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The Effect of Employee Stock Options on Bank Investment Choice, Borrowing, and Capital

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Abstract

In this paper, we assess the effects of CEO stock options on three key corporate policies for banks: investment choice, amount of borrowing, and level of capital. Using a sample of 549 bank-years for publicly traded banks from 1992 to 2002, we find that stock option grants lead CEOs to undertake riskier investments. In particular, higher levels of option grants are associated with higher levels of equity and asset volatility. Consistent with the role of options as a nondebt tax shield, we also show that option grants reduce the banks' incentive to borrow as evidenced by lower levels of interest expense and federal funds borrowing. Furthermore, we demonstrate that increases in CEO and employee stock option grants result in increased bank capital levels, perhaps because option grants create a contingent liability for the firm that needs to be funded in advance.

Key words: CEO compensation, employee stock options, risk taking, banking firms, borrowing, bank capital

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1. Introduction

Alignment of the incentives of executives and employees with the interests of shareholders has received substantial attention in the literature. Stock-based compensation is recognized as an important mechanism in reconciling the interests of employees and shareholders. Murphy (1999) and Core, Guay, and Larcker (2003) summarize the extensive theoretical and empirical literature on the impact of stock-based compensation on corporate decisions.[1]

Despite the importance of banks in the U.S. economy (i.e., they are an important source of liquidity in times of crisis, they provide access to the nation's payment systems, and they maintain federally insured deposits), the effect of compensation on bank decisions has received less attention than it has in other industries. A few exceptions are Houston and James (1995) and John and Qian (2003) who examine risk-taking and leverage decisions, respectively.

Because banks differ from non-financial firms in several important dimensions, the impact of compensation on CEO decisions previously found for non-financial firms might not adequately characterize effects in the banking industry.[2] Furthermore, as Core,

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[1] For example, Agrawal and Mandelker (1987), Mehran (1992), and John and John (1993) focus on capital structure decisions, while Lambert, Lanen, and Larcker (1989), Fenn and Liang (2001), and Kahle (2002) examine the effect of stock-based compensation on dividend policy and repurchases. Papers that explore the relationship of stock option grants with contemporaneous and future corporate decisions and performance include Mehran (1995), Guay (1999), Cohen, Hall and Viceira (2000), Rajgopal and Shevlin (2002), Knopf, Nam and Thornton (2002), Hanlon, Rajgopal, and Shevlin (2004), and Coles, Daniel and Naveen (2006).

[2] Adams and Mehran (2003) explain why compensation structure in bank holding companies may be different than that in non-financial firms pointing out that bank regulations influence compensation

Guay, and Larcker (2003, p. 27) point out, "research on stock-based compensation and incentives has generated not only useful insights, but also has produced many contradictory insights." In our view, the banking industry provides an ideal setting to examine the effect of stock option compensation on corporate decisions because of uniform regulatory reporting requirements and the relative homogeneity of banking firms. This homogeneity means that, in effect, we have a stronger set of controls compared to previous studies that examine other industry sectors alone or pool them together. For example, banks have a narrower range of non-debt tax shields (e.g., asset depreciation), much more similar levels of leverage, and little R&D spending than non-financial firms.[3] Production technologies of banks are also far more homogenous than those of non-financial firms, while bank investment decisions are easier to observe than the investment decisions of other firms. Bank investments, which are predominantly loans, are reported in detail in regulatory filings. We thus expect to obtain sharper empirical findings than previous papers and perhaps resolve some of the "contradictory insights" found in the existing literature.

Our empirical analysis of the effect of option compensation on bank decisions is based on 549 firm-years of data for publicly-traded banks on ExecuComp from 1992 to 2002. While theoretical models (Core, Guay, and Larcker (2003) and Hanlon, Rajgopal, and Shevlin (2005)) do not provide a definitive prediction about the incentive effects of

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structure and, in turn, risk-taking. Furthermore, they document that nonfinancial firms grant more stock options to their executives relative to executives of comparably-sized banking firms. Skeel (1998) and Mehran and Winton (2001) discuss of the role of regulation in insolvency in the banking industry and of compensation structure and level of pay, respectively.

[3] Specifically, banks are subject to more stringent oversight from regulators than other firms, which arguably implies more consistent and accurate financial reports. Relative to non-financial firms, banks have little cross-sectional variation in leverage. John, Mehran, and Qian (2007) show that bank holding companies are highly levered with mean and median of book leverage of 92%, and there is relatively small variation in leverage ratios across banks.

option grants and CEO risk-taking behavior, our empirical evidence suggests that stock option grants do lead to greater risk taking by bank CEOs. Furthermore, the effect of options on firm risk appears to be through project choice rather than levering up, because options are negatively related to borrowing. Consistent with DeAngelo and Masulis (1980) non-debt tax shields and the substitutability of options for debt as a tax shield (Graham, Lang, and Shackelford (2004) and Kahle and Shastri (2005)), we also document that higher levels of option grants are associated with lower levels of borrowing. Finally, we show that increases in CEO and employee stock options grants result in increased bank capital, perhaps, because option grants create a contingent liability for the firm that needs to be funded in advance. Together, these empirical results suggest an important role for option compensation in bank investment, capital structure, and capital level decisions.

There are several important public policy and research implications of our work. First, we provide a better understanding of how compensation affects incentives, and in turn, corporate decisions. John, Saunders, and Senbet (2000) argue that banking regulations should be formulated to take such incentive distortions into account.[4] In fact, following the recent subprime crisis, there have been renewed calls for regulation of compensation in the banking industry with an emphasis on the designing compensation

[4] John, Saunders, and Senbet (2000) argue that regulation that incorporates the incentives of top-management will be more effective than capital regulation in aligning risk-taking incentives. They suggest that pay-performance sensitivity of top-management compensation in banks may be a useful input in pricing FDIC insurance premiums and designing bank regulation. Similarly, Cole and Mehran (1998) suggest that since insider ownership improves firm performance (and if higher ownership reduces the risk of default), then regulators can encourage ownership as a “complement to, or substitute for, capital requirements, which generate their own inefficiencies.” (p. 294)

packages that mitigate risk-taking incentives.[5] In our paper, we document the complex incentive effects of options on investment, borrowing, and capital. We suggest that all of these effects should be considered when evaluating the impact policy proposals on bank risk.

Second, our results imply an alternative explanation for the buildup of regulatory capital in the 1990's. Previous papers, such as Ashcraft (2001) as well as Flannery and Rangan (2007), propose market discipline or regulatory innovations as possible explanations. We suggest that the capital buildup might also be due to significant secular growth in option grants over these two decades.[6]

Third, our findings may be related to the recent increase and transformation of retail activities in which banking firms engage (see Clark, Dick, Hirtle, Stiroh, and Williams (2007) for the trend). It is difficult to associate the growth in retail banking with the growth in employee stock options, and our sample does not allow us to speak directly to this issue. However, we do provide new evidence on the negative relationship between the grant of employee stock options and holdings of interest bearing liabilities, which is consistent with changes in the relative composition of a bank's retail activities.

