What Can Market Microstructure Contribute to Explaining Executive Incentive Pay?: Liquidity and the Use of Stock-Based Compensation

Version June 17, 2002

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Abstract

Recent theoretical models derived from market microstructure have shown that liquid stock markets can improve the alignment of managers' and shareholders' interests, contrary to the traditional view of managers being monitored by a stable set of shareholders. Little evidence exists on the issue, because most of the key variables such as the precision of stock traders' information or their costs of influencing management are not observable. We show, however, that the model of Holmstrom and Tirole (1993) can yield the testable prediction that managers' compensation will be more closely tied to shareholder wealth when the firm's shares trade more actively. We test this and related propositions on a sample of over 45,000 executive years. In virtually all specifications, the effect of liquidity is at least as great as that of size, risk, industry, year, the existence of growth options, leverage, the existence of cash constraints, firm focus, or the presence of government regulation, existing option holdings and stock holdings. In fact, based on 900 simulations across different sample sizes, three liquidity variables account for between 67% and 79% of the explained variation with the remainder accounted for by 17 traditional variables. By contrast, accounting-based bonus incentives are employed by more illiquid firms. We conclude that boards delegate monitoring of executives to active market traders when the stock is liquid and undertake internal monitoring using bonus schemes when the stock is relatively illiquid.

Key words: Pay-performance sensitivity, Executive options; Incentives; Liquidity; Information content; Monitoring, Bonus schemes

*JEL classification***:** J33; G32

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I. Introduction

Few investments offer as much liquidity as publicly traded stock. Almost by definition, liquidity requires that a firm's shares be held by a large number of owners, many of whom are only temporary. It is often argued that managers will inevitably fail to serve the interests of such shareholders; originally by Smith (1776) and Berle and Means (1932) and more recently in debates over the virtues of 'relationship investing' in countries such as Germany and Japan (Coffee, 1991; Roe, 1994; Bhide, 1993). Admati, Pfleiderer and Zechner (1994) show formally how liquid markets undermine governance by providing investors with the option of easy exit.

Other theoretical models, however, come to the opposite conclusion; liquidity can explain why executives' pay is tied to stock market performance and thus *reduce* agency problems. Building on Hayek's (1945) insight that market prices provide information as well as terms of trade[1] and the Kyle (1985) market microstructure model of 'informed' trading, Holmstrom and Tirole (1993), hereafter, H-T, show how liquidity can improve incentive contracts by increasing the information content of stock prices.[2] With stock prices of liquid stocks more reflective of the actions of executives and closer to fundamentals, boards are able to delegate more of the monitoring of the executives' performance to the market by providing a higher proportion of pay as stock-based incentives.

Empirical research has not kept pace with the theory. Consistent with the view that large shareholders have an incentive to monitor managers (see Demsetz and Lehn, 1985), Hartzell and Starks (2000) finds a positive association between CEO incentive pay and institutional holdings. This suggests that institutional investors provide a monitoring role in the form of demanding more stock-based pay, but does not indicate whether market liquidity supports or undermines such monitoring. The purpose of this paper is to derive and test the key empirical implications of H-T. H-T show that stock prices are more valuable for incentive contracting when there are more uninformed (liquidity or 'noise') traders, because informed traders then have a greater incentive both to gather information and to trade aggressively so their information is impounded into prices. While it is possible to empirically capture the importance of stock prices in incentive contracting (e.g., Jensen and Murphy, 1990; Aggarwal and Samwick, 1999) neither the presence of uninformed traders nor the precision of informed traders' knowledge are directly observable. We show,

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[1] Hayek (1945, p. 521) recognized that individuals possess only incomplete knowledge that is both dispersed and confined to "particular circumstances of time and place".

[2] A complementary argument appears in Kyle and Vila (1994), Kahn and Winton (1998) and Maug (1998) who demonstrate that liquidity can reduce the costs that an investor bears in taking a large position in order to influence or replace managers, as originally suggested by Manne (1965).

however, that average trade volume is directly related to the underlying importance of uninformed traders in the H-T model. We also show that after controlling for trade volume, the responsiveness of price to order flow is directly related to the precision of the informed traders' knowledge in the H-T model.

Our analysis of the H-T model shows that relatively straightforward and intuitive measures of the stock trading process should be linked to compensation. There remains the challenge of measuring the importance of stock prices in executive pay. To abstract from issues of total remuneration we first scale stock-sensitive pay made up of the value of option grants and restricted stock by the level of overall compensation, which includes the value of option and restricted stock grants as well as all forms of cash pay such as salary and bonuses. Total remuneration could reflect a host of factors including size, compensating differentials, managerial ability, or simply overcompensation. To focus on remuneration as determined by the firm's board, we exclude the return on company shares held privately by the executive. This scaled measure of the proportion of stock-based pay we term the Market Delegation Ratio (MDR) since it reflects the extent to which the board effectively delegates monitoring and the problem of aligning incentives to the stock market. In addition, we analyze the dollar sensitivity of pay to stock price performance, first by following the approach of Aggarwal and Samwick (1999) and second, by directly computing the pay-performance sensitivity of stock holdings and stock options.

