by three key elements: the business model in place; how well executives execute the business model; and external conditions beyond the control of executives. These three elements converged in late-2007 for many of the largest U.S. financial companies, with dire results. For much of the preceding two decades, large commercial banks had been transitioning their retail business away from the traditional "lend-and-hold" model which relied on interest income generated from repeat borrower-lender relationships, and toward an "originate-and-sell" loan securitization model that relied heavily on the fee income generated by non-repeat, arms-length financial transactions. This new business model efficiently channeled trillions of investor dollars to mortgage borrowers, in exchange for which investors—large commercial and investment banks among them—held mortgage-backed securities (MBS) and/or derivatives of MBS.[3] This business model proved very profitable, and generated record earnings for the commercial banking industry during most years from the mid-1990s through the mid-2000s. But these were years of relatively benign economic

[2] One of the few recent examples is the Omnibus Budget Reconciliation Act of 1993 which capped the allowable corporate tax deduction on the salaries of a firm's five highest paid managers to $1 million; beyond this amount, only "qualified performance based pay" merits a deduction. The law was intended to better align executive compensation with corporate performance. Gritsch and Snyder (2005) find that stock option compensation has increased as a result of this change

[3] These derivative securities include interest-only and principal-only instruments backed by pools of mortgages, and more complex collateralized debt obligations which are backed by pools of MBS. Loan securitization has also increased in credit card, auto loan, student loan, and small business credit markets; financial losses on the asset-backed securities created in these transactions have not occurred as quickly, however, nor have they been as large, as for MBS.

conditions; growing this business model absent the disciplining effects of economic stress for such a long time period encouraged excesses.[4] The collapse of the housing bubble exposed these excesses, most notable among them the subprime MBS with investment-grade ratings that performed so abysmally upon the collapse of the housing bubble in 2007.

In retrospect, it is clear that managers at commercial and investment banks committed a number of fundamental risk-management mistakes. Portfolios were over-weighted in MBS, as bank managers (like some famous economists) underestimated the covariances of regional housing price movements.[5] The financial leverage used against these investments was often excessive, both on the balance sheet and in off-balance sheet investment vehicles. And these levered portfolios of long-term assets were often financed with short-term debt, suggesting that managers forgot or simply ignored the key lessons of the 1980s savings and loan crisis.

Arguments in favor of government-imposed limits on executive compensation at these institutions must ultimately be judged by two questions: Did the incentives embedded in executive compensation contracts at U.S. financial firms during the 1990s and 2000s cause or contribute to this record of financial mismanagement? And if so, is government regulation of executive compensation necessary to curtail future episodes of mismanagement, or do these firms (i.e., their compensation committees) naturally respond to mismanagement and excessive risk-taking by adjusting the performance incentives in executive contracts? In this paper, we devise and implement empirical tests that address each of these questions. We find strong (albeit preliminary) statistical evidence linking contractual risk-taking incentives at commercial banks to financially risky business policies—including but not limited to risks associated with the originate-to-sell business model—and we find suggestive evidence that bank

[4] Between 1991 and 2007 there was only a single, relatively shallow recession. And ironically, the consumer spending generally credited for the mildness of the 2001 recession was made possible by mortgage securitization, which permitted homeowners to more readily access the equity that would previously been locked up in their homes.

[5] This view was not limited to investors in home real estate securities. Alan Greenspan famously stated during congressional testimony that upward pressure on home prices was largely a regional phenomenon and that nationwide declines in home prices were unlikely. (Testimony to Congress on July 20, 2005.)

boards respond to mismanagement and excessive risk-taking by altering the incentives in executive compensation contracts in sensible ways.

We use market proxies—so-called delta and vega—to capture the incentives present in executive compensation contracts between 1993 and 2006 at large publicly traded U.S. commercial banking companies. Pay-performance sensitivity, or delta, measures the semi-elasticity of CEO compensation to changes in the firm's stock price. Pay-risk sensitivity, or vega, measures the change in CEO compensation with respect to changes in stock price volatility. Over the past two decades total CEO compensation at the largest U.S. commercial banks has been similar to that paid to CEOs at the largest U.S. industrial companies (see Figure 1). However, the incentive structures embedded in the contracts of bank CEOs permanently diverged from those of non-bank CEOs around 2000, when bank CEO pay became substantially more sensitive to stock price volatility (see Figure 2). Perhaps coincidently, this increase in CEO return to risk-taking occurred at approximately the same time that annual increases in U.S. housing prices began to accelerate (see Figure 4). We test whether and to what degree vega and delta are determinants of banks' policy decisions regarding the composition of bank income, loan mix, credit quality, securities investments, deposit mix, financial leverage, off-balance sheet activities, and asset growth rates. Following Coles, et al. (2006), we use a three-stage least squares (3SLS) estimation approach to control for the potential endogeneity of executive compensation contracts to bank policy choices. This not only improves the accuracy of our estimates, but also allows us to test whether and how compensation committees respond to managers' policy decisions by adjusting the delta and vega in compensation packages.

We find plentiful evidence that bank business policies are influenced by the incentives present in CEO compensation contracts. On average, banks in which CEOs have been given stronger incentives to take risk (high-vega banks) generate a larger percentage of their incomes from noninterest activities—including but not limited to securitization activities (e.g., loan origination, loan securitization, and loan servicing fees)—and invest a larger percentage of their assets in private (i.e., subprime or otherwise non-conforming) mortgage securitizations. High-vega banks also take more credit risk, use more financial leverage, and rely more on non-core deposit funding. Importantly, the data indicate that this bundle of relatively risky business policies exposes high-vega banks primarily to systematic risk, and thus exacerbates the financial stress often experienced by banks during macroeconomic downturns. In contrast, banks in which CEOs are less incented to take risk (low-vega banks) tend to invest larger portions of their assets in on-balance sheet loan portfolios and relatively safer government-sponsored pass-through mortgage securitizations. Holding vega constant, tying CEO compensation more closely to stock price (high-delta contracts) is nearly always associated with policy choices in the opposite direction of those made at high-vega banks. This suggests that, at least at commercial banking companies, high-delta compensation packages can induce risk-averse policy incentives that temper or balance the risk-inducing effects of high-vega compensation packages (or vice versa).

Our results also suggest, at least for some business policies, that bank boards are monitoring and responding to risk outcomes with sensible adjustments to compensation contracts. Pay-risk sensitivity (vega) tends to be set lower at banks exposed to the most credit risk, e.g., those invested in large amounts of nonperforming loans or risky (non-agency) mortgage-backed securities. Consistent with this, pay-performance sensitivity (delta) tends to be set higher at banks invested in risky MBS as well as at banks that exhibit high amounts of systematic or idiosyncratic risk; this suggests attempts to induce greater CEO risk aversion. However, for other business policies boards appear to be reinforcing risky policy choices—presumably because boards perceived these policies as reasonable rather than excessive risks, or because boards did not perceive these policies to be risky during our sample period (e.g., mortgage-backed securities?). Pay-risk sensitivity tends to be set higher at banks that are generating large amounts of income from non-traditional activities (e.g., brokerage, insurance, investment banking), financially levering their off-balance sheet activities, or exhibiting high amounts of systematic risk.

The remainder of the paper is organized as follows. Section 2 discusses the transactions banking model central to the expansion of mortgage credit in the U.S. and how the adoption of this model has affected bank financial performance. Section 3 reviews the relevant literature on executive compensation and risk-taking. Section 4 presents our empirical model and test methodology and states the broad hypotheses linking executive compensation and risk-taking. Section 5 describes our data, defines the variables we use to specify the model, and presents variable-specific hypotheses. Section 6 reports our (preliminary) empirical results. Section 7 summarizes and concludes.

2. Transactions banking

The top commercial banking companies in the U.S. have grown immensely larger over the past two decades. During the mid-1980s only Citibank had more than $100 billion in assets; by the mid-2000s nearly 20 U.S. banking companies had more than $100 billion, and three exceeded $1 trillion. And even these burgeoning asset figures understate the expansion of the largest U.S. banks, because the industry simultaneously experienced a doubling of noninterest income from activities largely unrelated to bank assets.

What permitted this staggering increase in bank size? Deregulation allowed banks to expand their geographic footprints and offer non-banking products such as investment banking, brokerage, and insurance sales and underwriting.[6] But why was deregulation necessary? Innovations in financial markets and information technologies set in motion a process of disintermediation that threatened to make the heavily regulated U.S. banking sector obsolete. The advent of money market mutual funds, 401K plans, discount brokerage, and other new options for depositors and savers was depriving banks of their most important sources of funds, while the expansion of commercial paper, high-yield debt, and OTC stock markets was providing banks' core business customers with ready substitutes for bank loans.

The banks most successful at coping with disintermediation created an entirely new retail banking business model that took advantage of looser regulation, new channels of information, and deeper financial markets. "Transactions banking" embraces financial disintermediation. Banks use their expertise in loan underwriting to originate loans, but instead of issuing deposits to fund these loans on-

[6] In 1994 the U.S. Congress passed the Riegle-Neal Interstate Banking and Branching Efficiency Act, which effectively repealed the McFadden Act at the national level and harmonized the patchwork of state-by-state banking and branching rules. In 1999 Congress passed the Graham-Leach-Bliley Financial Services Modernization Act, which effectively repealed the Glass-Steagall Act by granting broad-based securities and insurance powers to commercial banking companies.

balance sheet, they (or their investment bank partners) issue asset-based securities to fund these loans in off-balance sheet loan securitization pools. Loan securitizations are investment trusts that purchase existing home mortgage loans (or auto loans, or credit card receivables) from banks, using funds raised by selling "mortgage-backed securities" (MBSs) to third-party investors. This process allows banks to sell their otherwise illiquid loans to the securitization, and use the proceeds of these sales to fund additional loans—in a sense, recycling bank capital. Banks earn noninterest income from loan origination fees, loan securitization fees, and loan servicing fees, while the loan interest and principal repayments are shared by the MBS investors. The banking system, however, is not shed of the credit risk associated with the securitized loans. Depending on the riskiness of the loans in the pool, the originating or securitizing banks may hold a portion of the MBSs themselves or provide recourse agreements to MBS investors. And the investors in MBS can be banks and other financial institutions that want exposure to the risks and returns of diversified pools of mortgages (or other retail loans) without having to generate these loans themselves.

The growth in securitized mortgage lending was facilitated in large part by government-sponsored enterprises (GSEs) such as Ginnie Mae, Fannie Mae, Freddie Mac. Well over half of the residential mortgage debt in the U.S. is securitized by, held in the portfolios of, or guaranteed by these three institutions. Most of the MBSs issued by these GSEs are relatively safe and easy-to-understand "pass-through" securities: the pooled mortgages are either backed by government guarantees, private insurance, or large down payments, and the interest and principal cash flows are shared equally by the investors.[7] But investors in other types of MBS can bear substantial amounts of risk. Private (non-GSE) mortgage-backed securities are backed by pools of non-conforming loans that carry additional risk for a

[7] Because Fannie Mae and Freddie Mac initially securitized or held only conforming mortgages (non-jumbo first mortgages with either 20% down payments or private mortgage insurance), they were permitted to operate with very little capital; moreover, their lines of credit at the U.S. Treasury created the perception that they were "too-big-to-fail," which gave them a funding advantage over private-sector mortgage securitizers. But in response to political pressure during the early 2000s, both Fannie and Freddie began purchasing subprime MBSs. As these investments soured and the GSEs reached the verge of insolvency, the Treasury Department made good on its "implicit government guarantee" by injecting equity funding and nationalizing ownership of the two GSEs.

wide range of reasons: they are large (jumbo) loans, they have low down payments, borrows provided incomplete documentation of income (low-doc loans), or borrowers had poor credit ratings (subprime loans). And structured mortgage-backed securities—derivative MBS products that are backed by pools of other MBS—decompose the underlying mortgage interest and principal repayments into "tranches" according to financial needs and risk appetites of investors: interest-only tranches, principal-only tranches, and tranches that are either more or less exposed to prepayment risk or credit risk.