The rest of the paper is organized as follows. Section 2 presents the link between employee stock options and corporate decisions in the banking industry. Data and estimation is discussed in Section 3. Empirical results are presented in Section 4. In

[5] See for example, Joint Committee Report on "Observations on Risk Management Practices during the Recent Market Turbulence", March 6, 2008, http://www.ny.frb.org/newsevents/news/banking/2008/rp080306.html

[6] Our sample consists of publicly traded banks, so the applicability of our results to private banking firms is unclear. However, it is likely that many private banking firms also have broad-based employee stock options plans, similar to privately held non-financial firms (see Oyer and Schaefer, 2006). We are currently exploring this issue.

Section 5, we provide evidence on trends in employee stock options and restricted stock grants. Section 6 concludes the paper.

2. Stock-based compensation and corporate decisions

In this section, we discuss the relationship between option compensation and three key decisions in the banking industry: the composition of investments, the level of borrowing, and the level of capital. It should be noted that we do not take the view that the observed compensation contracts are equilibrium contracts, and we specifically address the issue of the endogeneity of compensation contracts using a two-stage least squares / instrumental variables approach in our empirical analysis (see Section 4.4). We find it reasonable to view causality as follows: the investment opportunities of the firm lead to the choice of compensation contract by the board, and then the compensation contract creates incentives that drive the choices of the CEO.

2.1. Investment choice

There is an extensive literature on how and when CEOs make real and financial decisions to reduce their compensation risk to the detriment of shareholders (e.g., Jensen and Meckling, 1976). To solve this incentive problem, Holmsrom (1979), Grossman and Hart (1983), and others show that tying compensation to firm performance motivates the CEO to undertake value-enhancing decisions. Along similar lines, Harris and Raviv (1979) and Hirshleifer and Suh (1992) argue that CEOs are risk-averse and as a result they prefer their compensation to be structured so that they bear less personal risk. This implies that, all-else equal, CEOs prefer fixed compensation over performance-based compensation.

However, in their reviews of incentive effects of equity based compensation, Core, Guay, and Larcker (2003) and Hanlon, Rajgopal, and Shevlin (2005) document the ambiguous predictions of theoretical models on CEO risk-taking. For example, Core, Guay, and Larker (2003) suggest that the incentive effect of stock options through risk-taking is unlikely to be large. Lambert, Larcker, and Verrecchia (1991) as well as Ross (2004) argue that it is difficult to assess the effect of option grants on CEO risk-taking without knowledge of CEO's wealth and risk aversion. Milgrom and Roberts (1992) posit that CEOs have a vested interest in the continuation of their employment with their current firm, since their human capital is tied to their employment contract and the survival of the firm they manage. Therefore, CEOs will tend to make financing and investment choices that minimize risk. In addition, Mehran, Nogler, and Schwartz (1998) claim that executive stock options and other equity-based compensation plans provide incentives for risk reduction in asset liquidation. Their suggestion may be equally applicable to other corporate restructuring and investment decisions.

We do not believe that the existing literature provides a clear prediction of the specific relationship between stock options and the riskiness of CEO investment choice, particularly for firms in the banking industry. There are other factors influencing the design of pay packages that are not present among non-financial firms. These factors can alter the incentive effect of stock options, particularly the incentive for risk-taking as discussed in Adams and Mehran (2003).

Regulators may also be concerned with the effect of stock options on risk taking, particularly when financial institutions do not have sufficient capital. For non-financial firms, stock options may be appropriate instruments to provide incentives for managers to create value, or to protect the creditors of distressed firms. However, for banks, stock options may create incentives that conflict with regulatory policy objectives to protect the non-share-holding stakeholders of banks, such as depositors and taxpayers.

Moreover, the incentive effect of stock options also depends on the treatment of compensation when a firm is financially distressed. In an unregulated environment, distress typically leads to reorganization, and the incumbent CEO is usually given the opportunity to turn around the corporation.[7] CEOs of distressed firms typically get paid according to their compensation contracts even when their firms enter Chapter 11.

By contrast, distress in the banking industry generally leads to liquidation, and the incumbent CEO is removed from management.[8] In addition, depositor claims have seniority over management compensation contracts. Therefore, bank CEOs might be more likely to avoid risky projects, because their compensation claims become worthless in the event of liquidation (Mehran and Winton 2001).[9]

Bank CEOs also might be more conservative because their human capital is more closely tied to the survival of the firm. In the banking industry, the reputational impact of insolvency is likely to include the loss of opportunities to manage another banking firm

[7] For example, Hotchkiss (1995) reports that only 41 percent of CEOs of distressed firms are replaced in the month of filing and only 55 percent are replaced by the time reorganization is approved.
[8] See, for example, Skeel (1998) for a discussion of regulatory actions in cases of insolvency.
[9] See Skeel (1999) for a similar discussion. Mehran and Winton (2001) further argue that liquidation of distressed firms in the banking industry and seniority of depositors' claim to management compensation contracts would cause CEOs of banking firms, all-else equal, to demand higher compensation when they are nominated to CEO positions.

or to be appointed to the board of other banking firms. A higher standard of accountability according to law and well-defined regulatory expectations for bank CEOs (and bank directors) can facilitate their prosecution relative to non-bank CEOs. Risky projects might also be avoided due to the potential for litigation. Therefore, it is possible that the risk-taking incentives provided by stock options are offset by closer regulatory supervisions and/or by career concerns for bank CEOs.

2.2. Borrowing

DeAngelo and Masulis (1980) show that the value of the tax subsidy that is associated with borrowing declines at the margin in the presence of non-debt tax shields. Their work is the starting point for our analysis of the effect of option compensation (firm-wide rather than just for the CEO in this case) on bank borrowing decisions.

More recently, Graham, Lang, and Shackelford (2004) as well as Kahle and Shastri (2005) investigate whether the tax shield (or deduction) associated with stock option exercise reduces the firm's need to rely on debt tax shields. Specifically, when employees exercise their options, the firm receives a tax deduction upon exercise for each share in an amount equal to the excess of the stock price at the exercise time over the exercise price.[10] Thus, the exercise of a large option grant might exhaust the usable tax shield leaving no tax advantage for debt issuance. Both papers find that firms with heavier reliance on employee stock options use less debt in their capital structure. Graham, Lang, and Shackelford (2004) further show that these same firms have marginal tax rates that are consistent with no measurable tax incentives for debt financing.

[10] This deduction is available in the case of Nonqualified Stock Options (NQSOs). No deduction is allowed to the company in connection with Incentive Stock Options (ISOs).

There is an important difference between a banking firm and a non-financial firm in terms of preference for the timing of expenses to use as tax shields. A non-financial firm can cumulate expenses over a long period of time (even through distress) and use those expenses to offset earnings in the future.[11] For a bank, however, distress typically entails liquidation. Thus, the value of a tax shield (such as debt) that tends to generate long-lived tax loss carry-forwards is much lower for a bank than for a non-financial firm (Mehran, 2006). Banking firms might then prefer options to debt because greater leverage can increase the probability of default (DeAngelo and Masulis, 1980), and greater debt may increase the regulatory scrutiny.