We test our predictions on a sample of over 1,500 publicly traded US corporations and 45,000 executive years covering the period 1992-1999 using stock turnover as our major measure of liquidity.[3] The shares of these firms are quite liquid overall in that the average annual volume of trade exceeds the firm's market capitalization. More importantly for our purposes, the annual turnover rate ranges from just less than 3% to over 2700% of market capitalization and is largely unrelated to firm size. We find that this variation in liquidity is strongly associated with the use of stock-based pay, and obtain similar results for the responsiveness of prices to order flow. While the H-T model does not allow for any fixed costs of trading, we use the bid-ask spread as an additional proxy for lack of liquidity and find, consistent with their overall argument, that wider spreads are negatively associated with the use of stock prices in executive compensation. These results hold using conventional panel data methods and with Tobit, and in most cases even when we control for firm fixed effects. Moreover, the effect of liquidity is larger than that any of the conventional explanations for the use of stock-based incentives, including firm size, risk, growth opportunities or regulation. To illustrate, the model incorporating all eleven conventional explanations for the allocation of options including size (multiple measures), risk, industry, year, the existence of growth options, leverage, the existence of cash constraints, firm focus, the presence of government regulation of the industry, and the existing stock of options and share holdings of the executive plus five executive title dummies and a gender dummy, together with the full set of industry and year

[3] For a theoretical model of asset prices and share trading based on stock turnover as the most appropriate liquidity measure see Swan (2002).

controls, explains 13.8% of the adjusted variation in the use of stock-based incentive pay. The three liquidity proxies on their own explain 16.6% of the adjusted variation (after controlling for industry and year) and incorporating all variables raises the explanatory power to 19.7%.

These results give empirical content to Hayek's (1945) insight that prices convey information since they demonstrate that 'better' prices are systematically used more in incentive contracts. By 'better' prices we mean stock prices that reflect a large trade volume or turnover, a low bid-ask spread, and where order flow is on average highly informative. The only exception is that turnover either becomes insignificant or the sign is reversed using fixed effects in the option grant and option holding regressions and the sign of the bid-ask spread is consistently of the predicted negative in the MDR regressions but positive in the incentive intensity regressions. The empirical problem with the bid-ask spread is that it is highly negatively correlated with size and incentive intensity tends to fall with size.

Our evidence pertains to both the mix of incentives and the absolute level of pay-performance sensitivity. Thus while Core and Guay (1999) introduce total option incentives for the CEO, we extend this approach to the top five executives. We then extend it again to stock grants to all staff and executives in addition to the top five most highly paid executives.[4] Moreover, when the market for the firm's stock is less liquid, we find more intensive use of bonus schemes that are not based on stock price. Presumably this reflects boards replacing stock market monitoring with alternative measures such as those based on accounting information. Hence, the mix of stock price versus accounting-based incentives seems to depend strongly on the liquidity of the market in which the company's stock is traded.

Similar to Yermack's (1995) study and more recent work by Bryan *et al* (2000) we find that highly regulated industries (see Joskow, Rose and Wolfram, 1996), and firms with ample internal cash rely less on stock-based pay. Consistent with Bryan et al (2000) and in contrast to Yermack (1995), we find that stock-based incentives are weaker for executives that privately own a significant proportion of the equity in the firm, stronger in firms with valuable growth opportunities and greater reliance on intangible assets, and weaker for more levered firms (see also Garvey and Swan, 1992a, b). As in Core and Guay (1999), we find significantly less reliance on options and market-based incentives for executives with high pay-performance sensitivity due to existing stock holdings in the company for which they work. We find that more focused firms appear to use more stock-based incentives but once liquidity is controlled for this effect disappears.

Pay performance sensitivity and volatility of returns could be positively related due to the relationship between risk and the importance of CEO effort (Prendergast, 2000) or a negative relationship could hold due to risk aversion on the part of executives (Aggarwal and Samwick,

[4] The only other reasonably large sample size treatment is Core and Guay (2001) who use a sample size of 1,694 firm-year observations from 1994-1996 whereas our sample size is 7,167 firm-years over the period 1992-1999. We also test a much larger range of explanations including the use of our three proxies for liquidity.

1999). Previous studies of ownership concentration (Demsetz and Lehn, 1985) and executive pay-performance sensitivity (Core and Guay, 2002) find a positive relationship whereas our results are mixed.[5] Our interpretation is that the debate on the effect of risk has overlooked other, potentially more important, aspects of firms' stock prices.

The next section reformulates H-T as a set of testable propositions and provides theoretical justification for the measures we use. Section III describes the data and its sources, section IV presents empirical results on incentive mix while V is devoted to incentive intensity and VI concludes.

II. Deriving testable propositions from the model of Holmstrom and Tirole (1993)

We follow H-T's notation except that we suppress their time subscripts 1 and 2. These relate to short- versus long-term effort and value and are not critical to the testable propositions of the model. Stock prices in H-T are formed in expectation of a liquidating payout,

$$\Pi = e + \theta + \varepsilon, \tag{1}$$

where e is the manager's effort and θ and ε are normally distributed mean-zero noise terms with volatilities σ_θ and σ_ε, respectively . The informed trader observes a signal of terminal value equal to $e+\theta+\eta$, where η is a mean-zero normally distributed error term with volatility σ_η. Thus the informed trader has no information about ε and a noisy signal of θ. Unlike the original Kyle (1985) model on which the analysis is based, H-T allow the informed trader to expend resources to reduce the noise in her signal. She does so to the extent that she can hide her information behind exogenous liquidity order flow which equals the mean-zero normally distributed variable y.

H-T's Proposition 1 characterizes the stock price equilibrium in their model. The key results for our purposes are as follows:

1. The informed trader's optimal order to the market, x, is jointly determined by her information and by market parameters. We can combine H-T's equations (8), (9), and (13) to express her order as:

$$x = (\theta + \eta)\frac{\sigma_y}{\left(\sigma_\theta^2 + \sigma_\eta^2\right)^{1/2}}. \tag{2}$$

2. We can combine their equations (11) and (13) to express the equilibrium price, p, as a function of total order flow $z = x + y$ as:

$$(1 + A)p = \bar{e} + z\frac{\sigma_\theta^2}{2\sigma_y\left(\sigma_\theta^2 + \sigma_\eta^2\right)^{1/2}}, \tag{3}$$

[5] In the more recent study by Demsetz and Villalonga (2001) managerial shareholdings are not significantly related to the proxy for firm specific risk.

where A reflects the stock appreciation rights or options awarded to the manager and $\bar{e}$ is the manager's expected effort choice.