The transactions banking model has yielded large production and financing efficiencies for banks that use it, and by sharing credit risk with investors outside of the banking system has increased access to credit for millions of households and small businesses. But mismanagement of this lending technology was a key contributor to the bubble in U.S. housing markets during the 2000s and the subsequent turmoil in world financial markets.

Transactions banks gain access to enormous economies of scale (Hughes et al. 1996, Rossi 1998). These scale economies are associated with the collection and analysis of the "hard," quantifiable borrower information central to the automated lending processes used to evaluate, originate, and pool large volumes of retail loans (Stein 2002). But transactions banks all have access to the same information (e.g., credit scores) and all produce non-differentiated financial commodities such as mortgage loans and credit card loans, so price competition is intense and profit margins are tight. Hence, transactions banks have strong incentives to grow larger in order to exploit further unit cost reductions. Acquiring other banks has been the most efficient way to achieve increased scale; over 10,000 bank charters have been merged out of existence since 1980. Once transactions banks have exhausted their external growth options, internal growth requires increasing the number of loan originations, which creates incentives to relax lending standards and make loans to less creditworthy borrowers. This incentive to write increasingly risky loans is amplified by the fact that, in its purest form, the transactions banking model separates loan underwriting from the monitoring and bearing of credit risk. Although pooling loans does to some extent reduce risk via diversification, MBS investors bear the bulk of the credit risk. And given the information problems associated with pools comprised of hundreds or thousands of individual loans, as well as the complexity of the expected cash flows from some structured MBS products, investors simply cede the task of evaluating credit risk to third-party securities rating firms.

Earnings at large banking companies have become more reliant on noninterest income over time—not just from their transactions banking activities, but also from other nontraditional lines of business made accessible by deregulation such as securities underwriting and brokerage, and from selling backup lines of credit that enable their business clients to issue their own debt securities. DeYoung and Roland (2001) argue that increased reliance on noninterest has altered the risk-return profiles of banks. For example, compare (a) the fee income a bank receives by originating and securitizing a mortgage loan to (b) the interest income a bank receives by originating a small business loan and holding it in its loan portfolio. The former is a non-repeat transaction with the borrower, and the volume of this business is sensitive to housing market volatility and mortgage interest rates—that is, systematic risk. The latter is a long-term relationship that both sides have an interest in preserving, which will continue to generate interest income (and perhaps fee income as well) into the future. In a similar fashion, fees charged in securities brokerage are typically based on the value of assets sold or under management; again, predominantly systematic risk. Moreover, activities that generate noninterest income increase banks' operating leverage—the production functions for most of these activities are dominated by fixed costs, e.g., personnel expenses—as well as their effective financial leverage if these activities do not leave footprint on the balance sheet. Leverage amplifies revenue volatility into even greater earnings volatility.

A number of empirical studies have investigated the volatility of noninterest income at banks and its effect on risk. DeYoung and Roland (2001) show that (non-deposit-related) fee income is associated with higher revenue volatility, higher operating leverage, and higher earnings volatility at U.S. commercial banks. DeYoung and Rice (2004b) find that marginal increases in non-interest income are associated with a worsening of banks' risk-return trade-off. Stiroh (2004a, 2004b) finds no evidence of diversification gains at banks that combine interest and non-interest income. Choi, et al. (2006) find that noninterest income at commercial banking companies in 42 different countries is strongly and positively related to systematic risk. Clark, et al. (2007) emphasize how the increasingly retail-focused strategies of large U.S. banking companies expose these banks to economic and business cycle volatility. Elysiani and Wang (2008) demonstrate that noninterest income makes it more difficult for analysts to forecast the quarterly earnings of banking companies.

The sub-prime mortgage crisis provides an illustration of the income volatility associated with fee-driven transactions banking. While the headlines in the financial press have justifiably dwelled on the over $2 trillion of capital losses suffered by banks and other investors in sub-prime mortgage-backed securities, transactions banking companies that originated, serviced, and securitized mortgages have experienced material, and in some cases crippling, reductions in fee income as investor demand for new MBS dried up and household demand for both new and existing houses declined. Total industry noninterest income fell from 43% to 38% of operating income between 2006 and the first three quarters of 2008, the largest two-year decline since the mid-1970s. Many of the largest financial institutions with non-diversified, "mono-line" mortgage banking strategies failed (e.g., American Home Mortgage, New Century Financial, Countrywide Financial, Washington Mutual) due to the combined impact of plummeting fee income and large losses in their portfolios of subprime mortgages and mortgage-backed securities.

3. Executive Compensation

Why does executive compensation affect firms' policy choices? According to agency theory, CEO compensation shapes managerial incentives, and delta and vega are two important measures of such managerial incentives (Core and Guay 2002). Delta, or pay-performance sensitivity, measures the change in the dollar value of CEO wealth for a 1% change in stock price. Vega, or pay-risk sensitivity, captures the change in the dollar value of CEO wealth for a 0.01 change in stock return volatility. The impact of high delta is two-fold. On the one hand, high-delta contracts tie managerial wealth to shareholder value by paying managers with shares of firm stock, in attempts to reduce conflicts of interest between managers and shareholders (Jensen and Meckling 1976; Morck et al. 1988; McConnell and Servaes 1990; Berger et al. 1997). On the other hand, high-delta contracts concentrate managerial wealth in the shares of the firm, providing incentives for poorly diversified, risk-averse managers to pass up positive NPV projects that increase firm risk. High-vega contracts seek to mitigate managerial risk-aversion by paying managers in stock options, which should make risk more valuable to managers by increasing their pay-risk sensitivity (Jensen and Meckling 1976; Smith and Stulz 1985). Studies of industrial firms provide evidence that high-vega contracts encourage riskier policy choices while high-delta contracts encourage less risky policy choices (Knopf et al. 2002; Rogers 2002; Nam et al. 2003; Coles et al. 2006).

Executive compensation in the banking industry has not traditionally been structured to encourage risk-taking (Smith and Watts 1992; Houston and James 1995). However, as discussed in section 2, industry deregulation expanded banks' investment opportunities, allowing them to expand into new geographic markets and provide non-banking financial services such as investment banking, securities brokerage, and insurance sales and underwriting. To motivate their CEOs to take advantage of these growth options, bank boards dramatically reshaped executive contracts. Although total executive compensation increased no faster than in other industries (see Figure 1), the composition of bank CEO pay became more equity-based. Total equity compensation (including both options grants and restricted stock grants) at large banking companies increased from 29% of total compensation in 1992 to more than 50% in 2000, before slipping back to about 40% in 2005.[8] More importantly, the changing composition of bank CEO compensation resulted in larger deltas and vegas (see Figures 2 and 3), which indicate that bank CEO wealth has become more sensitive to stock price and stock return volatility.

The terms of executive compensation contracts may not be exogenous; in response to managers' policy choices—and the risk profiles implied by those choices—boards may take actions to alter managerial incentives. Guay (1999) suggests that firms with more R&D expenditures are more likely to have high-vega contracts. Coles et al. (2006) further show that vega increases in R&D expenditures and leverage, while vega decreases in investments in plant assets and firm focus. Similar evidence has been

[8] Full data is available upon request. The non-monotonicity can be attributed mainly to option grants, whose values and percentages peaked in 2000 and declined steadily since then. One explanation for these declines is the lackluster stock performance after 2000 compared to the stock market boom period of 1994-2000. Another explanation is the beginning of option expensing around 2002 (Carter et al. 2007).

compiled for banking companies (Crawford et al. 1995; Hubbard and Palia 1995). Chen et al. (2006) document that, in the post-deregulation era, option-based compensation at banks is positively related to market-based measures of bank risk.

The main focus in this study is on vega and the interplay of pay-risk sensitivity and bank policy choices. However, we include delta as an important control variable in our tests, which allows us to also observe the relationships between delta and bank policy choices. There are mixed theories on delta's impact on risk-taking. Smith and Stulz (1985) show that high delta increases the risk aversion of undiversified managers, causing managers to reduce firm risk. But John and John (1993) argue that high-delta contracts can provide incentives to shift risk to debt-holders, causing managers to take excessive risk on behalf of shareholders (i.e., themselves). This is a legitimate concern here, since asset substitution problems can be more serious in banks where the majority of debt is typically in the form of deposit contracts guaranteed by the Federal Deposit Insurance Corporation (FDIC). Since one bank may have a very different mix of vega and delta than another bank, it is essential to control for the various underlying effects of delta when we examine the relationships between vega and banks' policy choices.

4. Methodology

Following the literature, we expect that (a) bank CEOs with stronger risk-taking incentives will implement riskier business policies and (b) bank boards will adjust compensation packages in response to CEO policy choices and the outcomes of those policies. Hence, compensation contracts and business policy choices are simultaneously determined, and ordinary least squares (OLS) regressions of policy measures on contemporaneous compensation incentives may generate biased parameter estimates. To address the endogeneity issue, we use two different estimation methods in our tests: (1) OLS with lagged compensation variables, and (2) three-stage least squares (3SLS) estimation.[9]

[9] Although 3SLS generates more efficient coefficient estimates in large samples, the small-sample properties of 3SLS are not well understood. Because of this, we also used two-stage least squares (2SLS) in our analyses (not shown here, available upon request). The untabulated 2SLS results do not change our inferences.

4.1. Ordinary Least Squares

To account for the likelihood that policy choices will have feedback effects on the terms of compensation contracts, we estimate the following OLS business policy model (firm subscripts suppressed for convenience):

$$Policy_t = f(ln(Vega_{t-1}), ln(Delta_{t-1}), ln(TA_{t-1}), ln(MB_{t-1}), Controls_{t-1}), \quad (1)$$

where $ln(Vega_{t-1})$ and $ln(Delta_{t-1})$ are the natural logs of one-period lagged vega and delta, and $ln(TA_{t-1})$ and $Ln(MB_{t-1})$ are the natural logs of total assets and the market-to-book ratio of equity measured at the beginning of the year. We predict that $ln(Vega_{t-1})$ is positively related to policies that increase bank risk. However, we have no unambiguous expectation for the impact of $ln(Delta_{t-1})$, as there is no firm consensus in prior studies on whether high-delta contracts encourage managerial risk-aversion or managerial risk-taking behavior on net. We expect that larger banks and banks with better investment opportunities will be more likely to engage in nontraditional banking activities that generate more volatile income streams and higher market risk exposures. $Controls_{t-1}$ includes unique control variables in each of the specific business policy regressions; these business policy-specific control variables are listed in Appendix B.