In addition, a firm may prefer options to debt, because options act as a contingent tax shield. Employees will tend to exercise options (generating an additional labor cost that can be used as a tax shield) when the stock price is rising, which is likely to be when the firm is profitable and has earnings to offset. When the firm is doing poorly and the share price is falling, options are unlikely to be exercised, resulting in lower labor costs for the firm and the absence of an unneeded tax shield. We, therefore, expect higher option grant levels to be associated with lower levels of debt to the extent that options function as a non-debt tax shield.

2.3. Bank capital

[11] Under the current tax code, the actual incidence on a firm's corporate taxes of a dollar earned this year ranges from two years before the current year (due to the two-year tax loss carry-back period) to twenty years after current year (due to the 20-year tax loss carry-forward period). This is the case for taxable years beginning after August 5, 1997 (IRS Section 172). Like non-financial firms, banks and savings institutions had various special provisions in the tax code that determined the appropriate carry-backward and carry-forward periods for tax years prior to 1994.

We argue that CEO and employee stock options can affect bank capital in several ways. First, when an employee exercises a stock option, the employee pays the bank the exercise price in exchange for shares of stock. This cash inflow mechanically increases bank capital. Ofek and Yermack (2000) suggest that this is analogous to backdoor equity financing with no price effect. However, it is not clear how extensively firms rely on this method of raising equity and capital. Second, when a bank grants stock option today, it may set aside cash today (increase capital) to fund the on-going purchase of its own shares in expectation of future option exercises.

In addition, because exercise decisions cannot be perfectly forecasted, banks might also set aside an additional cash buffer to cover the cost of unexpected exercises.[12] Indeed, option exercise patterns are uncertain and are likely to be sensitive to future market conditions as well as firm performance.[13] Employees might accelerate their exercises if there is negative news about the firm, although CEOs and other executives might be reluctant to engage in seemingly opportunistic behavior.

In terms of the behavior of capital for a bank over time, we expect to see an increase in option grants followed by a build up of capital. Cross-sectionally, we predict that banks with large options programs will have higher capital ratios than banks with smaller or no options programs.[14]

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[12] We discussed this hypothesis with the office of the CFO of a major bank and were told that the bank is aware of the possibility of a large unexpected exercise of stock options, and the bank has built up more capital to deal with this scenario.

[13] Mehran and Tracy (2007) document that only 34% options granted are exercised in the first year after they vested, and only 15% and 11% of bank executive stock options are exercised in the second and third year, respectively.

[14] On the other hand, banks with larger CEO and employee stock option plans might chose not build up a capital buffer for future option exercise costs, despite the fact that exercises can reduce the capital base (Adams and Mehran, 2003). In some scenarios, the size of the cash outflow might be large enough to cause bank capital to fall below the regulatory requirement. While this might force the bank to enter the equity market, issuing equity would not necessarily help the bank if it induces a further decline in the stock price.

3. Data and estimation

3.1. Data

Our sample is constructed using the set of bank holding companies that report financial data to the Federal Reserve System on the Y-9C form over the period 1992-2002. We retain the subset of these banks that are publicly traded as identified by a manual name matching process of Y-9C reporters with SIC 6021 (national commercial banks) or SIC 6022 (state commercial banks) in the Compustat database. In addition, to be included in the sample, the bank must be included in Standard and Poor's ExecuComp database, which contains details of executive pay packages. Bank years in which there is a merger, there are co-CEOs, or there is a change of CEO are dropped. As we see in Table 1, there are a total of 549 bank years in our full sample. There are between 30 and 64 observations per year from 1993 through 2002.[15]

We compute the delta and vega of each bank CEO's portfolio at the end of each fiscal year using the approach of Core and Guay (2002).[16] Their "one year approximation method" facilitates estimation of option portfolio characteristics using a single year's data, rather than tracking grants and exercises over time. Delta is defined as the change in the value of the CEO's wealth for a one-percent change in stock price, while vega measures the change in the CEO's wealth for a 0.01 change in the annualized standard deviation of stock returns. We exclude from the analysis ExecuComp records

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So, all-else equal, these banks would have less capital in some situations relative to firms with smaller employee stock option plans. We view this as a less likely scenario than the one described above.

[15] The option disclosure rule adopted in 1994 requires firms to report their compensation for the two previous years to the SEC. However, this requirement was not enforced in 1994, the first year of filings. Many firms also did not provide the details of their executive stock option plans for 1992 and 1993 in their filings. As a result, we have fewer observations in 1993.

[16] We are grateful to John Core and Wayne Guay for sharing their computer code with us.

for reloaded option grants and repriced option grants. Other studies that use delta to measure pay-for-performance sensitivity or vega to measure volatility sensitivity include Guay (1999), Cohen, Hall and Viceira (2000), Rajgopal and Shevlin (2002), Knopf, Nam and Thornton (2002), Hanlon, Rajgopal, and Shevlin (2004), and Coles, Daniel and Naveen (2006).

As shown in Panel A of Table 2, the average delta of a bank CEO's portfolio is about $986,000, while the average portfolio vega is about $136,000. There is a fairly wide spread around these average values; the standard deviation for delta and vega are $3,145,000 and $201,000, respectively. It is not surprising to see cross-sectional variation in delta and vega, because compensation contracts are likely to be structured to reflect cross-sectional differences in CEO risk preferences, CEO endowments, or particular characteristics of the bank's business strategy. Furthermore, there is no consensus on the optimal structure of CEO compensation to provide a particular set of incentives, so one would naturally expect to observe idiosyncratic variation in CEO compensation contracts even if the sample of banks is completely homogeneous.

Our dependent variables span several aspects of bank CEO decisions. To analyze the risk of investment choices, we measure each bank's equity market volatility and asset volatility. For each bank year, we calculate the annualized standard deviation of daily stock returns using data from CRSP. Stock price volatility has been used as a dependent variable in several previous studies of option incentive effects (e.g., Coles, Daniel and Naveen, 2006).[17] We also decompose total volatility into systematic and residual components based on an annual regression of daily excess stock returns on excess returns

[17] To reduce positive skewness, we follow the existing literature and the log of volatility as a dependent variable.

to the S&P500 index (see for example, Cohen, Hall and Viceira, 2000). Because banks can take risk on both the asset and liability side of their balance sheet, we supplement the other measures with Moody's KMV asset volatility.[18] Asset volatility measures the bank's risk after controlling for leverage. Panel B of Table 2 reports that the annualized total, systematic, and residual volatility for an average bank in our sample are 29.6%, 14.2%, and 25.3% while average asset volatility is 5.3%.