3. The informed trader invests more in information collection, thereby reducing σ_η, as liquidity trade increases, meaning that σ_y increases. The reason that an increase in the variability of liquidity trade means an increase in total trade is that the absolute volume of liquidity trade increases; y is normally distributed with mean zero so a large negative y is a large liquidity sell order and a large positive y is a large liquidity buy.

H-T's Proposition 3 summarizes the key comparative static results on the use of stock-based incentives. They show that pay-performance is stronger when σ_ε is lower, and when σ_η is lower for exogenous reasons. However, recall also that σ_η falls in the importance of liquidity trade σ_y. For this reason, H-T can show that optimal pay-performance sensitivity becomes stronger as σ_y increases.

It is perhaps now clear why there has been no direct empirical test of the model, at least up until now. None of the key variables above are directly observable. H-T argue that ownership concentration affects the importance of liquidity trade but also note that this variable could exert its own independent effect on pay-performance through corporate governance channels (see also Hartzell and Starks, 2000). H-T note that in their model, price volatility helps convey the precision of the informed trader's information but this aspect has already been treated extensively in previous empirical research on executive compensation (Garen, 1994, Aggarwal and Samwick, 1999, and Core and Guay, 2002).

Our approach is to shift attention from price volatility to other less appreciated aspects of stock market trading. First and most importantly, the volume of trade is a direct measure of the key unobserved variable σ_y. This is important and non-obvious because we cannot directly observe liquidity trade. We can, however, observe the total amount of trade which in the H-T model is equal to the absolute value of total order flow from both liquidity and informed traders, z. Using our equation (2), we can write:

$$z = x + y = y + (\theta + \eta)\frac{\sigma_y}{\left(\sigma_\theta^2 + \sigma_\eta^2\right)^{1/2}}. \qquad (4)$$

Not surprisingly z has a mean of zero since both y and the informed trader's signal have means of zero and they are uncorrelated. If we observe many rounds of trading, the average amount of volume will reflect the volatility of total order volume since large negative and positive z's both contribute the same amount to volume.[6] Most importantly, we can express the variance of order flow as:

[6] Roughly speaking, average volume should equal the value of a put plus a call option both written at the money with both the risk-free rate and dividend yield equal to zero with unit time to maturity on an asset with volatility σ_z.

$$\sigma_z^2 = \sigma_y^2 + \left(\sigma_\theta^2 + \sigma_\eta^2\right)\left[\frac{\sigma_y}{\left(\sigma_\theta^2 + \sigma_\eta^2\right)^{1/2}}\right]^2 = 2\sigma_y^2 . \quad (5)$$

Thus, the volatility of order flow and hence average volume are direct measures of the key unobservable, the importance of liquidity trade. The H-T model predicts stronger use of stock-price based incentives when the stock trades more thickly because the speculator spend more resources becoming informed and also trades more aggressively on her information. For these reasons the stock price is more informative.

The intuition behind this result is far more general than the specific model used by H-T. Volume will always reflect the demand of those who have relatively strong reasons to trade and to trade in a timely fashion. If such traders are scarce, then those who have more discretion about the timing of their trades will also hold back. If traders with a high demand for timely execution (nondiscretionary traders in the terminology of Admati and Pfleiderer, 1989) are prevalent, then informed traders would also enter more aggressively. In the Kyle model, this tendency of informed traders to reinforce the volume effects of uninformed traders is reflected in (5) where the variance of order flow is *double* the variance of uninformed order flow. Even when informed traders have the greater demand for immediacy prices continue to be more informative when there is more volume. A one-time 'burst' of volume surrounding events such as earnings or merger announcements does not necessarily imply prices that are more informative of executives' contributions. By contrast, if volume is high on average over an entire year then it is indeed credible that price is more informative.

A common measure used in the market microstructure literature to capture the importance of informed trade is the responsiveness of prices to order flow; depending on the application this is called the Kyle 'lambda' or the 'adverse selection component of the bid-ask spread'. In the H-T model, the sensitivity of price to order flow is the term multiplying z in our equation (3), $\frac{\sigma_\theta^2}{2\sigma_y\left(\sigma_\theta^2 + \sigma_\eta^2\right)^{1/2}}$. However, this term has an ambiguous *a priori* relationship to the use of stock-based incentives as it contains three parameters with distinct and opposing effects. First and most obviously, it could be driven by the fundamental volatility term σ_θ. Even after controlling for volatility, there remains the problem that price could be highly responsive to order flow because (i) there is very little liquidity trade (σ_y is low) in which case optimal pay would be only weakly linked to the stock price, or (ii) because informed traders have precise information for reasons unrelated to the amount of liquidity trade (σ_η is low for what H-T call "exogenous reasons") in which case optimal compensation would be closely linked to the stock price. This ambiguity is more general than the H-T model. Prices could be very responsive to orders either because of thin trading (low

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"Roughly speaking" because asset value is lognormally distributed in Black-Scholes-Merton while it is normally distributed here.

uninformed and hence also low informed order flow) or because informed traders have precise information. However, our original insight that observed trade volume captures liquidity trade σ_y allows us to sidestep these problems. Holding constant volatility and volume, variation in the responsiveness of prices to order flow captures the accuracy of the informed trader's information (σ_η). H-T's model predicts that compensation will be more closely linked to the stock price because, after controlling for volume and volatility, the price is more responsive to order flow when σ_η is lower. With stock price more responsive to order flow containing greater information concerning firm performance and executive actions, the board is effectively able to enlist the aid of the stock market to monitor managers with, correspondingly, less need for accounting-based internal bonus schemes.