4.2. Three-Stage Least Squares

To address the joint determination of business policies and compensation incentives, we need to isolate the impact of business policy choices on CEO compensation structure from the impact of CEO compensation structure on business policy choices. Therefore, we estimate simultaneous equation systems using 3SLS, which combines two-stage least squares (2SLS) and seemingly unrelated regression (SUR) techniques. Specifically, we estimate the following system of equations:

$$Policy_t = f(ln(Vega_t), ln(Delta_t), ln(TA_{t-1}), ln(MB_{t-1}), Controls_{t-1}) \quad (2)$$

$$ln(Vega_t) = f(Policy_t, ln(TA_{t-1}), ln(MB_{t-1}), ln(Salary_t) \quad (3)$$

$$ln(Delta_t) = f(Policy_t, ln(Vega_t), ln(TA_{t-1}), ln(MB_{t-1}), Cash\_Balance_{t-1}, Tenure_t) \quad (4)$$

where $ln(Salary_t)$ is the natural log of CEO salary for the year, $Cash\_Balance_{t-1}$ is the percentage of assets held in cash at the beginning of the year, and $Tenure_t$ is the number of years in the CEO's term. The control variables in the bank policy regressions (2) are the same as those in the OLS regressions. We include $ln(Salary_t)$ in the vega regression (3) as a proxy for managerial risk-aversion (Core and Guay, 1999; Guay, 1999; Coles et al., 2006). We expect that bank CEOs with larger amounts of fixed pay will be more willing to take on risk. We expect a negative coefficient on *Cash_Balances* and a positive coefficient on *Tenure* in the delta regression (4). Prior studies have shown that compensation committees at cash-constrained firms are more likely to provide CEOs with high-delta contracts; high-delta contracts are also more likely as managerial ability becomes less uncertain or when the approach of CEO retirement creates horizon problems.

5. Data

Our sample is based on the intersection of the ExecuComp database and the Federal Reserve Y-9C Bank Holding Company database from 1993 through 2006. ExecuComp reports top executive compensation information extracted from annual proxy statements; we estimate our key variables delta and vega from these data. The FR Y-9Cs contain quarterly financial data that cumulates over the calendar year; we extract business policy variables, as well as most of our control variables, from the year-end December 31 reports. We start with 141 banks (1,057 bank-years) in the ExecuComp database.[10] The process of lagging variables, merging the two databases, and estimating delta and vega reduces this to 139

[10] Our banking sample includes ExecuComp observations with the SIC code of 6020.

banks (974 bank-years). As shown in Table 1, the number of banks in each year ranges from a low of 61 in 1993 to a high of 75 in 1998. The sample includes a total of 216 CEOs.[11]

Table 2 presents descriptive statistics on CEO characteristics, business policy measures, and additional bank characteristics. Following Core and Guay (2002), we use the "one-year approximation" method to generate annual estimates of vega and delta.[12] Vega has a mean (median) of $149,351 ($50,917), and delta has a mean (median) of $616,410 ($280,742). In other words, the average bank CEO enjoys an increase of $149,351 in his/her equity portfolio for a 0.01 increase in stock return volatility, and an increase of $616,410 for a 1% increase in stock price. Since the two variables have large standard deviations and are skewed to the right, we use log transformations to produce more symmetric data distributions. At the average bank in our sample, the CEO has 9 years of tenure in the position, and earns $4.55 million in total annual compensation—approximately $710,000 in salary, $970,000 in bonus, $1.62 million in option grants, and $610,000 in restricted stock.

We examine twenty-eight policy measures that are expected to affect bank risk. Descriptive statistics for these variables appear in Panel B of Table 2. We include four measures of noninterest income. *Nonint* is total noninterest income, *Nonint_Less* is total noninterest income less fiduciary income and deposit service charges, *Nonint_Sec* is noninterest income from loan securitization and servicing, and *Nonint_Nontrad* is noninterest income from nontraditional banking activities such as investment banking, brokerage, trading, venture capital, and insurance underwriting. Each is scaled by net operating income (i.e., noninterest income plus interest income minus interest expense). Based on the extant banking literature (e.g., DeYoung and Roland 2001), we expect each of the noninterest measures to be risk-increasing and thus positively related to vega. (Because the general compensation literature provides

[11] As discussed in the following section, we do not used firm fixed effects in our estimations. Because our results are based mainly on cross-sectional variation in the data, changes in bank CEOs do not pose a critical problem.
[12] We value CEO stock options using the Black-Scholes (1973) model modified by Merton (1973) to account for dividends payouts. Vega is the partial derivative of the option value with respect to stock-return volatility, multiplied by 0.01 times the number of options. Delta equals delta from options plus delta from stock holdings. Delta from options is the partial derivative of the option value with respect to stock price, multiplied by 1% of the current stock price times the number of options. Delta from stock holdings is simply the product of 1% of the current stock price and the number of shares.

mixed results on the relationship between delta and risk-taking, we will not establish any expectations in this section for the direction of the delta-policy associations.)

We include six loan portfolio measures. *Loans* is total loans and leases held in portfolio, *Commer_Loans* is commercial and industrial loans, and *Commer_Real_Loans* is commercial real estate loans. Each is scaled by total assets. Because large banks have increasingly shifted credit risk off of their balance sheets and on to their income statements (Stiroh 2004, 2006), we expect investments in the loan portfolio—holding credit risk constant—to be negatively related to vega. We also measure loan quality. *Alloc_loans* is allocation for loan and lease losses, *Prov_loans* is provision for loan and lease losses, and *Charge_loans* is net charge-offs and recoveries on loan and lease losses. Each is scaled by total assets. Since low quality loans expose banks to greater credit risk, we expect these three (ex post) measures of credit risk to be positively related to vega.

We include five bank financing measures. *Noncore_Deposit* is the percentage of bank assets funded by noncore deposits, such as time deposits of $100,000 or more. *Short_Funds* is the percentage of bank assets funded by purchased fed funds and repurchase agreements. Funding long-term investments with short-term and/or unstable liabilities increases both interest rate risk and liquidity risk at banks. Therefore, we expect these two variables to be positively related to vega. We include three measures of financial leverage as well: *Equity_Mult* is the simple equity multiplier, total assets divided by book equity capital; *Equity_Mult_Off* equals the sum of total assets and off-balance sheet asset equivalents (e.g., unused commitments and letters of credit) divided by book equity capital; and *Equity_Mult_Flows* equals net operating income divided by book equity capital. We expect financial leverage to be positively related to vega.

We include two measures to capture banks' expansion and growth. *Growth* is the natural log of the annual increase in total assets, and *Intangible* is the percentage of bank assets that are intangible. Both of these measures are positively related to asset acquisitions. Because banks that grow more aggressively will tend to exhibit greater operational risks, we expect these two variables to be positively related to vega. We also include the notional value (*Deriv_Notional*) and fair value (*Deriv_FV*) of derivatives contracts held for trading purposes, both of which are scaled by total assets. Conceptually, we would expect derivatives trading to be positively related to vega. However, the data to which we have access does not indicate the net long versus short exposures in these contracts. Furthermore, the vast majority of derivatives contracts in the banking industry are held at just a small handful of banks (Minton et al. 2006). For both of these reasons, our expectations regarding the derivatives-vega relationship are not strong ones.

We include six measures of investment in mortgage backed securities (MBS): the amortized cost and fair value of private securitizations (*MBS_Private_BV* and *MBS_Private_FV*), the amortized cost and fair value of structured mortgage-backed products (*MBS_ Struct _BV* and *MBS_ Struct _FV*), and the amortized cost and fair value of agency pass-through securities (*MBS_ Pass_BV* and *MBS_Private_FV*). Each is scaled by total assets. As discussed above, pass-through MBS are backed by insured and/or conforming mortgages, so we expect these investments to be negatively related to vega. In contrast, we expect investments in complex structured MBS products and low credit-quality private MBS products to be positively related to vega.

Finally, we include three measures of market-based risk. *Risk* is the standard deviation of daily stock returns, *Beta* is the slope coefficient estimated from a standard one-factor market model, and *Idiosyn_Risk* is the standard deviation of the market model residuals. Prior studies suggest that higher vega leads to higher total risk (Coles et al. 2006), and that the value of executive stock options increases with systematic risk after controlling for total risk (Meulbroek, 2001; Duan and Wei 2005). As result, we expect both *Risk* and *Beta* to be positively related to vega. We have a weaker expectation that *Idiosyn_Risk* will also be positively related to vega.

Panel C of Table 2 reports descriptive statistics for the control variables in each of our models. As discussed above, some of these variables appear as controls in all versions of the model—asset size and the market-to-book ratio in the business policy regressions; CEO salary in the vega regressions; and cash balances and CEO tenure in the delta regressions—while others are used to help identify selected versions of the business policy regressions.

Table 3 reports Pearson and Spearman correlations among the 28 policy variables; the three risk measures *Risk*, *Beta*, and *Idiosyn_Risk*; and the compensation incentives *Vega* and *Delta*. Consistent with our expectations, fee income, commercial loans, problem loans, noncore deposits, financial leverage, asset expansion, derivative contracts, and private MBS are all positively correlated with the risk measures. Also as expected, noninterest income, problem loans, financial leverage, asset expansion, derivative contracts, and private MBS all show positive correlations with *ln(Vega)* and *ln(Delta)*, while on-balance sheet lending and structured MBS are negatively related to *ln(Vega)* and *ln(Delta)*. Consistent with prior studies, *ln(Vega)* and *ln(Delta)* are positively related to *Beta.* Importantly, noninterest income, problem loans, financial leverage, intangible assets, and derivative contracts are all positively correlated to *Beta*—although these bivariate correlations do not control for the influence of other factors, they are suggestive that transactions banks (noninterest income, financial leverage) may be especially vulnerable to economic downturns.

6. Results

Our 1993-2006 data are an annual panel—however, because the chief variables of interest (business policy, vega, delta) exhibit little variation over time at the firm level, fixed effects estimation is not appropriate.[13] Instead, we estimate both model (1) and model (2,3,4) using two alternative techniques. First, we apply ordinary least squares (OLS) with year fixed effects to the pooled time series-cross section data panel. The year dummies absorb annual variations in business policy and/or compensation practices that are common to all firms. Still, given that the variation in our data is primarily cross-sectional, simply pooling the data in this fashion will over-represent the power of our statistical tests. Our solution is to use annual OLS cross-section estimation with Fama-McBeth estimators, a

[13] When we applied a firm fixed effects approach to the data (not shown here) we found few statistically relationships between the policy variables and the compensation variables. The many strong and economically sensible correlations between these variables in Table 3, taken together with the disappearance of these relationships in firm fixed effects regressions, leads us to conclude that most of the variation in our data is cross-sectional.

flexible approach that permits all coefficients to vary each year. We report the results of both estimation procedures in the tables below.

We present selected results from the OLS estimations of model (1) in Table 4. (We do not discuss the coefficients on the control variables Z in this preliminary version of the paper. The interested reader can consult the full regression results reported in Appendix C.) Although the results are not always robust and a number of our hypothesized compensation-policy relationships do not obtain, the statistically strongest and most robust results tell an economically sensible story. Banks with high pay-risk sensitivity (high vega) tend to have higher than average amounts of systematic risk, and their policy choices reflect this. High-vega banks rely more on noninterest income—which as we argue above exposes banks to systematic risk (DeYoung and Roland 2001, Choi, et al. 2006, Clark et al. 2007)—and hold greater amounts of intangible assets. Because these business policies make the bank more opaque, they are difficult for analysts to value (Elysiani and Wang 2008) and hence will tend to increase stock price volatility for these banks. In contrast, banks with high pay-performance sensitivity (high delta) exhibit higher idiosyncratic risk, and their policy choice reflect this. High-delta banks invest a high percentage of their assets in loans, and as a result their returns are more likely to follow the firms and sectors to which they lend rather than the market average. The high reliance on short-term funding and the high percentage of problem loans at these banks are both consistent with policies aimed at expanding the loan portfolio. High-delta banks also tend to grow their assets faster; in a stock market that values earnings growth, this policy is consistent with high pay-performance sensitivity. Finally, there is a sensible symmetry in these results: high-vega (high-delta) CEOs choose policies that make their banks more (less) reliant on noninterest income from securitization and non-traditional activities, and less (more) reliant on traditional portfolio lending.

Of course, model (1) does not account for the potential endogeneity of executive compensation contracts to the policy choices made by managers, and as such the coefficient estimates reported in Table 4 may be biased. We present selected results from the model (2,3,4) estimations in Table 5. Again, we estimate this model two ways: pooled 3SLS estimation with year dummies, and annual 3SLS cross-section estimation with Fama-McBeth estimators.