We proxy for the intensity of debt use using each bank's interest expense to asset ratio and federal funds borrowed to assets ratio. Our interest expense-based measure is particularly relevant in testing the tax shield hypothesis as interest paid by the bank on its borrowing is deductible. We measure the extent of bank borrowing using the marginal source of funding for large banks, which is federal funds borrowing (Kashyap and Stein, 2000).[19] As shown in Panel B of Table 2, an average bank in our sample has an interest expense to asset ratio of 3.0% and a federal funds to assets ratio of 2.7%.

To investigate compensation effects on bank capitalization, we use the Tier 1 capital ratio and the total capital ratio, two most commonly capital measures used by regulators and researchers.[20] In our sample, the average Tier 1 capital ratio is 10.1%,

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[18] KMV estimates asset volatility and asset value using an iterative procedure that takes equity value, equity volatility, capital structure, and the riskless rate as given and uses two pricing equations based on the Merton (1974) model. For a more detailed discussion, see Crosbie and Bohn (2003).

[19] Our measure of federal funds borrowing is the data item "Fed Funds sold and securities purchased under agreements to resell," which is on the asset side of the balance sheet.

[20] The numerator for the Tier 1 ratio is Tier 1 capital, which consists primarily of shareholders' equity. The numerator for the total capital ratio is total capital, which is the sum of Tier 1 capital and Tier 2 capital (undisclosed reserves, revaluation reserves, general provisions/general loan-loss reserves, hybrid debt capital instruments and subordinated debt). For both ratios, the denominator is total risk-weighted assets. For additional details, see Annex 1 of Basel Committee on Banking Supervision (1988).

which is higher by about 2% to 3% than to the minimum required regulatory capital ratio.[21] The average total capital ratio is 13.0%.

We next create a set of control variables based on bank characteristics similar to those of Demsetz and Strahan (1997). For each bank, end-of-year data from Y-9C reports is used to calculate the bank's log-assets (in millions) as well as its share of real estate, commercial and industrial, and consumer loans versus total loans. We then calculate loan concentration (sum of squared loan shares) and trading assets as a share of total assets. We also measure positions in commodity, foreign exchange, equity, and interest rate derivatives relative to total bank assets. Since this data is only available since 1995, our sample size is reduced to 408 bank-years for regressions that include these variables.

Summary statistics are presented in Panel C of Table 2. An average bank in the sample has about $41.22 billion in assets. The real estate segment has the largest loan share, with an average of 48.2%, followed by commercial and industrial segment at 25.0% and consumer loans at 16.4%. Our banks have an average trading book size that is 1.9% of assets, and they generally hold relatively large positions in interest rate derivatives (53.4% of assets) and foreign exchange rate derivatives (24.6% of assets).

3.2. Estimation technique

Our empirical analysis is based on a panel regression of annual observations of CEO decision variables on lagged annual values of CEO option portfolio value, CEO pay-for-performance (delta), and lagged risk sensitivity incentives (vega). CEO

[21] The definition of regulatory capital and the required minimum capital ratio have changed over our sample, so it is difficult to precisely determine how much the sample capital is higher relative to required capital.

incentives are measured at the end of each year, while CEO decisions are measured over the subsequent year. This setup helps to mitigate endogeneity/simultaneity, since the incentives are in place before the decisions are made. In these regressions, we also control for cross-sectional differences in bank characteristics that might be associated with CEO decision variables, but unrelated to the incentive effects of stock options. To further address the possible effects of endogeneity of option portfolio characteristics, we re-estimate these panel regressions using two-stage least squares/instrumental variables. Those results are discussed in Section 4.4.

Our sample starts in 1992, but since the regressions include prior year data, the first year of the analysis is 1993. In our regressions, we adjust for cross-sectional differences in bank types by including two sets of control variables. When we do not include derivatives controls, there are 549 bank-year observations. Regressions that include derivatives exposures are based on 408 bank-years, since derivatives reporting on the Y-9C form began in 1995.

All regressions incorporate year fixed effects to control for trends in the variables, such as business cycle effects. Because the fixed effects are highly significant, we report an adjusted R-squared for the fixed effects only regression along with the adjusted R-squared for the full regression. The incremental explanatory power of the main explanatory variables and the control variables is equal to the difference between these two adjusted R-squareds. To address possible within-firm correlation of errors, we calculate p-values using standard errors robust to clustering by firm (e.g., Wooldridge, 2002) and Petersen (2008)).

We interpret a significant positive coefficient on vega as evidence that CEO compensation packages increase CEO risk taking via riskier investment decisions. Significant negative coefficient on option portfolio value in the interest expense and federal funds borrowing regressions are viewed as support for the hypothesis that larger option grants result in reduced borrowing. In the capital ratio regressions, a significant positive coefficient on option portfolio value is consistent with higher capital accumulation in anticipation of higher future option exercise costs.

4. Estimation results

4.1. CEO investment choice

Our first set of regressions focuses on whether incentives generated by bank CEO pay packages affect risk taking. In Table 3, we report results for regressions of annual stock volatility on the previous year's CEO portfolio delta and vega, control variables, and year fixed effects (not reported). Regressions reported in columns (1), (2), and (3) do not include the derivatives exposures or trading assets controls, while those in (4), (5), and (6) include all controls.

As shown in columns (1) and (3), there is a statistically significant positive relationship between the volatility sensitivity of a CEO's portfolio (vega) and the level of total and residual equity volatility. The respective coefficients of 0.13 and 0.14 show that an increase in the vega of a CEOs option portfolio — for example through additional option grants this year — results in increased risk for the bank next year. To the extent that vega affects risk through investment choice (loan shares) or other control variables, we expect these coefficients underestimate the risk-taking incentive effects of stock options. We explicitly model and control for these relationships (i.e., the determinants of delta and vega) using two-stage least squares / instrumental variables in Section 4.4.

If banks CEOs increase risk through higher leverage, then we would expect to see a link between vega and systematic risk. This is because increasing leverage, which would increase the firm's beta, would be the most straightforward method for a CEO raise the level of systematic risk. In fact, we do not find such a relationship (columns (2) and (4)). Thus, to the extent that higher vega leads to higher risk taking, it appears that the risks taken are idiosyncratic, possibly reflecting expansion into new business lines (e.g., Stiroh 2006) or choosing different weights on their current activities.

We find further support for an incentive effect of options on bank risk when we augment these models with a larger set of controls as shown in columns (4), (5), and (6). We once obtain a statistically significant positive relationship between equity volatility and vega. The magnitude and statistical significance of the vega coefficient does drop in all three specifications with these additional control variables. In addition, we see that total and residual volatility are lower for larger banks (negative coefficient on log-assets in columns (1), (3), (4), and (6)) while systematic volatility is higher for larger banks (positive coefficient on log-assets in columns (2) and (5)).

In Table 4, we measure the relationship between option grants and bank asset volatility. This amounts to re-estimating the Table 3 regressions using as the dependent variable the log of KMV asset volatility instead of the log of equity volatility. Consistent with the Table 3 regression results, we find that vega is highly significant and positive using both sets of control variables.