We include one additional stock market variable that is not considered in the H-T model. The Kyle model on which H-T is based assumes that the only cost of market-making is adverse selection, and this has no fixed component. However, actual stock markets inevitably have a positive bid-ask spread even for the smallest trades. A wider spread implies lower liquidity and thus a less informative stock price and weaker optimal stock-based incentives.[7]

The purpose of this paper is to link the above measures of market liquidity to the strength of managers' stock-based incentives. Compensation research starting with Jensen and Murphy (1990) has explicitly estimated such incentives as the dollar change in CEO wealth for a given dollar change in shareholder wealth. However, these estimates of the sensitivity of CEO wealth are dominated by privately held stockholdings such as those of Bill Gates and do not form part of company board determined remuneration.[8] We separately examine the different sources of incentives in our empirical tests. We examine separately the pay-performance sensitivity of option grants, option holdings and total sensitivity including privately held shares for the five highest paid firm executives. In addition, we examine the total pay-performance sensitivities of all employees other than the top five executives and their pay-performance sensitivity per employee. This is the

[7] To be sure, a wide spread could also reflect a high "adverse selection component" due to informed trade but we have already controlled for this aspect with our measure of the responsiveness of prices to order flow.

[8] If managerial stock ownership can be treated as exogenous then cross-sectionally firms with higher managerial share ownership should perform better. However, neither Demsetz and Lehn (1985), or Himmelberg, Hubbard and Palia (1999) who extend the Demsetz and Lehn methodology, nor the more recent Demsetz and Villalonga (2001) find evidence of this. Instead they propose that managerial share ownership is endogenous. Demsetz and Lehn find that the ownership level tends to be higher in riskier firms with more volatile stock prices while Himmelberg, Hubbard and Palia attribute ownership variations to unobservable firm heterogeneity that creates spurious correlation between ownership and performance. For a review of this literature see Short (1994) and Demsetz and Villalonga (2001). The upshot is that there appears to be no robust evidence that managerial stock ownership mitigates agency problems. In this study we investigate the determinants of this intrafirm heterogeneity using both OLS and fixed effects methodologies.

first attempt to explain the sensitivities of employees other than the top five executives incorporating a full range of explanatory variables including liquidity variables.

III Data Sources and Descriptive Statistics

Our data come from a number of sources. Accounting values and annual stock returns at the firm level come from Standard and Poor's (S&P) *COMPUSTAT Research Insights (RI) North American* data ending in the December quarter 2000, and annual compensation variables are obtained from S&P's *ExecuComp* database, 1992-1999. Coverage is based on the five highest-paid executives for the top 1,500 US stocks based on inclusion in the S&P 500, S&P Midcap 400 and S&P SmallCap 600 indices. Firm level data is also provided on option grants to employees other than the top highest paid executives. Because firms both enter and leave the top 1,500 ranking a maximum of 1,890 stocks are included in total with over 82,000 executive years. Where we have a complete data set including all our liquidity proxies it is reduced to 45,658 executive years. However, even where we have complete data, in the interests of nesting our hypotheses and testing all competing explanations utilizing the same dataset, we use the same complete dataset in all our regressions even though we could utilize nearly all 82,000 observations with a reduced set of explanatory variables. The value of options awarded and the number and value of option holdings are calculated based on data provided by *ExecuComp* and from the New York Stock Exchange (NYSE) *Trades and Quotes* (*TAQ*) intraday database, 1993-1998, from which additional share price volatility data was calculated.

A. Compensation data and derived measures

We value salary, bonuses and stockholdings as reported in *ExecuComp* except that we adjust all financial data and returns using the CPI Index to constant June 30, 2000 prices. The value of stock options must be estimated and we follow the standard practice of using the Black and Scholes (1973) formula for European call options, as modified by Merton (1973) to account for dividend payments. It can be written as:

$$\text{Option Value} = N\left[Pe^{-dt}\phi(Z) - Ee^{-rT}\phi\left(Z-\sigma\sqrt{T}\right)\right],$$

where:

$Z = \left[\ell n(P/E) + T\left(r - d + \sigma^2/2\right)\right] \Big/ \sigma\sqrt{T}$,

ϕ = cumulative probability function for normal distribution,

N = number of shares covered by award,

E = exercise price,

P = price of underlying stock,

T = time to expiration,

r = risk-free-interest rate,

d = expected dividend rate over life of option, and

σ = expected standard deviation of stock return (volatility) over the life of option.

The Black-Scholes model has limitations for our purposes since executive stock options are inalienable until vested and executives cannot take short positions in their own firm's stock. However, it is much preferred over *ad hoc* alternatives, which is reflected in its endorsement by the SEC (1992) and FASB (1993).[9] On the face of it, this valuation method, while reflective of its cost to shareholders in the company, might overstate its value to the executives receiving awards. The inability to trade and hedge options together with risk aversion could reduce their value in the hands of recipients. On the other hand, senior executives are the ultimate insiders and know how they will respond to the incentives provided.

Estimates of the inputs to the Black-Scholes-Merton formula are based on the following definitions and assumptions:

All annual, quarterly and monthly data extracted from *RI North American* and from the NYSE *TAQ* data are converted to the fiscal years of the firms, following the conventions of S&P. This is necessary to ensure exact matching with the *RI*, *TAQ* and *ExecuComp* data. All shares on issue, option and stock price information in both the *RI North American* data and *ExecuComp* are converted to year 2000 equivalents from the date of reporting so as to allow fully for stock splits. Splits within the fiscal year are incorporated in the reported option grant and pricing information reported to the SEC and included in *ExecuComp*;

P = price of the underlying stock at the time the option is valued, and E = the exercise price of the options, are from *ExecuComp*.

d = ℓn(1 + dividend rate), with dividend rate defined as the annual dividend per share by ex-date, for the fiscal year, divided by the fiscal year-end stock price;

r = ℓn(1 + interest rate), where interest rate is defined as the average of the daily yield on the three month Treasury bill rate during the last month of the firm's fiscal year, source, *RI*;

T = life of options (in years), set equal to the difference between expiry date and the financial year end for the year of the option grant rounded up to the nearest year. The data is from *ExecuComp.* If the maximum duration is not reported, the options' life is set equal to ten years, which is the duration for an overwhelming majority of awards and the limit imposed by the IRS for options to receive favorable tax treatment (see Matsunaga, 1995);