Identifying the three-equation 3SLS model is a challenge, because each version of the system is based on a different business policy variable. The vega equation (3) and the delta equation (4) are specified the same way in all 28 of the regression systems, but the right-hand side specification of the business policy equation (2) must vary by definition. In a few of the systems, we use a business policy variable from one of the other systems as an identifying instrument in the business policy regression (2). All of the system estimations reported in Table 5 are identified based on the following straightforward test: each equation in the system contains at least one statistically significant coefficient on a variable that has been excluded from the other two equations in the system. A list of these identifying right-hand side variables appears in the Appendix B.

The results from the 3SLS business policy regressions tell the same basic story as do the single-equation OLS results above, but controlling for endogeneity generates much more robust results and brings the story into sharper focus. High-vega banks have high amounts of systematic risk and, consistent with this exposure, generate substantially larger portions of their operating income from noninterest income. For example, using the Fama-McBeth estimator, a one standard deviation increase in vega increases the noninterest share of total operating income by about 38%. (The statistically significant and positive impact of delta on securitization-based noninterest income is smaller—however, we observe this variable in only six of the 14 years in our data, which makes estimation and inference more difficult.)

High-vega banks make a number of unambiguously risk-increasing policy choices. Loan quality is lower (greater provisions for loan losses, more net loan charge-offs), suggesting high amounts of credit risk. A greater portion of assets are funded with non-core deposits, which increases both interest rate risk and liquidity risk. A smaller portion of activities are backed by equity finance (*equity multiplier_flows* and *equity multiplier_off*), which increases insolvency risk. And high-vega banks are relatively more likely to invest in high-risk mortgage-backed securities (*MBS_private*) than in low-risk agency securitizations (*MBS_pass-through*). The two results that seeming contradict this pattern are the significant negative associations of vega and holdings of commercial real estate loans and derivatives securities. However, these two results should be interpreted with caution. Commercial real estate lending is a highly competitive but relatively safe business *except* during real estate downturns when loan defaults can increase dramatically; but because real estate downturns had previously been regional phenomena, large banks can run well-diversified portfolios of these loans. (This is in contrast to small banks that hold non-diversified portfolios of local commercial real estate loans which, as a result, historically comprise the largest percentage of bank insolvencies.) As to derivatives, since the regulatory data only allow us to measure aggregate derivatives holdings, we cannot measure the proportions of net long-versus-short exposures that could expose banks to losses (or gains) from interest rate or currency movements.

Consistent with the incentives they face, high-delta banks (holding vega constant) make policy choices that expand bank activities in areas that are well understood by investors. For example, they loan out a substantially larger than average percentage of their assets; using the Fama-McBeth estimator, a one standard deviation increase in delta increases the lending share of total assets by 15%. Within the loan portfolio, high-delta banks substitute commercial real estate loans for general (non-real estate) business loans, while outside the loan portfolio they generate a smaller than average portion of their income from difficult-to-value non-interest activities. These results suggest that high pay-performance sensitivity creates incentives for bank executives to run relatively traditional banking models. The one result that is inconsistent with this picture is the positive association between delta and private mortgage securitizations.

The other two equations in the system capture the "feedback" from managers' policy choices to the compensation incentives that the board provides management. The results displayed in the last four columns of Table 5 suggest that compensation committees adjust both delta and vega in a coordinated fashion, in attempts curb management from taking excessive risk. For instance, in the vega equations, the loan quality, private MBS, and structured MBS policy variables all carry significantly negative coefficients; this is strong evidence that bank boards attempt to moderate risk taking and reduce policy excesses by weakening CEO risk-taking incentives. Consistent with this, delta tends to be set higher for banks with large amounts of non-core deposit funding, banks that invested in private and structured MBS, with systematic risk, and with idiosyncratic risk; this suggests that bank boards attempt to influence CEOs to make more risk-averse policy decisions by increasing their pay-performance sensitivity.

For other policy choices, however, bank boards appear to be reinforcing risky policy choices. For example, boards tend to increase vega when the share of noninterest income in total income is large and when banks finance these cash flows with high amounts of financial leverage. Why would potentially risk-increasing policy choices be greeted with *higher* risk-taking incentives? This is a sensible response if we remember the conventional wisdom in the banking community during most of our sample period that fee-based activities were risk-reducing at banks (DeYoung and Roland 2001); given these incorrect beliefs, rational boards would seek to increase risk-taking incentives at noninterest-intensive banks, even to the point of further levering these activities. Another potential explanation is that boards *did understand* that noninterest income tends to increase the bank's systematic risk, and increased vega to incent management to increase the volatility of stock price (i.e., reduce the correlation between bank returns and market returns). This interpretation would also explain the significant positive coefficient on systematic risk in the vega equation.

Finally, the significantly negative coefficients on the three loan variables in the delta regression are not clearly intuitive, and we offer the following speculative interpretation: Because loans (and especially business loans) are the most traditional of commercial bank business policies, the market understands these policies and will give them high risk-adjusted values; given the positive market reactions to these policies, bank managers with high deltas could easily over-invest in loans, causing the board to reduce pay-performance sensitivity.

One must be careful when interpreting the compensation "feedback" results in the vega and delta equations. The coefficient estimates on the policy variables are largely capturing cross-sectional variation in the data—the coefficients do not represent inter-temporal reactions within given firms. For example, the negative coefficients on loan charge-offs in the vega equation indicate that high loan losses *relative to the industry* will tend to elicit less risk-performance sensitive contracts. The coefficient estimates on delta in the vega equations (on vega in the delta equation) are interpreted similarly. Note that when these coefficients are statistically significant, they always carry a positive sign—that is, bank boards tend to alter the terms of CEO compensation in order to jointly increase or decrease delta and vega. This is consistent with the use of pay-risk sensitivity to offset the unwanted managerial risk-aversion side effects of pay-performance sensitivity.

7. Summary, Discussion, and Conclusions

The huge losses suffered by large U.S. financial institutions that created and invested in risky mortgage-backed securities, and the nearly equally huge government subsidies spent to keep these firms functioning and afloat, have raised the public's ire. True to form, politicians have responded with a variety of schemes to limit the pay of the financial executives who "got us into this mess." While much of this is political theater—in time, a substantial portion of the government loans and capital injections are likely to be paid back, and *ex post facto* sanctions on employee pay and bonuses are unlikely to withstand constitutional scrutiny—the episode has raised public consciousness and increased the likelihood of a more permanent role for government in monitoring and determining executive pay in publicly traded companies. In 2005, Representative Barney Frank introduced "The Protection Against Executive Compensation Abuse Act," which called for increased public disclosure of executive pay—including the targets for short-term and long-term performance incentives—and would have required shareholder approval of executive compensation contracts. The bill did not progress beyond initial stages. However, Frank and others are considering new legislation that would link executive pay to company performance, and such a bill would have a better chance for passage in today's environment.[14]

Underlying the efforts to control executive pay is the belief that corporate risk-taking can be controlled by inserting the proper incentives into executive compensation contracts. We examine whether and how the terms of CEO compensation contracts at large, publicly traded commercial banks between 1993 and 2006 influenced the risk-profiles of these firms, and also whether and how the firms' boards

[14] "Cuomo, Frank Seek to Link Executive Pay, Performance," Susanne Craig, Wall Street Journal, March 13, 2009.

responded to risk-taking by changing the terms of CEO compensation contracts. We find strong evidence linking contractual risk-taking incentives (which we proxy with standard measures of vega and delta) to financially risky business policies, including but not limited to increased investments in mortgage-backed securities and increased operating income from originate-to-securitize banking activities. We also find evidence suggesting that bank boards respond in to mismanagement and excessive risk-taking by altering the incentives in executive compensation contracts in sensible ways.

We draw three broad conclusions from these findings. First, banking executives were to some extent aware of the risks that they were taking by investing in risky MBS and by increasing the proportion of their banks' revenues generated by originate-and-securitize banking activities. Our findings run contrary to the claim that banks were misled by over-optimistic ratings on MBS (although such claims may be valid for less sophisticated investors). Second, banking executives endorsed these risky business policies at least partially in response to the incentives present in their compensation contracts. This lends legitimacy to arguments for government intervention to limit contractual risk-taking incentives for executives *at systemically important financial institutions*. Third, government intervention to limit risk-taking incentives in financial executive compensation contracts would at best strengthen, and at worst interfere with, the risk-mitigation behaviors already being exhibited by bank boards. For those prone to policy activism, our findings that bank boards respond to risky policy choices by sometimes attempting to constrain risk-taking, while in other instances attempting to encourage additional risk-taking, could be seen as a justification for intervention. But the terms of optimal contract incentives are likely to vary from firm to firm and from CEO to CEO, while government prescriptions almost by necessity tend to be one size fits all. Furthermore, the contractual incentives that we test here were designed by boards to mitigate principal-agent problems on the behalf of shareholders, while contractual incentives imposed via regulation are presumably aimed at providing public goods (i.e., financial market stability, fairness) and could work far differently.

In interpreting our 1993-2006 findings, it is important to realize that bank managers were making their policy decisions conditional not only on the incentives structured into their compensation agreements, but also conditional on their beliefs regarding the risk-return tradeoffs associated with their various policy options. The 2007-2009 financial crisis is likely to have changed managers' understanding of risks and returns in some lines of business. For example, the housing downturn revealed that many mortgage-backed securities were far riskier than suggested by either their third-party ratings or their contractual yields; managers' beliefs about the risk-return tradeoffs inherent in MBS are likely to have changed post-downturn. Thus, our 2006 tests reflect bank managers' pre-crisis beliefs about the risk-return qualities of MBS, and may only imperfectly capture how their business policy choices will react to contractual risk-taking incentives post-crisis. Similarly, our estimates are based on the incomplete pre-crisis understanding of these risk-return tradeoffs by bank boards and compensation committees. Thus, one must be careful when drawing inferences about optimal post-crisis policy based on our pre-crisis results. Proposals to foster macroeconomic stability by rolling back banking powers may be misguided, because *informed* post-crisis managers will arguably be better able to implement those powers effectively. And proposals to constrain risk-taking by constraining the ability of bank boards to set the terms of executive compensation may also be misguided, because *informed* post-crises boards will arguably be better able to determine efficient incentives.

Finally, we note that none of these conclusions are meant to extend to non-banking firms. Commercial banks are subject to supervisory monitoring that, if not explicitly, implicitly creates extra pressure for boards to mitigate risk-taking managerial behaviors. Moreover, the level and types of risk taken by bank executives, and endorsed by bank compensation committees, during the 1990s and 2000s, to some large extent are special to the newness of the transactions banking business model and the incomplete understanding of the risks inherent in that model and the products it created.