4.2. Borrowing

In Table 5, we examine whether stock option grants reduce a bank's incentive to borrow. Our proxies for borrowing are interest expense as a share of assets and the ratio of federal funds borrowing to assets. We see that higher levels of grants of employee stock options are associated with lower levels of interest expense in both specifications (columns (1) and (3)). We obtain a similar result when our dependent variable is federal funds borrowing to assets (columns (2) and (4)). Estimated coefficients for the interest expense ratio are -0.002 and -0.015, while for the federal funds ratio they are -0.013 and -0.100. One coefficient is significant at the 10% level, two are significant at the 5% level, and one is significant at the 1% level.

Using the estimated parameters and all variables set to their sample averages, we find that an option grant that causes a 10% increase in the total value of the CEO's option portfolio value is associated with a decline in interest expense to assets from 2.996% to 2.993%. In dollar terms, this corresponds to an average decline of 10.8 million dollars in interest expense. The same option grant increase is also associated with a drop in federal funds borrowing to assets from 2.689% to 2.686%. In dollar terms, this is a reduction of about 1.4 million dollars in federal funds borrowing. Together, these results suggest that options grants are a substitute for debt, which is consistent with options being used as a non-debt tax shield.

4.3. Capital choice

Next, we examine the link between CEO option grants and bank capital. In Table 6, we detect a statistically significant positive relation between both the Tier 1 and total capital ratios and the lagged value of the CEO option portfolio. This relationship is fairly consistent across all specifications that we consider with coefficients ranging from 1.04 to 1.41.

Furthermore, on average, a grant that increases by 10% the value of the CEO's option portfolio increases the Tier 1 capital ratio from 10.125% to 10.144% and the total capital ratio from 13.010% to 13.031%. These results are consistent with the hypothesis that banking firms that grant a larger amount of stock options set aside more capital. In addition to increasing capital to prepare for the expected exercise pattern, the firm may set aside additional capital to deal with unexpected option exercises.

4.4. Robustness checks

We conduct a number of additional tests to explore the robustness of our findings. We first investigate whether the possible endogeneity of CEO option portfolio characteristics (delta, vega, and option portfolio value) affects our empirical results. For this purpose, we re-estimate the models in Tables 3 through 6 using instrumental variables / two-stage least squares. In the first stage, delta, vega, and option portfolio value are regressed on their own lags, year fixed effects, lagged log assets, lagged loan shares, and lagged loan concentration. Then, the residuals from these regressions are used in the second stage in place of the original values of delta, vega, and option portfolio value. For each estimation, we also show the results of three specification tests (at the 5% significance level): the Andersen (1984) test for instrument irrelevance, the Stock and Yogo (2005) test for weak instruments, and the Durbin (1954) - Wu (1973) - Hausman (1978) test for exogeneity (OLS unbiasedness). All of these results are shown in Table 7.

Looking at the first-stage regression results, we see that delta, vega, and option portfolio value are fairly well explained their own lags, control variables, and year fixed effects. Adjusted R-squared for these three option portfolio characteristics range from 80% to 90%. Interestingly, for vega, loan shares and loan concentration are not helpful in characterizing cross-sectional variation.

Now, turning first to the second-stage regressions relating option grants to bank risk in Table 7, Panel B (which are equivalent to instrumental variables (IV) regressions), we once again find a highly statistically significant positive relationship for total, residual, and asset volatility with the vega of the CEO's option portfolio. In addition, the estimated vega coefficients in the OLS and IV regressions are fairly similar. As an example, in the total volatility regressions, the estimated vega coefficient using OLS is 0.1270 (Table 1) versus 0.1281 using IV (Table 7). Both are statistically significant at the 5% level. We reject instrument irrelevance and weak instruments, and do not reject OLS unbiasedness.

We next use instrumental variables to re-estimate the relationship between option compensation and bank borrowing and bank capital (Table 7, Panel C). We continue to detect a negative relationship between CEO option portfolio value and borrowing. This lends further support for the substitutability of debt and options as tax shields. Looking at the coefficient on option portfolio value in the interest expense to assets regressions, the OLS estimate is -0.0017 and the IV coefficient is -0.0016. Each of these coefficients is statistically significant at the 5% level.

In IV regressions of Tier 1 and total capital ratios on CEO option portfolio value, we obtain coefficients of 1.03 and 1.14, and both are significant at the 1% level. These compare with OLS estimates of 1.04 and 1.40, reinforcing our earlier finding that banks build up capital in response to option grants.

As a further robustness check, we augment our OLS regressions with firm fixed effects. To limit the total number of explanatory variables, we retain the year fixed effects but drop the other controls. Most of our earlier results continue to go through, but not surprisingly (due to the addition of 549 additional explanatory variables), there is reduced statistical significance. In order to conserve space, we summarize the results below do not include them in the tables.

In the firm fixed effect regressions, we detect a significant, positive relationship between the CEO's portfolio vega and each of our bank risk measures. However, with firm fixed effects, the connection between option grants and proxies of bank borrowing intensity is weaker. In particular, option portfolio value is significantly negatively related to the interest expense ratio using OLS standard errors (but not clustered standard errors), and no significant relationship is found with federal funds borrowing. We still find that banks with larger option grants have higher Tier 1 capital, but the relationship is no longer statistically significant for total capital.

We continue by exploring whether the relationship between capital and bank risk dominates the original relationship between vega and bank risk that we identified in Table 3. In the presence of the capital variables, estimates of vega from the volatility regressions continue to be positive. Vega remains significant at the 5% level in the volatility regressions without derivatives controls; however, vega is no longer significant in the specifications with derivatives controls. To see whether the difference between the larger and smaller samples has a meaningful effect on our results about CEO risk taking, we re-estimate the Table 3 regressions in columns (1), (2), and (3) using the smaller sample of 408 bank-years used in (4), (5), and (6). The results are qualitatively similar.

5. Conclusions

The contracting literature recognizes that CEOs have a unique role in modern corporations. They undertake investment and financing decisions and allocate corporate resources. In this paper, we show that CEO stock options affect at least three key corporate policies for banks: investment choice, amount of borrowing, and level of capital. Therefore, we can improve our understanding of banks' investment, financing and capital decisions by studying CEO compensation decisions.

We document that the bank's equity volatility (total as well as residual) and asset volatility increase as CEO stock option holdings increase. Because options are not associated with a rise in systematic volatility, we posit that the volatility increase is driven by riskier investment decisions rather than higher leverage. In fact, we show that larger option grant programs are associated with less use of debt; we attribute this to the substitutability of options and debt as a tax shield.

In our earlier discussion of project choice, we describe why the incentive for risk-taking associated with stock options might be smaller for bank CEOs than the CEOs of non-financial firms. One can thus argue that the risk-taking incentive effect of options that we find for banks is likely to be even larger for non-financial firms. These incentive effects may be further magnified by the larger sizes of options grants to CEOs of non-financial firms and perhaps by regulatory differences as well.

Our finding of a positive relationship between option grants and bank capital suggests a new explanation for one of the puzzles in the banking literature: the record build up of capital in the 1990s (e.g., Flannery and Rangan, 2004). Over this same period, our calculations show that annual employee stock option grants rose from 0.6 to 18.1 billion dollars (Figure 1).[22] Future research might further explore the relationship between these trends.