σ = annualized volatility, estimated as the square root of the sample variance of daily share returns (computed from *TAQ*) over a minimum of 60 days of daily data and then annualized, and where these could not be calculated, the square root of the sample variance of monthly stock returns

[9] See also Carpenter (1998) and Hall and Murphy (2001) for further insights and qualifications relating to the use of the Black-Scholes model in relation to executive compensation. In particular, executive stock options are non-tradable and are held by undiversified and presumably risk-averse executives.

during the last three years using *RI* data. Remaining observations were obtained from the standard deviation of returns reported by *ExecuComp.*

Applying the above formula to newly granted options is straightforward. We also identify the stock of unexercised options from previous years based on data for the number of options granted and exercised as well as option holdings and gains realized from exercising previously awarded options. We began with the first reported number of options held at the end of the fiscal year from *ExecuComp* for each executive. Adding options exercised during the year and subtracting new grants gave us initial option holdings. Many executives enter the database with large option holdings but, as noted by Aggarwal and Samwick (1999), these estimates represent only holdings of options 'in the money'. To estimate *total* option holdings we exploit the fact that end of year holdings must equal beginning of year holdings plus new option grants, less the number of options exercised. Option holdings were augmented wherever necessary to ensure that this identity is satisfied. We also required that only 25% of new option grants could be exercised in the first year, another 25% in the following and so on, until all could be exercised in year four. Meeting these fairly conventional vesting rules implied imputing some additional option holdings.

The portfolio of option holdings for each executive is then constructed with the following rules. First, any option grants recorded in *ExecuComp* with missing values were assigned an option life of ten years and an exercise price equal to the stock price at the time of issue. Second, all option holdings either taken from *ExecuComp* or imputed were assigned both an exercise price and an expiry date based on the stock price at the estimated time of the grant and the date of the grant itself. This data was, of course, available for holdings accumulated from grants reported in *ExecuComp.* Initial option holdings were assumed to be exercised first if they were in the money but all subsequent options exercises are based on the assumption that options most in the money are exercised first so long as they have been vested. This process was continued for each executive until all options that are reported exercised in *ExecuComp* have in fact been exercised in the modeling program. By construction the combination of option holdings and reported new grants is sufficient to meet these exercise requirements. Black-Scholes valuations were then computed for all option holdings and option grants. The resulting option holding numbers and values were then compared with the corresponding figures from *ExecuComp*. Despite the fact that *ExecuComp* only reports and values in the money options the correspondence was reasonable. However, unlike the numbers shown in *ExecuComp* our imputed holdings all satisfy the "adding up" principle.

For every option granted to a top five executive *ExecuComp* also reports the number of options granted as a proportion of all options granted in that fiscal year, including options granted to both top five and non-top-five executives. On averaging the rounding error we construct estimates of the total number of options granted to all employees including the top five. These are then valued on the assumption that they have the same exercise price, time to expiry and vesting requirements as the average for the top-five executives. We then accumulate all the option data for the top five executives to obtain firm-level estimates for the top five in aggregate. These values are then deducted from the overall firm-level estimates to obtain estimates for the value of options granted to

all non-top five executives. These non-top five employee options are incorporated in an aggregate firm level database as opposed to the executive level database for the top five executives.

The above procedure allows us to provide new evidence about the pay-performance sensitivity for both new option grants and option holdings for the top five most highly paid executives and the pay-performance sensitivity of option grants to non-top-five employees on both an absolute and per-employee basis. We calculate the sensitivity of options using the method described in Yermack (1995), namely the Black-Scholes-Merton formula's partial derivative with respect to stock price (hedge ratio) multiplied by the fraction of equity represented by the option award. This provides an estimate of the change in the value of the executive's stock option award for every dollar change in the value of the firm's equity.[10] We also compute the pay-performance sensitivity of the executives' entire stock option portfolio. Specifically, the formula to calculate the pay-performance sensitivity can be written as:

$$Pay-Performance\ Sensitivity \approx \left[\sum\left(\Delta_{it}\xi_{it}\right)\Big/\sum\xi_{it}\right]$$
$$\times\left[shares\ represented\ by\ current\ year\ award\,/\,shares\ outstanding\ at\ beginning\ of\ the\ year\right]$$

where: $\Delta = \partial\ Black-Scholes\ \ value/\partial P\ = e^{-dt}\phi\left[\ell n\left(P/E\right)+T\left(r-d+\sigma^2/2\right)\right]\Big/\sigma\sqrt{T}$ and

ξ = the number of options in the grant. The formula estimates the change in value of the executive's stock option awards(s) for every dollar change in the value of the firm's common equity. The partial derivative, Δ, is the well known 'hedge ratio' used in Black-Scholes applications. The pay-performance sensitivity formula above is adjusted accordingly (*i.e.*, by using the weighted average hedge ratio as noted above) for calculating the pay-performance sensitivity for all option holdings. Since outstanding shares on issue typically do not reflect the potential diluting effect of options allocated to all employees including the top five, the computed hedge ratio times the number of options granted was added to the number of shares on issue in the denominator of the pay-performance sensitivity calculation. Consequently, the total pay-performance sensitivity of all employees collectively could not exceed 1.

Total board-determined remuneration or 'flow compensation' for each executive for each company fiscal year was computed as the sum of salary and other annual payments, bonus, and long-term incentive pay and market-based pay comprising the Black-Scholes value of current option grants plus the value of restricted stock grants. Option grants are valued at the date at which the grant is made rather than at the end of the firm's fiscal year so as to better reflect the intention of the firm's board. The value of stock privately owned by executives and the return on this stock does not form

[10] Studies prior to Yermack (1995) lacked an appropriate variable to measure the performance incentives of stock options. Eaton and Rosen (1983) and Lewellen *et al* (1987) value stock option awards with an *ex post* measure of the paper gains earned by executives. While Murphy (1985) and Mehran (1995) use the Black-Scholes model, they ignore the degree of sensitivity between changes in award values and changes in the value of each firm. Smith and Watts (1992) and Kole (1993) indicate whether firms adopted stock option plans, but do not take into account the frequency or size of awards under those plans.

part of total remuneration because it is outside board control and the cost is not met by the firm itself.[11] *ExecuComp* reports the number of shares held privately by each executive at the end of the fiscal year so we are able to compute both the proportion of total common stock outstanding held by each executive and its dollar value at fiscal year end and opening.