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Table 1
Year Membership of Sample Banks (N=974, 1993-2006)

Year	*No. of Observations*
1993	61
1994	73
1995	66
1996	71
1997	71
1998	75
1999	73
2000	72
2001	63
2002	71
2003	74
2004	67
2005	71
2006	66
Total	974

Table 2
Descriptive Statistics (1993-2006)

Panel A: CEO Characteristics

	# of Obs	*Mean*	*Standard Deviation*	*25th Percentile*	*Median*	*75th Percentile*
Vega ($000s)	974	149.351	248.861	19.603	50.917	158.083
ln(Vega)	974	3.948	1.623	3.025	3.950	5.069
Delta ($000s)	974	616.410	905.716	112.823	280.742	710.537
ln(Delta)	974	5.637	1.324	4.735	5.641	6.567
Salary ($000s)	974	710.023	285.042	515.703	687.308	887.160
ln(Salary)	974	6.489	0.401	6.247	6.534	6.789
Bonus ($000s)	974	971.519	1414.090	207.160	476.197	1107.710
Option_Grants ($000s)	971	1621.510	2612.350	150.044	635.783	1968.510
Rstock_Grants ($000s)	908	606.218	1677.260	0.000	0.000	385.608
Total_Compensation ($000s)	971	4549.960	5304.250	1412.900	2461.070	5301.590
Tenure	973	9.026	6.674	4	7	13

Panel B: Business Policy Measures

	# of Obs	*# of Years*	*Mean*	*Standard Deviation*	*25th Percentile*	*Median*	*75th Percentile*
Nonint	974	14	0.361	0.162	0.248	0.322	0.430
Nonint_Less	974	14	0.206	0.139	0.113	0.166	0.252
Nonint_Sec	412	6	0.015	0.034	0.000	0.002	0.014
Nonint_Nontrad	412	6	0.066	0.078	0.015	0.041	0.082
Loans	974	14	0.619	0.145	0.578	0.657	0.706
Commer_Loans	974	14	0.145	0.076	0.094	0.137	0.184
Commer_Real_Loans	974	14	0.145	0.100	0.076	0.124	0.198
Alloc_loans	974	14	0.010	0.004	0.008	0.009	0.012
Prov_loans	974	14	0.003	0.003	0.001	0.002	0.004
Charge_loans	974	14	0.003	0.003	0.001	0.002	0.004
Noncore_Deposit	974	14	0.094	0.068	0.050	0.073	0.115
Short_Funds	974	14	0.074	0.059	0.035	0.060	0.101
Equity_Mult	974	14	12.363	2.546	10.642	12.206	13.648
Equity_Mult_Flows	974	14	0.688	0.203	0.556	0.659	0.772
Equity_Mult_Off	974	14	17.333	6.528	13.672	16.263	19.275
Growth	974	14	0.128	0.153	0.038	0.092	0.177
Intangible	974	14	0.019	0.017	0.006	0.013	0.024
Deriv_Notional	839	11	1.181	4.430	0.000	0.001	0.144
Deriv_FV	839	11	0.032	0.123	0.000	0.000	0.003
MBS_Private_BV	912	13	0.016	0.034	0.000	0.001	0.017
MBS_Private_FV	912	13	0.016	0.034	0.000	0.001	0.016
MBS_Struct_BV	912	13	0.039	0.044	0.004	0.026	0.059
MBS_Struct_FV	912	13	0.039	0.043	0.004	0.025	0.058
MBS_Pass_BV	912	13	0.068	0.065	0.023	0.048	0.092
MBS_Pass_FV	912	13	0.068	0.065	0.024	0.047	0.092
Risk	974	14	0.017	0.006	0.013	0.016	0.020
Beta	974	14	0.921	0.346	0.683	0.894	1.150
Idiosyn_Risk	974	14	0.015	0.006	0.011	0.013	0.017

Table 2 (Continued)

Panel C: Bank Characteristics

	N	*Mean*	*Standard Deviation*	*25th Percentile*	*Median*	*75th Percentile*
Net_Oper_Rev ($000s)	974	3,019,320	5,712,160	342,417	958,449	2,827,081
Total_assets ($000s)	974	54,266,555	109,286,316	6,642,681	17,533,980	48,624,000
ln(TA)	974	16.690	1.345	15.594	16.529	17.609
MB	973	2.375	0.975	1.673	2.156	2.811
ln(MB)	973	1.179	0.264	0.983	1.149	1.338
Cash_Balance	954	0.056	0.045	0.031	0.044	0.065
Deposit	929	0.704	0.106	0.640	0.708	0.782
Core_deposit	927	0.612	0.115	0.550	0.618	0.694
Equity_Ratio	974	0.083	0.016	0.072	0.081	0.092
Net_Interest_Margin	927	0.046	0.011	0.041	0.046	0.052
Foreign_Deposit	929	0.041	0.081	0.000	0.005	0.040
One_Yr_Gap	974	0.200	0.154	0.096	0.208	0.313
Nonint_Less/Beg(TA)	974	0.015	0.018	0.006	0.010	0.016
Trading_Rev/Beg(TA)	774	0.001	0.002	0.000	0.000	0.001

All variable definitions are in Appendix A.

Table 3
Correlation (N=974, 1993-2006)

Panel A: Pearson Coefficients

	Risk	*Beta*	*Idiosyn_Risk*	*Ln(Vega)*	*Ln(Delta)*
Nonint	0.089***	0.260***	-0.006	0.406***	0.353***
Nonint_Less	0.117***	0.265***	0.031	0.374***	0.355***
Nonint_Sec	0.044	0.078	-0.037	0.320***	0.230***
Nonint_Nontrad	-0.047	0.097***	-0.133***	0.324***	0.186***
Loans	-0.153***	-0.169***	-0.118***	-0.099***	-0.093***
Commer_Loans	0.080***	0.025	0.085***	-0.008	-0.040
Commer_Real_Loans	-0.099***	-0.107***	-0.077**	-0.155***	-0.181***
Alloc_loans	0.011	0.072***	0.035	-0.046	-0.029
Prov_loans	0.301***	0.148***	0.240***	0.172***	0.161***
Charge_loans	0.181***	0.273***	0.117***	0.251***	0.226***
Noncore_Deposit	0.155***	-0.028	0.169***	-0.003***	0.023
Short_Funds	0.026	0.031	0.015	0.027***	0.123
Equity_Mult	0.164***	0.001	0.175***	-0.042	0.009
Equity_Mult_Flows	0.213***	0.136***	0.187***	0.108***	0.191***
Equity_Mult_Off	0.232***	0.303***	0.167***	0.219***	0.318***
Growth	0.101***	0.003	0.114***	-0.068**	0.045
Intangible	-0.123***	0.184***	-0.207***	0.320***	0.287***
Deriv_Notional	0.059	0.226***	-0.019	0.286***	0.239***
Deriv_FV	0.069**	0.228***	-0.012	0.275***	0.218***
MBS_Private_BV	0.070**	0.040	0.069**	0.078***	0.145***
MBS_Private_FV	0.071**	0.040	0.069**	0.080***	0.146***
MBS_Struct_BV	0.024	-0.058*	0.035	-0.112***	-0.125***
MBS_Struct_FV	0.029	-0.058*	0.038	-0.110***	-0.122***
MBS_Pass_BV	0.042	-0.027	0.048	-0.011	-0.017
MBS_Pass_FV	0.045	-0.027	0.048	-0.009	-0.014
Risk	1	0.156***	0.940***	0.058*	0.060*
Beta	0.156***	1	-0.043	0.244***	0.205***
Idiosyn_Risk	0.940***	-0.043	1	-0.075**	-0.047

Table 3 (Continued)

Panel B: Spearman Coefficients

	Risk	*Beta*	*Idiosyn_Risk*	*Ln(Vega)*	*Ln(Delta)*
Nonint	0.009	0.261***	-0.075**	0.452***	0.369***
Nonint_Less	0.018	0.241***	-0.070**	0.418***	0.354***
Nonint_Sec	-0.115**	-0.017	-0.146***	0.283***	0.200***
Nonint_Nontrad	-0.202***	-0.011	-0.269***	0.436***	0.277***
Loans	-0.136***	-0.119***	-0.143***	-0.039	-0.047
Commer_Loans	0.066**	0.018	0.074**	0.002	-0.008
Commer_Real_Loans	-0.101***	-0.222***	-0.102***	-0.197***	-0.220***
Alloc_loans	0.037	0.042	0.072**	-0.032	-0.040
Prov_loans	0.237***	0.050	0.182***	0.160***	0.116***
Charge_loans	0.107***	0.187***	0.050	0.279***	0.197***
Noncore_Deposit	0.124***	-0.150***	0.118***	-0.035	-0.018
Short_Funds	-0.056*	-0.051	-0.046	-0.017	0.097***
Equity_Mult	0.150***	0.001	0.180***	-0.074**	0.009
Equity_Mult_Flows	0.193***	0.128***	0.191***	0.152***	0.181***
Equity_Mult_Off	0.140***	0.230***	0.116***	0.215***	0.245***
Growth	0.069**	-0.011	0.100***	-0.106***	0.057*
Intangible	-0.128***	0.184***	-0.255***	0.332***	0.282***
Deriv_Notional	-0.093***	0.254***	-0.187***	0.483***	0.426***
Deriv_FV	-0.089***	0.256***	-0.192***	0.494***	0.423***
MBS_Private_BV	-0.030	0.007	-0.058*	0.117***	0.173***
MBS_Private_FV	-0.028	0.008	-0.057*	0.119***	0.176***
MBS_Struct_BV	-0.043	-0.107***	-0.029	-0.144***	-0.160***
MBS_Struct_FV	-0.041	-0.108***	-0.028	-0.143***	-0.158***
MBS_Pass_BV	0.017	-0.047	0.012	0.008	-0.026
MBS_Pass_FV	0.020	-0.047	0.013	0.010	-0.024
Risk	1	0.135***	0.927***	0.051	0.043
Beta	0.135***	1	-0.061*	0.273***	0.223***
Idiosyn_Risk	0.927***	-0.061*	1	-0.110***	-0.086***

All variable definitions are in Appendix A.

Table 4
Selected OLS Results

	OLS Robust Error			*OLS Fama McBeth*		
	Obs	*ln(Vega)* $_{t-1}$	*ln(Delta)* $_{t-1}$	Years	*ln(Vega)* $_{t-1}$	*ln(Delta)* $_{t-1}$
Nonint	773	0.023***	-0.011**	14	0.0217***	-0.006
		[0.004]	[0.005]		[0.002]	[0.006]
Nonint_Less	773	0.011***	0.009	14	0.013***	0.013
		[0.004]	[0.006]		[0.003]	[0.008]
Nonint_Sec	357	0.003***	0.0001	6	0.003*	0.001
		[0.001]	[0.002]		[0.001]	[0.002]
Nonint_Nontrad	357	0.004**	-0.012***	6	0.004	-0.012***
		[0.002]	[0.003]		[0.002]	[0.002]
Loans	773	-0.010**	0.009*	14	-0.007*	0.014***
		[0.004]	[0.006]		[0.004]	[0.005]
Commer_Loans	773	0.00002	-0.005*	14	0.000	-0.003
		[0.002]	[0.003]		[0.001]	[0.002]
Commer_Real_Loans	773	-0.003	-0.002	14	-0.004	0.003
		[0.003]	[0.004]		[0.003]	[0.003]
Alloc_Loans	799	0.000	0.001***	14	0.000**	0.001***
		[0.000]	[0.000]		[0.000]	[0.000]
Prov_Loans	799	0.000	0.000**	14	0.000	0.000**
		[0.000]	[0.000]		[0.000]	[0.000]
Charge_Loans	799	0.000	0.000**	14	0.000***	0.001**
		[0.000]	[0.000]		[0.000]	[0.000]
Noncore_deposit	799	0.002	0.005**	14	0.003*	0.003
		[0.002]	[0.002]		[0.002]	[0.002]
Short_Funds	799	-0.006***	0.009***	14	-0.005***	0.006**
		[0.002]	[0.002]		[0.002]	[0.002]
Equity_Mult	799	-0.163***	0.110	14	-0.124**	-0.010
		[0.061]	[0.098]		[0.042]	[0.111]
Equity_Mult_flows	799	0.003	-0.008	14	0.004	-0.007
		[0.005]	[0.006]		[0.006]	[0.005]
Equity_Mult_off	799	-0.185	0.596***	14	0.014	0.387
		[0.155]	[0.197]		[0.133]	[0.222]
Growth	771	-0.003	0.012**	14	-0.005	0.011**
		[0.005]	[0.005]		[0.005]	[0.004]
Intangible	773	0.001***	0.001	14	0.001***	0.001
		[0.000]	[0.001]		[0.000]	[0.001]
Deriv_Notional	646	-0.072	0.131	11	-0.068	0.152**
		[0.080]	[0.102]		[0.051]	[0.061]
Deriv_FV	646	-0.001	0.002	11	0.000	0.003*
		[0.002]	[0.003]		[0.002]	[0.001]
Year Dummies		Yes				