[22] For these calculations, we assume that the characteristics of option grants to non-executives and executives are the same.

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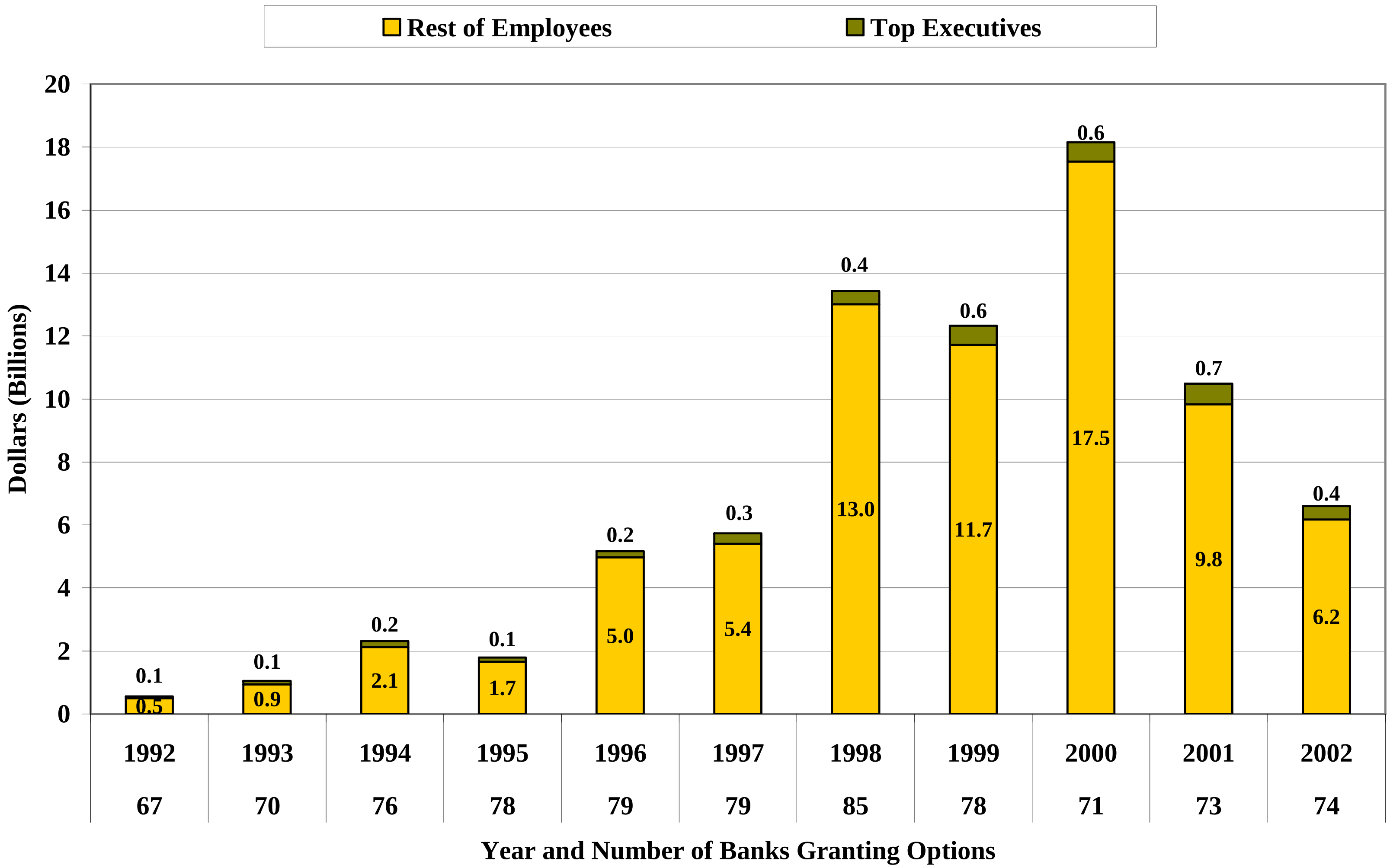
Figure 1
Value of Option Grants by Banks in Execucomp



Note: We assume each option granted to lower rank employees has the same value as those granted to executives.

Table 1
Bank sample size

This table presents the number of observations per year for our sample of banks. The sample is constructed using the set of bank holding companies that report financial data to the Federal Reserve System on the Y-9C form (call report) over the period 1993-2002. We retain the subset of these banks that are publicly traded as identified by a manual name matching process of Y-9C reporters with national and state commercial banks (SIC 6021 or 6022) in the Compustat database and that are also included in Standard and Poor's ExecuComp database.

Year	Number of banks
1993	30
1994	51
1995	58
1996	64
1997	54
1998	61
1999	64
2000	52
2001	55
2002	60
Total	549

Table 2
Summary Statistics

This table presents summary statistics for the variables used in our analysis over the period from 1992-2004. Panel A includes incentive variables, Panel B includes dependent variables, and Panel C includes control variables. In Panel A, we calculate the total delta and vega of each bank CEO's portfolio at the end of each fiscal year using the approach of Core and Guay (2002) and option portfolio value using Black and Scholes (1973). In Panel B, equity return volatility is the annualized standard deviation of daily returns calculated over a calendar year, while systematic and residual volatility are from annual regressions of daily equity returns on the S&P500 index return. Data is from CRSP. Asset volatility is from Moody's/KMV. The interest expense to asset ratio, Federal Funds borrowed to assets ratio, and capital ratio (available since 1996) are calculated at the end of each year using Y-9C data. The dividend yield and dividend sales ratio are end of year values from Execucomp. Additional details are given in the text. Panel C reports statistics for control variables used in our regression analysis; most of these control variables are also used by Demsetz and Strahan (1997). Log assets (in millions) is from Execucomp and the remaining variables are calculated using Y-9C data. Loan shares (commercial and industrial, real estate, and consumer) are end of year outstanding amounts divided by total loans. Loan concentration is the sum of squared loan shares. Derivative exposures (interest rate, foreign exchange, equity, and commodity, which are available since 1995) are end of year gross notional outstanding amounts divided total assets.