Our formal pay-performance sensitivities computed using the Yermack method exclude sensitivity arising directly from Salary. Salary and other fixed components of executive remuneration typically have negligible pay-performance sensitivity of a few cents per $1,000 change in total share value). It is thus not market-based and is not designed to have any performance incentive effect other than as a cost associated with dismissal. Likewise the bonus component, which includes Long Term Incentive Pay (LTIP), is typically not related to share price movements although it may be indirectly so through its relationship to either accounting performance or by an accounting-related measure such as Economic Value Added. We capture any sensitivity of salary and bonus to the stock price by using the technique of Aggarwal and Samwick (1999).

MDR consists of the Black-Scholes value of option grants plus the value of restricted stock grants scaled by total compensation, where the latter is meant to proxy the opportunity cost of the executive's time. This in turn reflects his/her ability, educational attainment, seniority and other unobserved executive-specific attributes. Since, as has been well established in the literature, larger companies pay more, it also serves the purpose of ameliorating the impact of firm-size effects.

B. Stock trading and other explanatory variables

Daily stock trading data including opening and closing prices, the daily volume of shares traded, the number of shares outstanding, the standard deviation of daily closing prices and the time-weighted bid-ask spread are computed from the *TAQ* tick-by-tick database. This data is then summarized according to the fiscal year of each firm over the period 1992-1999.[12] While we have nearly all data for 1992 and 2000, our comprehensive data run from 1993-1999, with the starting date determined by the 1993 beginning of the *TAQ* database.

As discussed in the previous section, we use three alternative measures of market liquidity to examine its impact on agency issues. Our starting point is the dollar volume of trade in the company's stock. But even in our sample of the largest firms in the US, size measured as total assets varies from a minimum of about $5 million to almost $700 billion. Not surprisingly, the dollar volume of trade is larger for larger firms, and we wish to eliminate such scale effects which are not considered in the H-T model. The problem is that dollar-trading volume inevitably increases in firm size, and it is difficult to argue that such increases reflect just improved stock price

[11] There may be an exception to this. Some private executive shareholding is due to exercising previously awarded stock options so that ultimately the cost may have been borne by shareholders.

[12] While S&P ExecuComp and S&P *RI North American* data extends over the entire period, 1992 to 2000, certain key variables such as the time-weighted bid-ask spread sourced from the NYSE *TAQ* dataset are confined to the period, 1993-1998.

information. To follow the theory, we scale turnover by market capitalization and thus use the turnover of shares traded (common stock deflated by shares outstanding) as our primary measure of liquidity.

Our second measure is the responsiveness of prices to trade, which we term the 'informativeness' of order flow. We compute this as the coefficient from an OLS regression of the absolute value of the daily stock return from open to close as the dependent variable on the stock turnover for that day. We compute the coefficient for each year of company data in our sample. Turnover represents the number of shares traded on that day divided by the number of shares on issue on that day. The regression coefficient therefore represents the annualized sensitivity of returns to order-flow after normalizing for the size of the stock. Our third measure is the average annual percentage bid-ask spread weighted by the time the spread was prevailing on the market as in McInish and Wood (1992). The two-sided spread is expressed as a proportion of the midpoint and so represents the fraction of trade value that is absorbed by a round-trip trade.

C. Control Variables

In all regressions unless otherwise stated we control for the firm's membership in either Basic Materials, Consumer-Cyclical, Consumer-Non Cyclical, Energy excluding the regulated sector, SIC Code 4900-4999, Financial Services, Industrial, Other Services, Technology and Utilities with S&P's *Research Insights North American* data as the source of the SIC information. Regulated Energy Utilities (SIC 4900-4999) is the most regulated sector and is treated as a separate dummy variable representing regulation. We also utilize year dummies to pick up commonalities in pay across executives and firms that are driven by the state of the market or other economy-wide effects.

Yermack (1995) finds some evidence that firms with cash constraints tend to use option-based compensation. To control for this effect we use the accounting item, "Free cash flow", taken directly from *Research Insights*. It is made up of operating cash earnings prior to depreciation and amortization less cash dividends and capital expenditures. It is scaled by Total Assets to free it from purely scaled-based considerations. This captures the possibility that some firms use stock options as a primary form of compensation not so much for incentive reasons but because they have insufficient cash to hire and retain their executives. On this interpretation we would expect it to be negatively related to option allocations and positively linked to executive bonuses. It could also proxy weak governance systems due to 'excessive' free cash flow and poor investment opportunities along the lines of Jensen (1986). Such poorly managed companies might give away excessive options to executives.

Opening executive stock holdings are measured as the proportion of stock units held by the executive at the beginning of the fiscal year from *ExecuComp.* In deciding on MDR the board is expected to take account of existing executive pay performance sensitivity arising from stock ownership which is a substitute for new option grants. Hence MDR is anticipated to be negatively associated with the pay performance sensitivity of existing shares privately held. We would also

expect to obtain similar results for the dollar value of shares already owned by the executive but such a measure was discarded on the grounds that it would be biased towards higher capitalization stocks relative to the sensitivity measure. Similarly, the pay performance sensitivity of both option grants and holdings should be negatively associated with the proportion of the firm's common stock owned by the executive at fiscal year open. Both MDR and new option grant pay-performance sensitivity are expected to be negatively associated with the opening pay performance sensitivity of option holdings at the beginning of the firm's fiscal year. Thus the higher are existing incentives provided by options the less the requirement for new option grants since they should be substitutes.