Table 4 (Continued)

	OLS Robust Error			*OLS Fama McBeth*		
	Obs	*ln(Vega)* $_{t-1}$	*ln(Delta)* $_{t-1}$	Years	*ln(Vega)* $_{t-1}$	*ln(Delta)* $_{t-1}$
MBS_Private_BV	742	0.000	0.004***	13	-0.001	0.004**
		[0.001]	[0.001]		[0.001]	[0.001]
MBS_Private_FV	742	0.000	0.004***	13	-0.001	0.004**
		[0.001]	[0.001]		[0.001]	[0.001]
MBS_Struct_BV	742	-0.001	-0.002	13	-0.002**	-0.002*
		[0.001]	[0.002]		[0.001]	[0.001]
MBS_Struct_FV	742	-0.001	-0.002	13	-0.002**	-0.002*
		[0.001]	[0.002]		[0.001]	[0.001]
MBS_Pass_BV	742	0.001	0.002	13	-0.000	-0.001
		[0.002]	[0.002]		[0.002]	[0.002]
MBS_Pass_FV	742	0.001	0.002	13	-0.000	-0.001
		[0.002]	[0.002]		[0.002]	[0.002]
Risk	799	0.000	0.000	14	0.000***	0.000
		[0.000]	[0.000]		[0.000]	[0.000]
Beta	799	0.01	-0.019	14	0.033***	-0.009
		[0.009]	[0.012]		[0.007]	[0.015]
Idiosyn_Risk	799	0.000	0.000**	14	0.000	0.000**
		[0.000]	[0.000]		[0.000]	[0.000]
Year Dummies		Yes				

All variable definitions are in Appendix A.

Table 5
3SLS Results (1993-2006)

			Equation	*Business policy*		*Vega*		*Delta*	
			Right-hand Side Variable	ln(Vega)	ln(Delta)	Business policy	ln(Delta)	Business Policy	ln(Vega)
Policy Variable	Year	Obs	Estimation Technique						
Nonint		926	3SLS Robust Error	0.102*** [0.018]	-0.098*** [0.016]	1.241*** [0.475]	0.064 [0.124]	1.077** [0.496]	0.610*** [0.070]
	14		3SLS Fama-McBeth	0.104*** [0.022]	-0.077*** [0.019]	1.579*** [0.544]	0.155 [0.145]	1.461 [0.853]	0.556*** [0.117]
Nonint_Less		926	3SLS Robust Error	0.039*** [0.014]	-0.033*** [0.012]	0.938 [0.788]	-0.014 [0.124]	0.850 [0.669]	0.609*** [0.070]
	14		3SLS Fama-McBeth	0.024 [0.032]	0.008 [0.024]	1.333* [0.696]	0.047 [0.132]	2.211* [1.162]	0.434** [0.147]
Nonint_Sec		410	3SLS Robust Error	0.020** [0.008]	-0.013** [0.005]	6.655 [6.821]	0.216 [0.159]	8.309 [7.341]	0.593*** [0.157]
	6		3SLS Fama-McBeth	0.015* [0.006]	-0.009* [0.003]	5.624 [7.055]	0.214 [0.191]	17.731 [13.158]	0.416 [0.389]
Nonint_Nontrad		410	3SLS Robust Error	0.031** [0.015]	-0.034*** [0.010]	6.302*** [1.712]	0.423*** [0.141]	-3.656 [1.832]	0.831*** [0.138]
	6		3SLS Fama-McBeth	-0.006 [0.026]	-0.003 [0.019]	5.162*** [0.927]	0.327* [0.148]	0.535 [2.366]	0.446 [0.290]

Table 5 (Continued)

			Equation	*Business policy*		*Vega*		*Delta*	
			Right-hand Side Variable	ln(Vega)	ln(Delta)	Business policy	ln(Delta)	Business Policy	ln(Vega)
Policy Variable	Year	Obs	Estimation Technique						
Loans		924	3SLS Robust Error	-0.038** [0.016]	0.041*** [0.014]	-1.089** [0.498]	0.043 [0.116]	-1.783*** [0.612]	0.761*** [0.080]
	14		3SLS Fama-McBeth	-0.058 [0.036]	0.060*** [0.015]	-1.286 [0.889]	0.186* [0.104]	-3.573* [1.756]	0.601*** [0.128]
Commer_Loans		924	3SLS Robust Error	0.021*** [0.009]	-0.026*** [0.007]	1.268 [2.237]	0.054 [0.145]	-6.380*** [1.634]	0.713*** [0.080]
	14		3SLS Fama-McBeth	0.009 [0.010]	-0.025* [0.012]	0.486 [1.894]	0.235 [0.151]	-4.068* [2.107]	0.661*** [0.076]
Commer_Real_Loans		924	3SLS Robust Error	-0.057*** [0.012]	0.051*** [0.010]	-4.626*** [1.299]	0.224** [0.116]	-4.987*** [2.133]	0.667*** [0.080]
	14		3SLS Fama-McBeth	-0.055*** [0.014]	0.047*** [0.008]	-2.329 [1.632]	0.242** [0.099]	-6.652** [2.406]	0.473*** [0.139]
Alloc_Loans		952	3SLS Robust Error	0.000 [0.000]	0.000 [0.000]	-46.144** [23.218]	-0.123 [0.136]	-17.388 [18.883]	0.680*** [0.075]
	14		3SLS Fama-McBeth	-0.0001 [0.0003]	-0.0001 [0.0002]	-52.360*** [13.022]	-0.078 [0.131]	-4.513 [27.269]	0.644*** [0.115]
Prov_Loans		952	3SLS Robust Error	0.002*** [0.000]	-0.001** [0.000]	-119.420* [71.910]	-0.157 [0.154]	-38.148 [56.932]	0.682*** [0.133]
	14		3SLS Fama-McBeth	0.001** [0.0003]	-0.0002 [0.0003]	-209.968 [121.28]	-0.066 [0.177]	305.463 [281.672]	0.736*** [0.217]
Charge_Loans		952	3SLS Robust Error	0.002*** [0.000]	-0.001*** [0.000]	-138.885* [75.664]	-0.266 [0.182]	-32.747 [50.168]	0.721*** [0.101]
	14		3SLS Fama-McBeth	0.001*** [0.0004]	-0.0002 [0.0003]	-117.907* [61.121]	-0.094 [0.541]	282.02 [229.229]	0.818*** [0.238]

Table 5 (Continued)

			Equation	*Business policy*		*Vega*		*Delta*	
			Right-hand Side Variable	ln(Vega)	ln(Delta)	Business policy	ln(Delta)	Business Policy	ln(Vega)
Policy Variable	Year	Obs	Estimation Technique						
Noncore_Deposit		952	3SLS Robust Error	0.017** [0.006]	-0.006 [0.006]	6.666** [2.825]	0.040 [0.110]	9.174*** [3.316]	0.509*** [0.115]
	14		3SLS Fama-McBeth	0.015** [0.007]	-0.009 [0.009]	4.384 [3.668]	-0.065 [0.155]	13.889*** [4.381]	0.302 [0.180]
Short_Funds		952	3SLS Robust Error	0.008 [0.007]	-0.001 [0.006]	-6.514* [4.006]	0.040 [0.116]	-11.964*** [4.684]	0.721*** [0.096]
	14		3SLS Fama-McBeth	-0.005 [0.012]	-0.0005 [0.012]	-3.694 [5.301]	0.238 [0.147]	31.550 [29.410]	0.067 [0.371]
Equity_Mult		952	3SLS Robust Error	-0.232 [0.273]	-0.141 [0.231]	-0.124* [0.073]	0.022 [0.113]	-0.281*** [0.112]	0.532*** [0.128]
	14		3SLS Fama-McBeth	0.225 [0.348]	-0.931** [0.423]	-0.023 [0.130]	0.298* [0.147]	-0.163 [0.542]	0.713* [0.394]
Equity_Mult_Flows		952	3SLS Robust Error	0.058*** [0.019]	-0.058*** [0.016]	1.710*** [0.420]	0.056 [0.114]	1.147*** [0.386]	0.627*** [0.081]
	14		3SLS Fama-McBeth	0.053** [0.021]	-0.057 [0.034]	2.210*** [0.543]	0.019 [0.134]	1.686** [0.762]	0.426*** [0.118]
Equity_Mult_Off		952	3SLS Robust Error	3.102*** [0.640]	-1.350*** [0.551]	0.047*** [0.012]	0.049 [0.116]	0.033*** [0.010]	0.583*** [0.086]
	14		3SLS Fama-McBeth	2.811*** [0.668]	-1.425** [0.558]	0.013 [0.026]	-0.010 [0.133]	0.063 [0.036]	0.470*** [0.155]
Growth		922	3SLS Robust Error	0.015 [0.017]	0.015 [0.014]	-11.280*** [3.131]	0.150 [0.132]	2.448 [4.790]	0.554*** [0.110]
	14		3SLS Fama-McBeth	0.004 [0.020]	0.007 [0.021]	-3.057 [3.421]	0.180 [0.140]	2.838 [2.928]	0.522*** [0.098]
Intangible		924	3SLS Robust Error	0.005*** [0.002]	-0.003* [0.001]	-12.097 [18.509]	-0.004 [0.136]	-16.786 [15.322]	0.742*** [0.096]
	14		3SLS Fama-McBeth	0.002 [0.002]	-0.0004 [0.001]	-15.017 [17.297]	0.083 [0.132]	-24.498 [20.719]	0.776*** [0.153]

Table 5 (Continued)