Panel A. CEO option portfolio characteristics in $1,000's

Variable	Num. obs.	Mean	Std. dev.
CEO option portfolio value	549	17,138	35,718
CEO portfolio delta	549	986	3,145
CEO portfolio vega	549	136	201

Panel B. Dependent variables

Variable	Num. obs.	Mean	Std. dev.
Equity return volatility (total)	549	29.6%	9.9%
Equity return volatility (residual)	549	25.3%	8.8%
Equity return volatility (systematic)	549	14.2%	7.5%
Asset volatility	494	5.3%	2.2%
Interest expense/Assets	549	3.0%	0.9%
Federal Funds Borrowed/Assets	504	2.7%	5.0%
Tier 1 capital ratio	549	10.1%	2.5%
Total capital ratio	549	13.0%	2.6%

Panel C. Control variables

Variable	Num. obs.	Mean	Std. dev.
Assets ($ billions)	549	41.2	69.2
Commercial and industrial loan share	549	25.0%	12.6%
Real estate loan share	549	48.2%	19.0%
Consumer loan share	549	16.4%	13.9%
Loan concentration	549	39.3%	14.9%
Trading assets to assets	491	1.9%	6.3%
Interest rate derivatives to assets	408	53.6%	224.1%
Foreign exchange derivatives to assets	408	24.6%	83.8%
Equity derivatives to assets	408	1.3%	7.4%
Commodity derivatives to assets	408	0.7%	4.5%

Table 3
Effect of CEO option compensation on equity return volatility

This table reports estimated regression models that relate equity return volatility to CEO option compensation using an annual panel of banks from 1993-2002. Log volatility is regressed on the previous year's CEO portfolio delta and vega, which are measured using the method of Core and Guay (2002). Coefficients on delta and vega are multiplied by 1,000. Equity volatility is measured using the annualized standard deviation of daily stock returns over a calendar year. Systematic and residual volatility are estimated using annual regressions on S&P500 returns. All regressions include year fixed effects (not shown). In columns (1), (2), and (3), log assets, loan shares are used as control variables, while in columns (4), (5), and (6) there is an expanded set of controls similar to Demsetz and Strahan (1997). Data on derivative exposures is only available since 1995 resulting in a smaller sample size for these regressions. P-values are calculated using clustered standard errors (Wooldridge, 2002). Loan concentration is the sum of squared loan shares. Dependent variables are winsorized at the 1st and 99th percentiles. One, two, and three stars represent statistical significance at the 10%, 5%, and 1% levels.

	(1) Log total volatility		(2) Log systematic volatility		(3) Log residual volatility		(4) Log total volatility		(5) Log systematic volatility		(6) Log residual volatility	
$Delta_{t-1}$	-0.0040		-0.0146	**	-0.0024		-0.0007		-0.0072		0.0011	
$Vega_{t-1}$	0.1270	**	-0.1352		0.1434	***	0.0859	*	-0.1164		0.1071	*
Log $assets_{t-1}$	-0.0253	***	0.2247	***	-0.0780	***	-0.0359	***	0.1903	***	-0.0986	***
Commercial and industrial loan $share_{t-1}$	-0.0441		-0.3653	*	0.0065		-0.1313		-0.5189	**	-0.0489	
Real estate loan $share_{t-1}$	-0.6507	***	-1.0795	***	-0.5825	***	-0.7313	***	-1.2274	***	-0.6278	***
Consumer loan $share_{t-1}$	-0.2135	**	-0.0762		-0.2284	**	-0.3567	***	-0.3668		-0.3395	***
Loan $concentration_{t-1}$	0.4097	***	0.8105	***	0.3684	***	0.3697	***	0.6531	***	0.3044	***
Trading assets/$assets_{t-1}$							0.0924		-1.1024		0.7069	
Interest rate derivatives/$assets_{t-1}$							0.0337	***	-0.0240		0.0441	***
Foreign exchange derivatives/$assets_{t-1}$							0.0194		0.0375		-0.0036	
Equity derivatives/$assets_{t-1}$							-0.9811	***	0.5205		-1.2479	***
Commodity derivatives/$assets_{t-1}$							-0.7161	***	0.2120		-1.0824	***
Number of observations	549		549		549		408		408		408	
Adjusted R^2 (fixed effects only)	60.7%		51.5%		51.6%		54.9%		39.9%		51.9%	
Adjusted R^2 (full specification)	68.6%		71.2%		63.1%		66.7%		63.2%		67.1%	

Table 4
Effect of CEO option compensation on asset volatility

This table reports estimated regression models that relate asset return volatility to CEO option compensation using an annual panel of banks from 1993-2002. Log asset volatility (from Moody's/KMV) is regressed on the previous year's CEO portfolio delta and vega, which are measured using the method of Core and Guay (2002). Coefficients on delta and vega are multiplied by 1,000. In column (1), log assets and loan shares are used as control variables, while in column (2), there is an expanded set of controls similar to Demsetz and Strahan (1997). Data on derivative exposures is only available since 1995 resulting in a smaller sample size for these regressions. P-values are calculated using clustered standard errors (Wooldridge, 2002). Loan concentration is the sum of squared loan shares. Dependent variables are winsorized at the 1st and 99th percentiles. One, two, and three stars represent statistical significance at the 10%, 5%, and 1% levels.

	(1) Log asset volatility		(2) Log asset volatility	
$Delta_{t-1}$	0.0015		0.0048	
$Vega_{t-1}$	0.2019	***	0.1524	**
Log $assets_{t-1}$	-0.0415	***	-0.0256	**
Commercial and industrial loan $share_{t-1}$	-0.1863		-0.5303	***
Real estate loan $share_{t-1}$	-0.8337	***	-1.4161	***
Consumer loan $share_{t-1}$	0.1031		-0.5609	***
Loan $concentration_{t-1}$	0.4924	***	0.6763	***
Trading assets/$assets_{t-1}$			-0.2541	
Interest rate derivatives/$assets_{t-1}$			0.0195	
Foreign exchange derivatives/$assets_{t-1}$			-0.0510	*
Equity derivatives/$assets_{t-1}$			-1.0558	**
Commodity derivatives/$assets_{t-1}$			-0.2810	
Number of observations	494		369	
Adjusted R^2 (fixed effects only)	39.2%		29.1%	
Adjusted R^2 (full specification)	59.7%		59.1%	

Table 5
Effect of CEO option compensation on borrowing costs

This table reports estimated regression models that relate borrowing to CEO option compensation using an annual panel of banks from 1993-2002. Interest expense/Assets and Federal Funds Borrowed / Assets (from Y-9C reports) are regressed on the previous year's CEO option portfolio value, which is measured using the method of Core and Guay (2002). Coefficients on option portfolio value are multiplied by 100,000. All regressions include year fixed effects (not shown). In columns (1) and (2) log assets and loan shares are used as a control variables, while in columns (3) and (4) there is an expanded set of controls similar to Demsetz and Strahan (1997). Data on derivative exposures is only available since 1995 resulting in a smaller sample size for these regressions. Loan concentration is the sum of squared loan shares. P-values are calculated using clustered standard errors (Wooldridge, 2002). Dependent variables are winsorized at the 1st and 99th percentiles. One, two, and three stars represent statistical significance at the 10%, 5%, and 1% levels.