We use the Market to Book Ratio for total assets, otherwise known as Tobin's *Q*, to proxy for growth opportunities and the significance of intangible assets. The numerator is the market value of equity plus the total value of debt and the denominator is total assets. Both are taken from *Research Insights*. This variable is expected to be positively associated with both MDR and option sensitivity since companies with growth opportunities and significant intangible assets are expected to face more agency problems and to require more market-based pay.

As expected given the research of Huang and Stoll (1996) on spreads and Atkins and Dyl (1996) on volume, both are substantially higher for firms listed on NASDAQ than on the NYSE. We include a dummy for NASDAQ firms that is taken from the NYSE's TAQ in our regression tests, which also supplements our industry and year dummies.

According to John and John (1993) there should be a negative relationship between leverage and executive market-based incentives due to agency conflicts between equity and debt for significantly leveraged firms. Garvey and Swan (1992a, b) also propose a model utilizing internal labor markets in which there is a conflict between debt based incentives and equity incentives. We measure leverage as the ratio of Total Long-Term Debt to the Total Market Value of All Assets which is the sum of the Market Value of Equity and the Total Value of Debt. Results are similar if we use book value of assets.

Finally, we measure corporate diversification as the distance-weighted Herfindahl Index (*HI*) of the company's focus, based on market segment sales share:

$$HI = \sum_{i=1}^{n} \left[\left(SIC\ Distance \right) \left(Sales_i / Total\ Sales \right) \right]^2 ,$$

where the *SIC Distance* is the absolute value of the difference between the *SIC* code for the market segment which is non-core and the largest market segment based on the share of total sales and there are *n* market segments with a maximum of ten. The segment data is from *Research Insights*. A diversified firm will have an index value that is less than 1 while a fully focused firm will have an index value of 1. The SIC distance weighting recognizes that more closely related market segment activities will have more similar SIC codes and conversely for less related activities. Rajan et al (2000) find that a measure of diversification similar to ours has important effects on investment, but its effect on pay-performance is *a priori* unclear. Internal monitoring is arguably more difficult in a diversified firm which might suggest a substitution into stock-based pay. But external informed traders in the securities market are going to find it even harder to monitor divisional managers and

may be unable to hide if order flow due to noise traders is low. We would therefore expect stock-related pay to be low for diversified firms and to rise when there is an equity carve-out, so long as external monitoring is relatively more costly for unfocussed firms.

D. Descriptive statistics

Panel A of Table 1 provides basic descriptive statistics on our variables of interest utilizing the data in the subset of executive-years for which we have complete data. The first 11 rows summarize our measures of compensation and pay-performance sensitivity. We use all the executives reported in the *ExecuComp* database over the fiscal years, 1992-1999, and where there is matching market return data including dividends from *Research Insights*, stock turnover from either *Research Insights* or *TAQ*, and bid-ask spread data available from *TAQ* as well as complete accounting and related control data from *Research Insights*. We include a dummy variable in our regression tests to control for any effects that are specific to the CEO. The average executive in our sample received approximately $1.624 million annually in the prices of June 30, 2000, taking into account salary and any other fixed payment, bonus, restricted stock grants, LTIP and the Black-Scholes value of options granted in that year measured at the end of the fiscal year. The average executive owns shares in his own company worth approximately $14.7 million, but this is highly right-skewed with the median share ownership worth zero (not reported). The mean pay-performance sensitivity of these shares held is 0.0082 or less than 1% of shares outstanding but this ratio is much higher for CEOs. The average executive receives options worth $739,197 but once again this is much higher for CEOs. Because stock price movements change both the value and the incentive effects of stock options, we could use values computed both at grant date and at the end of the relevant fiscal year. However, since we are concerned with what boards actually allocate to executives, we utilize only option values at grant date. As is well known, option grants to CEOs dominate their incentives, at least using Black-Scholes values (Hall and Liebman, 1998). Of this total board determined remuneration of about $1.624m the Black-Scholes value of options plus the value of restricted stock grants makes up about 32% (MDR = 0.322). Our interest here is not with the average degree of alignment between management and shareholders, but in explaining how this alignment varies across firms and executives. The Bonus Proportion of Remuneration (BPR) is 21.5% and the Total Incentive Proportion (TIP), 57.6%.

Place Table 1 about here

As is standard for a large and diverse sample of US firms, all size measures (sales, assets, and market capitalization) are highly variable and skewed to the right as is our dollar returns measure. Our measure of stock turnover, the annual turnover rate (number of shares traded deflated by the number of shares on issue), is taken from *Research Insights* and supplemented by the ratio computed from *TAQ* data where necessary. It is also right-skewed in that the average is almost 133% but the median is only 84%. We accordingly use natural logarithms in our regression tests. Our measure of 'free cash flow' taken from *Research Insights* is scaled by the value of total assets to minimize scale effects.

We follow Aggarwal and Samwick (1999) in using the standard deviation of dollar market capitalization (computed as the standard deviation of proportional annual market returns for each stock multiplied by the opening market capitalization at the start of the firm's fiscal year) rather than standard deviations of percentage stock returns in our regressions. Not surprisingly since we also include separate controls for size, our results on the effect of liquidity and informativeness are unchanged if we use percentage risk measures. Our actual measure is the standard deviation of market capitalization *in levels* as it should be a more appropriate measure of the risk borne by the executive with respect to incentive purposes. Moreover, by using standard deviation rather than variance it is straightforward to convert to percentages by dividing through by market capitalization. We do not distinguish between firm-specific and systematic risk because Aggarwal and Samwick (1999) find that actual incentive contracts expose managers to both kinds of risk.