			Equation	*Business policy*		*Vega*		*Delta*	
			Right-hand Side Variable	ln(Vega)	ln(Delta)	Business policy	ln(Delta)	Business Policy	ln(Vega)
Policy Variable	Year	Obs	Estimation Technique						
Deriv_Notional		646	3SLS Robust Error	-2.956*** [0.575]	0.851* [0.520]	-0.007 [0.023]	0.052 [0.162]	0.020 [0.017]	0.663*** [0.092]
	11		3SLS Fama-McBeth	-2.583*** [0.645]	0.993 [0.562]	0.021 [0.020]	0.234 [0.133]	-0.004 [0.014]	0.588*** [0.134]
Deriv_FV		646	3SLS Robust Error	-0.082*** [0.016]	0.022 [0.015]	-0.469 [0.824]	0.058 [0.162]	0.798 [0.595]	0.668*** [0.092]
	11		3SLS Fama-McBeth	-0.063*** [0.016]	0.021 [0.014]	1.053 [0.745]	0.214 [0.127]	-0.110 [0.518]	0.588*** [0.134]
MBS_Private_BV		870	3SLS Robust Error	0.003 [0.004]	0.015*** [0.004]	-26.256*** [9.420]	0.354* [0.197]	17.663*** [5.088]	0.442*** [0.093]
	13		3SLS Fama-McBeth	0.007** [0.003]	0.009*** [0.003]	-15.052 [16.848]	-0.175 [0.258]	30.311*** [8.281]	0.043 [0.186]
MBS_Private_FV		870	3SLS Robust Error	0.003 [0.004]	0.015*** [0.004]	-26.423*** [9.464]	0.356* [0.198]	17.766*** [5.109]	0.442*** [0.093]
	13		3SLS Fama-McBeth	0.007** [0.003]	0.009*** [0.003]	-15.199 [16.833]	-0.175 [0.256]	30.269*** [8.312]	0.044 [0.185]
MBS_Struct_BV		870	3SLS Robust Error	-0.003 0.005]	0.001 [0.004]	-20.801*** [4.875]	0.000 [0.138]	17.998*** [4.865]	0.704*** [0.091]
	13		3SLS Fama-McBeth	-0.002 [0.004]	-0.0001 [0.003]	-7.516 [4.422]	0.020 [0.121]	10.223** [4.384]	0.542*** [0.116]
MBS_Struct_FV		870	3SLS Robust Error	-0.003 [0.005]	0.001 [0.004]	-20.767*** [4.896]	-0.001 [0.138]	18.001*** [4.862]	0.703*** [0.091]
	13		3SLS Fama-McBeth	-0.002 [0.004]	-0.0001 [0.003]	-7.731 [4.454]	0.019 [0.121]	10.256** [4.424]	0.543*** [0.117]
MBS_Pass_BV		870	3SLS Robust Error	-0.022*** [0.008]	0.024*** [0.007]	-0.156 [1.565]	0.001 [0.136]	2.577*** [1.089]	0.639*** [0.069]
	13		3SLS Fama-McBeth	-0.026** [0.010]	0.014 [0.010]	-6.841* [3.723]	0.086 [0.162]	-3.603 [4.464]	0.365 [0.207]
MBS_Pass_FV		870	3SLS Robust Error	-0.023*** [0.008]	0.024*** [0.007]	-0.225 [1.562]	0.004 [0.136]	2.603** [1.086]	0.641*** [0.069]
	13		3SLS Fama-McBeth	-0.027** [0.009]	0.015 [0.010]	-6.741* [3.723]	0.096 [0.161]	-3.461 [4.458]	0.363 [0.207]

Table 5 (Continued)

			Equation	*Business policy*		*Vega*		*Delta*	
			Right-hand Side Variable	ln(Vega)	ln(Delta)	Business policy	ln(Delta)	Business Policy	ln(Vega)
Policy Variable	Year	Obs	Estimation Technique						
Risk		952	3SLS Robust Error	0.001*** [0.000]	0.000 [0.000]	95.283*** [32.197]	0.005 [0.117]	87.872*** [28.729]	0.581*** [0.084]
	14		3SLS Fama-McBeth	0.00005 [0.0005]	0.0006 [0.0005]	30.813 [59.114]	0.124 [0.139]	70.710* [39.894]	0.483*** [0.114]
Beta		952	3SLS Robust Error	0.132*** [0.035]	-0.037 [0.030]	2.548*** [0.625]	0.044 [0.120]	3.219*** [0.917]	0.267* [0.150]
	14		3SLS Fama-McBeth	0.061** [0.025]	0.013 [0.030]	1.182** [0.469]	0.127 [0.096]	1.161* [0.574]	0.369** [0.132]
Idiosyn_Risk		952	3SLS Robust Error	0.000 [0.000]	0.000 [0.000]	97.008*** [38.413]	0.005 [0.118]	97.992*** [31.691]	0.609*** [0.081]
	14		3SLS Fama-McBeth	-0.0003 [0.001]	0.001 [0.001]	11.053 [72.632]	0.133 [0.153]	86.981* [40.996]	0.511*** [0.103]

All variable definitions are in Appendix A**.**

Figure 1

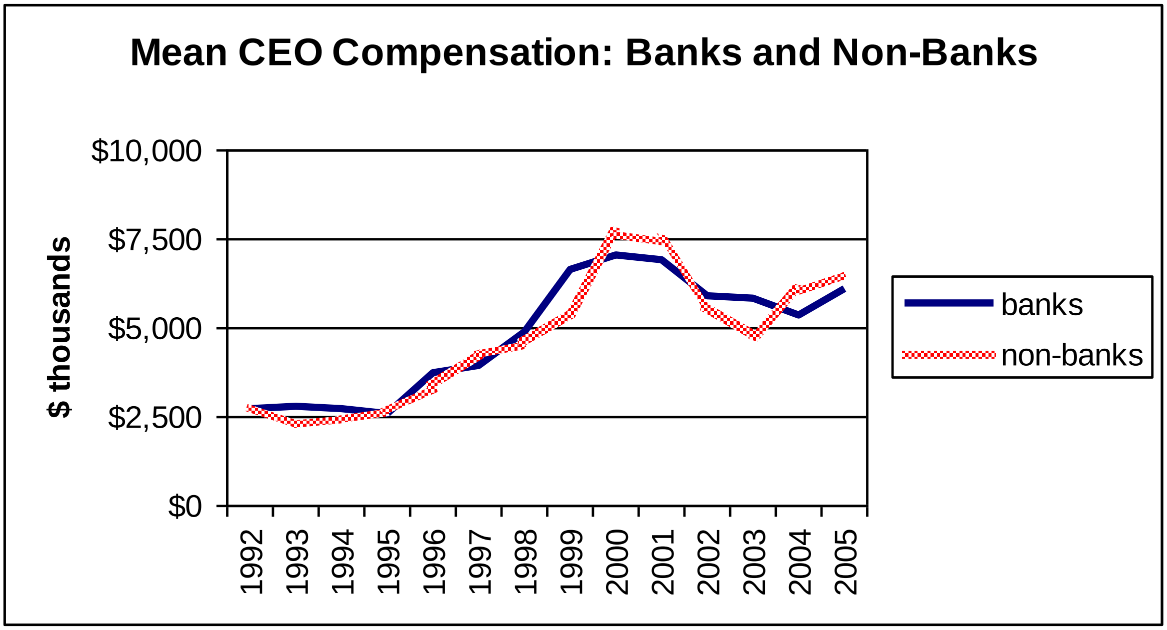


Figure 2

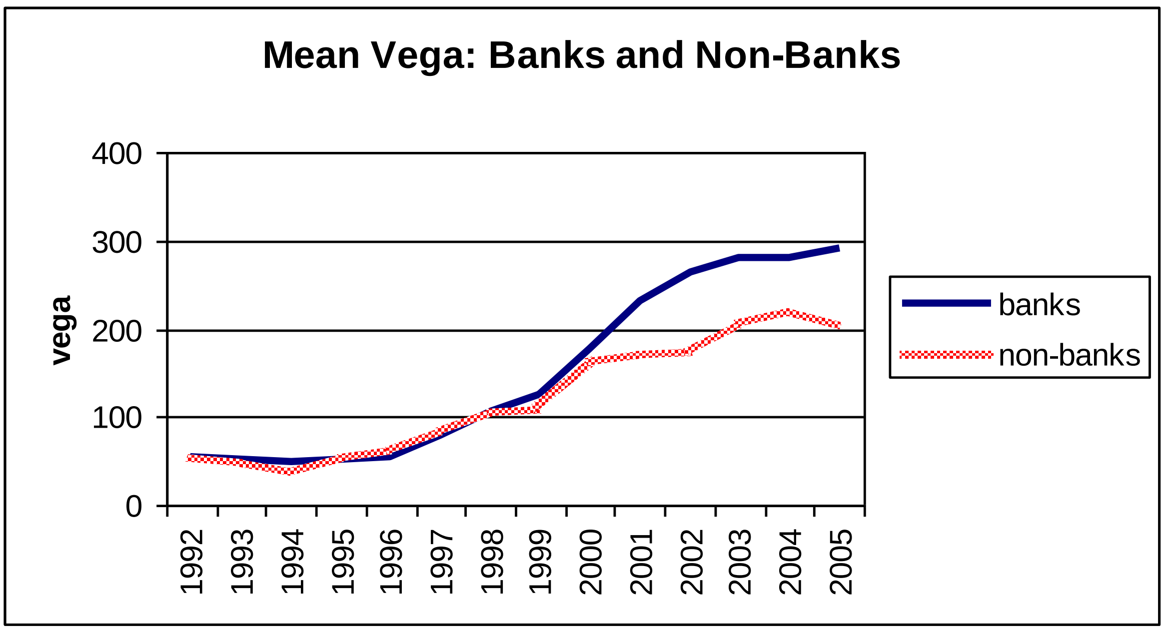


Figure 3

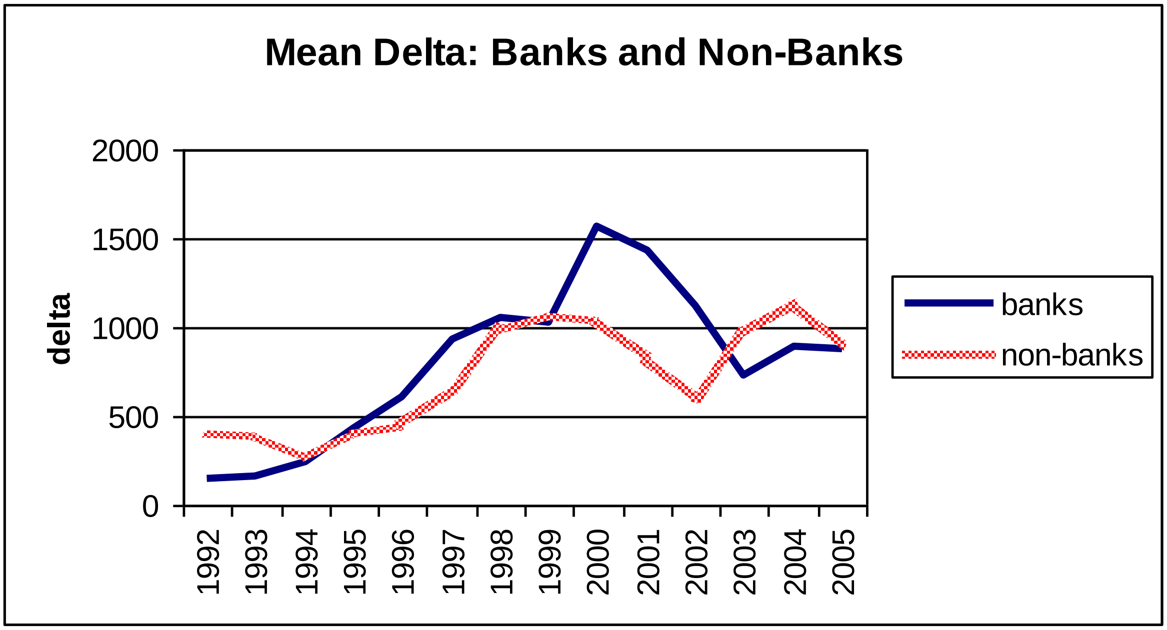
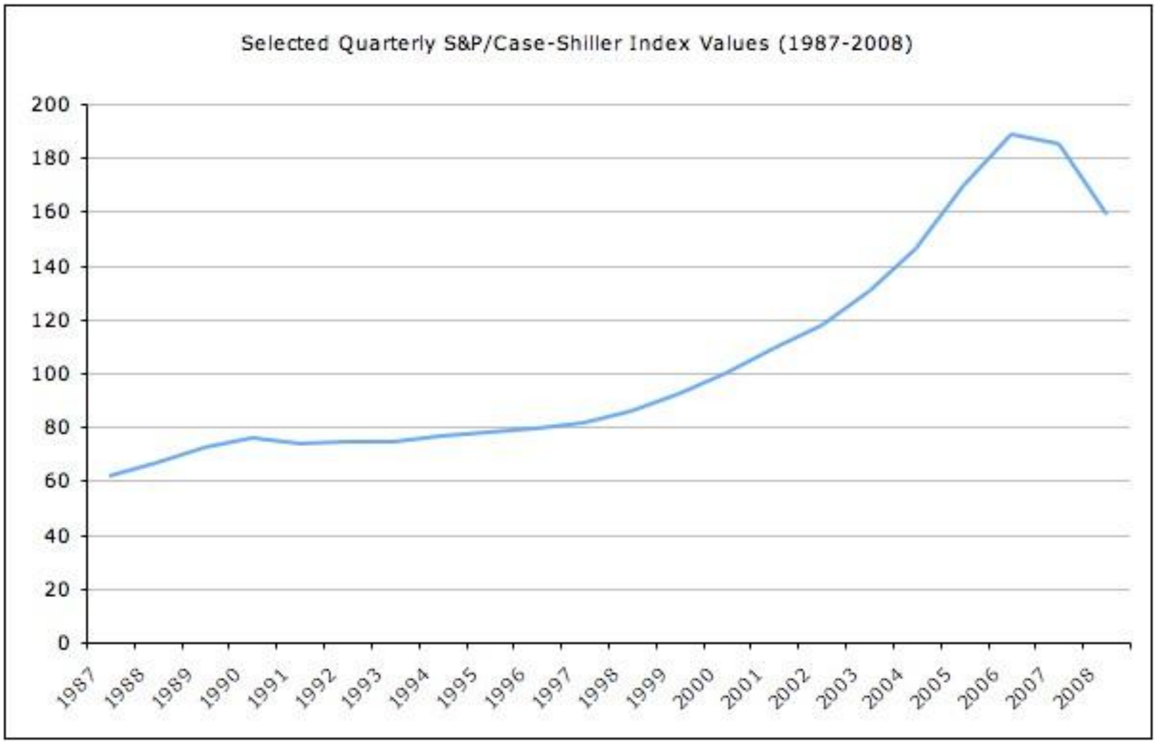