	(1) Interest expense/ Assets		(2) Federal Funds Borrowed/ Assets		(3) Interest expense/ Assets		(4) Federal Funds Borrowed/ Assets	
Option portfolio value$_{t-1}$	-0.0017	**	-0.0134	***	-0.0145	*	-0.0995	**
Log assets$_{t-1}$	0.0018	***	0.0045	***	0.0013	***	-0.0014	
Commercial and industrial loan share$_{t-1}$	-0.0165	***	-0.2206	***	-0.0088	***	-0.1449	***
Real estate loan share$_{t-1}$	-0.0106	***	-0.3385	***	0.0016		-0.2352	***
Consumer loan share$_{t-1}$	-0.0078	***	-0.3479	***	0.0072	**	-0.2360	***
Loan concentration$_{t-1}$	0.0112	***	0.1855	***	0.0051	*	0.1544	***
Trading assets/assets$_{t-1}$					0.0121		-0.0327	
Interest rate derivatives/assets$_{t-1}$					-0.0009	***	0.0016	
Foreign exchange derivatives/assets$_{t-1}$					0.0009		0.0183	***
Equity derivatives/assets$_{t-1}$					0.0226	**	0.0367	
Commodity derivatives/assets$_{t-1}$					0.0138	*	0.1751	*
Number of observations	549		504		408		378	
Adjusted R^2 (fixed effects only)	45.4%		-1.0%		53.1%		-0.8%	
Adjusted R^2 (full specification)	53.3%		54.1%		62.9%		67.2%	

Table 6
Effect of CEO option compensation on capital ratios

This table reports estimated regression models that relate the capital ratio to CEO option compensation using an annual panel of banks from 1993-2002. The Tier 1 capital ratio and total capital ratio (from Y-9C reports) are regressed on the previous year's CEO option portfolio value, which is measured using the method of Core and Guay (2002). Coefficients on option portfolio value are multiplied by 100,000. All regressions include year fixed effects (not shown). In columns (1) and (2) log assets and loan shares is used as control variables, while in columns (3) and (4) there is an expanded set of controls similar to Demsetz and Strahan (1997). Data on derivative exposures is only available since 1995 resulting in a smaller sample size for these regressions. Loan concentration is the sum of squared loan shares. P-values are calculated using clustered standard errors (Wooldridge, 2002). Dependent variables are winsorized at the 1st and 99th percentiles. One, two, and three stars represent statistical significance at the 10%, 5%, and 1% levels.

	(1) Tier 1 capital ratio		(2) Total capital ratio		(3) Tier 1 capital ratio		(4) Total capital ratio	
Option portfolio value$_{t-1}$	1.1157	***	1.2345	***	1.0441	***	1.4080	***
Log assets$_{t-1}$	-1.2218	***	-0.5165	***	-1.1113	***	-0.4739	***
Commercial and industrial loan share$_{t-1}$	-6.5658	***	-4.4404	***	-7.7709	***	-4.0043	***
Real estate loan share$_{t-1}$	-5.8649	***	-5.0011	***	-6.9894	***	-3.9653	***
Consumer loan share$_{t-1}$	-5.3083	***	-6.1792	***	-6.3500	***	-5.3726	***
Loan concentration$_{t-1}$	2.2211	**	3.0894	***	3.0688	***	2.2317	*
Trading assets/assets$_{t-1}$					-22.1205	***	-16.5151	***
Interest rate derivatives/assets$_{t-1}$					0.2045		-0.0287	
Foreign exchange derivatives/assets$_{t-1}$					0.5277	**	0.4490	
Equity derivatives/assets$_{t-1}$					1.5163		2.7768	
Commodity derivatives/assets$_{t-1}$					8.1969	***	18.0301	***
Number of observations	549		549		408		408	
Adjusted R^2 (fixed effects only)	-0.4%		2.7%		-0.5%		2.0%	
Adjusted R^2 (full specification)	38.4%		15.2%		41.0%		21.8%	

Table 7
Two-stage least squares models

We re-estimate the models from Tables 3 through 6 using two-stage least squares to control for possible endogeneity of delta, vega, and option portfolio value. All of these models are estimated using year fixed effects, log assets, and loan shares as control variables (coefficients not shown). In the first stage (Panel A), delta, vega, and option portfolio value are regressed on their own lags, year fixed effects, lagged log assets, lagged loan shares, and lagged loan concentration. Then, in the second stage (Panels B and C), the fitted values from the first-stage regressions are used as measures of option portfolio characteristics along with the same controls. We report the results of three specification tests for these instrumental variables models at the 5% significance level: the Anderson (1984) test for instrument irrelevance, the Stock and Yogo (2005) test for weak instruments, and the Durbin (1954) - Wu (1973) - Hausman (1978) test for exogeneity (OLS unbiasedness). Dependent variables are winsorized at the 1st and 99th percentiles. One, two, and three stars represent statistical significance at the 10%, 5%, and 1% levels.

Panel A. First-stage regressions using two-stage least squares

	(1)		(2)		(3)	
	$Delta_t$		$Vega_t$		Option portfolio $value_t$	
$Delta_{t-1}$	0.8710	***	0.0095	*		
$Vega_{t-1}$	0.7996		1.0249	*		
Option portfolio $value_{t-1}$					1.0822	***
Log $assets_{t-1}$	148.7937	*	19.4173	*	0.0599	
Commercial and industrial loan $share_{t-1}$	-1124.3031		-96.0582		0.2302	**
Real estate loan $share_{t-1}$	-3187.3067	***	-42.5785		0.0001	***
Consumer loan $share_{t-1}$	2172.7157	**	4.1221		0.0167	
Loan $concentration_{t-1}$	4557.5002	***	20.5682		0.0001	***
Number of observations	547		547		547	
Adjusted R^2 (fixed effects only)	0.0%		11.6%		4.4%	
Adjusted R^2 (full specification)	79.7%		82.8%		89.0%	

Panel B. Second-stage regressions for effect of CEO compensation on risk-taking

	Instrumental variables estimation							
	(1)		(2)		(3)		(4)	
	Log total volatility		Log systematic volatility		Log residual volatility		Log asset volatility	
$Delta_t$	-0.0060		-0.0154	*	-0.0044		-0.0006	
$Vega_t$	0.1281	**	-0.1151		0.1427	***	0.2008	***
Year fixed effects, log assets, and loan shares included as controls	yes		yes		yes		yes	
Adjusted R^2 (full specification)	69.4%		72.6%		64.1%		61.9%	
Anderson instrument irrelevance test	reject		reject		reject		reject	
Stock and Yogo weak instruments test	reject		reject		reject		reject	
Hausman test for OLS unbiasedness	not reject		not reject		not reject		not reject	

Panel C. Second-stage regressions for effect of CEO compensation on borrowing costs and capital ratios

	Instrumental variables estimation							
	(1)		(2)		(3)		(4)	
	Interest expense/ Assets		Federal Funds Borrowed/ Assets		Tier 1 capital ratio		Total capital ratio	
Option portfolio $value_t$	-0.0016	**	-0.0124	***	1.0300	***	1.14	***
Year fixed effects, log assets, and loan shares included as controls	yes		yes		yes		yes	
Adjusted R^2 (full specification)	54.4%		55.4%		40.1%		17.6%	
Anderson instrument irrelevance test	reject		reject		reject		reject	
Stock and Yogo weak instruments test	reject		reject		reject		reject	
Hausman test for OLS unbiasedness	not reject		not reject		not reject		not reject	