Figure 4



Appendix A
Variable Definitions

Panel A: CEO Characteristics

Vega	The pay-risk sensitivity, which is the change in the dollar value of CEO wealth for a 0.01 change in stock return volatility, measured by partial derivatives of Black-Scholes value of options with respect to stock return volatility.
Delta	The pay-performance sensitivity, which is the change in the dollar value of CEO wealth for a 1% change in stock price, measured by partial derivatives of Black-Scholes value of options and market value of stock holdings with respect to stock price.
Salary	The CEO's annual base salary.
Bonus	The CEO's annual bonus.
Option_Grants	The CEO's total value of stock options granted during the year (using Black-Scholes).
Rstock_Grants	The CEO's total value of restricted stock granted during the year.
Total_Compensation	The CEO's total annual compensation comprised of the following: salary, bonus, total value of stock options granted, total value of restricted stock granted, long-term incentive payouts, and all other total.
Tenure	The number of years in the CEO's term.

Panel B: Business Policy Measures

Nonint	Total noninterest income, scaled by net operating income.
Nonint_Less	Total noninterest income less fiduciary income and deposit service charges, scaled by net operating income.
Nonint_Sec	Noninterest income from loan securitization and servicing, scaled by net operating income.
Nonint_Nontrad	Noninterest income from nontraditional banking activities such as trading revenue, venture capital revenue, and underwriting income from insurance activities, scaled by net operating income.
Loans	Total loans and leases held in portfolio, scaled by total assets.
Commer_Loans	Commercial and industrial loans, scaled by total assets.
Commer_Real_Loans	Commercial real estate loans, scaled by total assets.
Alloc_loans	Allocation for loan and lease losses, scaled by total assets.
Prov_loans	Provision for loan and lease losses, scaled by total assets.
Charge_loans	Charge-offs and recoveries on loan and lease losses, scaled by total assets.
Noncore_Deposit	Noncore deposits such as time deposits of $100,000 or more, scaled by total assets.
Short_Funds	Federal funds purchased and securities sold under agreements to repurchase, scaled by total assets.
Equity_Mult	Total assets over total equity capital.
Equity_Mult_Flows	The sum of total assets and off-balance sheet items such as unused commitments and letters of credit over total equity capital.
Equity_Mult_Off	Net operating income over total equity capital.
Growth	The natural log of ending total assets over beginning total assets.
Intangible	Intangible assets, scaled by total assets.
Deriv_Notional	The notional amount of derivative contracts held for trading purposes, scaled by total assets.
Deriv_FV	The fair value of derivative contracts held for trading purposes, scaled by total assets.
MBS_Private_BV	The amortized cost of private mortgage backed securities, scaled by total assets.
MBS_Private_FV	The fair value of private mortgage backed securities, scaled by total assets.
MBS_Struct_BV	The amortized cost of structured mortgage backed securities, scaled by total assets.
MBS_Struct_FV	The fair value of structured mortgage backed securities, scaled by total assets.
MBS_Pass_BV	The amortized cost of pass-through mortgage backed securities, scaled by total assets.
MBS_Pass_FV	The fair value of pass-through mortgage backed securities, scaled by total assets.
Risk	The standard deviation of daily stock returns over a year.
Beta	The beta coefficient estimated from the market model over a year.
Idiosyn_Risk	The standard deviation of the market model residuals over a year.

Appendix (Continued)

Panel C: Bank Characteristics

Net_Oper_Rev	The sum of net interest income and total noninterest income.
Total_Assets	The ending balance of total assets.
ln(TA)	The natural log of beginning total assets.
MB	The beginning balance of the market-to-book ratio of equity.
ln(MB)	The natural log of the beginning market-to-book ratio of equity.
Cash_Balance	Cash and balances due from depository institutions, scaled by total assets.
Deposit	Total deposits, scaled by total assets.
Core_deposit	Total deposits less noncore deposits, scaled by total assets.
Equity_Ratio	Total equity capital over total assets.
Net_Interest_Margin	The difference between interest and fee income on loans over total loans and interest on deposits over total deposits.
Foreign_Deposit	Deposits in foreign offices, edge and agreement subsidiaries and IBFs, scaled by total assets.
One_Yr_Gap	The level of repricing asymmetry between assets and liabilities, scaled by total assets.
Nonint_Less/Beg(TA)	Noninterest income less fiduciary income and deposit service charges, scaled by beginning total assets.
Trading_Rev/Beg(TA)	Trading revenue over beginning total assets.

Appendix B: Identifiers in the Business Policy Regressions

Policy Measures	Identifiers in the policy regression
Nonint	$Short\_Funds_{t-1}$, $Deposit_{t-1}$, $Loans_{t-1}$
Nonint_Less	$Short\_Funds_{t-1}$, $Deposit_{t-1}$, $Loans_{t-1}$
Nonint_Sec	$Short\_Funds_{t-1}$, $Deposit_{t-1}$, $Loans_{t-1}$
Nonint_Nontrad	$Short\_Funds_{t-1}$, $Deposit_{t-1}$, $Loans_{t-1}$
Loans	$Core\_Deposit_{t-1}$, $Equity\_Ratio_{t-1}$
Commer_Loans	$Core\_Deposit_{t-1}$, $Equity\_Ratio_{t-1}$
Commer_Real_Loans	$Core\_Deposit_{t-1}$, $Equity\_Ratio_{t-1}$
Alloc_loans	$Loans_t$
Prov_loans	$Loans_t$
Charge_loans	$Loans_t$
Noncore_Deposit	$Nonint\_Less/Beg(TA)_t$, $Growth_{t-1}$
Short_Funds	$Nonint\_Less/Beg(TA)_t$, $Growth_{t-1}$
Equity_Mult	$Nonint\_Less/Beg(TA)_t$
Equity_Mult_Flows	$Nonint\_Less/Beg(TA)_t$
Equity_Mult_Off	$Nonint\_Less/Beg(TA)_t$
Growth	$Core\_Deposit_{t-1}$, $Equity\_Ratio_{t-1}$, $Net\_Interest\_Margin_{t-1}$
Intangible	$Core\_Deposit_{t-1}$, $Growth_{t-1}$
Deriv_Notional	$Foreign\_Deposit_{t-1}$, $One\_Yr\_Gap_{t-1}$, $Trading\_Rev/Beg(TA)_t$
Deriv_FV	$Foreign\_Deposit_{t-1}$, $One\_Yr\_Gap_{t-1}$, $Trading\_Rev/Beg(TA)_t$
MBS_Private_BV	$Short\_Funds_{t-1}$, $Deposit_{t-1}$
MBS_Private_FV	$Short\_Funds_{t-1}$, $Deposit_{t-1}$
MBS_Struct_BV	$Short\_Funds_{t-1}$, $Deposit_{t-1}$
MBS_Struct_FV	$Short\_Funds_{t-1}$, $Deposit_{t-1}$
MBS_Pass_BV	$Short\_Funds_{t-1}$, $Deposit_{t-1}$, $Loans_{t-1}$
MBS_Pass_FV	$Short\_Funds_{t-1}$, $Deposit_{t-1}$, $Loans_{t-1}$
Risk	$Loans_{t-1}$, $Nonint\_Less/Beg(TA)_t$, $Equity\_Ratio_{t-1}$
Beta	$Loans_{t-1}$, $Nonint\_Less/Beg(TA)_t$, $Equity\_Ratio_{t-1}$
Idiosyn_Risk	$Loans_{t-1}$, $Nonint\_Less/Beg(TA)_t$, $Equity\_Ratio_{t-1}$

Appendix C: Full Regression Results for *Nonint*

	$Nonint_t$	$Nonint_t$	$Nonint_t$	$Ln(Vega_t)$	$Ln(Delta_t)$	$Nonint_t$	$Ln(Vega_t)$	$Ln(Delta_t)$
	OLS robust Error	*OLS Fama McBeth*	*3SLS Robust Error*			*3SLS Fama McBeth*		
$ln(Vega_{t-1})$	0.023***	0.0217***						
	[0.004]	[0.002]						
$ln(Delta_{t-1})$	-0.011**	-0.006						
	[0.005]	[0.006]						
$ln(Vega_t)$			0.102***		0.610***	0.104***		0.556***
			[0.018]		[0.070]	[0.022]		[0.117]
$ln(Delta_t)$			-0.098***	0.064		-0.077***	0.155	
			[0.016]	[0.124]		[0.019]	[0.145]	
$Nonint\_Income_t$				1.241***	1.077**		1.579***	1.461
				[0.475]	[0.496]		[0.544]	[0.853]
$ln(TA_{t-1})$	0.022***	0.0204***	0.011	0.284***	0.067	0.002	0.208***	0.076
	[0.005]	[0.005]	[0.010]	[0.059]	[0.052]	[0.009]	[0.068]	[0.060]
$ln(MB_{t-1})$	0.235***	0.2606***	0.301***	-0.036***	1.037***	0.332***	-0.281	1.137***
	[0.023]	[0.024]	[0.030]	[0.285]	[0.175]	[0.027]	[0.358]	[0.263]
$Short\_Funds_{t-1}$	-0.408***	-0.317**	-0.364***			-0.196		
	[0.124]	[0.116]	[0.098]			[0.128]		
$Deposit_{t-1}$	-0.542***	-0.538***	-0.535***			-0.522***		
	[0.065]	[0.066]	[0.065]			[0.071]		
$Loan_{t-1}$	-0.387***	-0.397***	-0.349***			-0.336***		
	[0.037]	[0.028]	[0.036]			[0.043]		
$Ln(Salary_{t-1})$				1.370***			1.101***	
				[0.206]			[0.211]	
$Tenure_t$					0.052***			0.050***
					[0.005]			[0.012]
$Cash\_Balance_{t-1}$					-4.204***			-3.388***
					[0.771]			[0.676]
Year Dummies	Yes		Yes	Yes	Yes			
Annual Regressions		14				14	14	14
Observations	773	773	926	926	926	926	926	926