Panel B of Table 1 summaries our full data by fiscal year.[13] The components of CEO and Non-CEO pay are shown in June 2000 prices for the entire *ExecuComp* database for each of the fiscal years, 1992-1999 so as to base it on the entire set of executives. Note that in real terms the fixed salary for CEOs has fallen considerably over the eight years from $766,300 to $618,120 but the value of the total package has risen enormously from $2.53 m to $5.63 m, reflecting the vastly increased role of incentive based pay.

Table 2 summarizes the simple correlations between our variables. Notice that the simple correlation between MDR and share turnover in log form at 33% is the highest of the correlations of MDR with non-pay variables. As is well known in the compensation literature (e.g., Murphy, 1995) compensation is highly correlated with size. Total compensation has a higher correlation with sales, assets, or market capitalization than do option or restricted stock grants, reflecting the fact that salary and bonuses are the most tightly linked to size. Note also the very high positive correlation of 0.65 between the log of turnover and share price volatility or idiosyncratic risk. Similarly, the informativeness of order flow variable is also related to share price volatility (0.51). Both these findings are supportive of the prediction made by H-T (p.690) that volatility increases with stock liquidity.

Place Table 2 about here

However, as mentioned in the introduction, our measure of share turnover has negligible correlation with either size or, fortunately, with volatility of market capitalization. The volatility of share price and volatility of market capitalization are quite distinct. While it would be an exaggeration to claim that variations in liquidity are truly exogenous, the low correlation with size and risk makes our inferences effectively insensitive to the inclusion or exclusion of such control variables. As expected, the bid ask spread is more highly correlated with size and risk and such controls will have

[13] It thus contains more executives than our *minimum minimorum* dataset used for regressions. Had we based the table on the regression dataset omitted observations might have distorted the trend shown at the beginning and end of the dataset.

a larger impact on its estimated effect on incentive pay. Table 2 omits one important determinant of both spreads and volume. As we would expect given the research of Huang and Stoll (1996) on spreads and Atkins and Dyl (1996) on volume, both are substantially higher for firms listed on NASDAQ than on the NYSE. The reason is that in a dealer market such as NASDAQ trades are often double-counted compared with the NYSE. For this reason we include a dummy for NASDAQ firms in our regression tests, which do not involve fixed effects. This variable is captured in the fixed effects model by the dummy variable for the company.

Finally, we find a strong positive correlation between stock turnover and the standard deviation of the firm's market return (volatility). This could potentially affect our estimates of the Black Scholes Merton value of option grants and the hedge ratio. It could thus affect our estimated relationships between option allocations and stock turnover given in Table 4 below. To overcome this potential problem the Black Scholes Merton values were re-estimated using the mean standard deviation of returns across the entire sample instead of the individual firm values and the model in Table 4 re-estimated. However, the results were not sensitive to the replacement of the individual volatilities by the mean.

IV. Empirical Tests of the Incentive Mix

A. Simple statistics

Table 3 indicates the power and robustness of our results on incentive mix in a univariate, nonparametric setting. The first three columns of Table 3 sort executives into deciles on the basis of the annual turnover of company shares. The means are then computed within each decile rank for the remaining variables shown in the table, MDR, Bonus Proportion and Incentive Proportion made up of both option and bonus incentives. The fraction of pay that is directly tied to shareholder wealth, MDR, and the Incentive Proportion increase *monotonically* as we move from the least to the most heavily traded deciles. If there was no association we would expect MDR, Bonus and Incentive Proportion to remain at approximately their overall means as turnover is varied, or at least to vary randomly. The fraction of total remuneration in the form of options or restricted stock is about two and one half times higher in the top decile as in the lowest decile of share turnover, and the Incentive Proportion also rises by about 42%. The bonus proportion is the mirror image of MDR and nearly halves. The remaining columns of Table 3 repeat the decile ranking analysis for our two remaining measures of liquidity; the annual average time-weighted bid-ask spread and the informativeness of order flow. Both MDR and Total Incentives both fall monotonically as the spread increases and increase as informativeness increases. While bonus proportion does not increase in the spread as predicted, it does fall in informativeness.

Place Table 3 about here

The means of MDR, calculated within each decile rank of Annual Share Turnover, Bonus Proportion and Total Incentive Proportion, appear in Figure 1. The very considerable rise in MDR with Turnover is shown clearly. MDR is an increasing function of increasing Turnover (One Way

ANOVA, F =607.143, DF = 45,695, alpha < 0.001). MDR is also a diminishing function of increases in transaction costs as specified by the Bid-Ask Spread (One Way ANOVA, F=137.893, DF=45,695, alpha < 0.001) and an increasing function of increasing Information Content in terms of the impact of intraday trading on the absolute value of the share price movement between the open and close (one Way ANOVA, F = 529.961, DF=45,695, alpha < 0.001). At the 5% level of significance the critical F value is approximately 1 given our sample size and hence the decile rankings are far from being random. We should stress that while this sort of elementary univariate analysis is rarely undertaken for studies of this sort, it is highly complementary to our regressions which include a large number of additional variables.

Place Figure 1 about here

B. Regression analysis of MDR

Panel A of Table 4 reports the determinants of our basic measure of incentive alignment, MDR, the fraction of total annual remuneration in the form of option grants or restricted shares using Black-Scholes to value new option grants at grant date. We are left with a panel data set of 45,658 observations once we account for all missing observations inclusive of our set of liquidity variables. While the potential number of observations increases considerably for our 'traditional' variable set, we confine it to the same set as our complete set in order to nest all our tests. The first three columns report standard OLS results for our cross section-time series database, first including the "traditional" explanatory variables only, then "all inclusive" variables including both liquidity and traditional variables and, finally, the "liquidity" variables only. All three sets of regressions include industry and year dummies but excluding the Regulated Energy Utility Sector for the "liquidity" regression, with the regulated energy utility dummy reported for the "traditional" and "all inclusive" explanations.

Place Table 4, Panels A, B, C and D about here

The final three columns utilizing OLS methodology after controlling for firm fixed effects for panel data repeat the same threesome approach and the t-statistics for all six OLS regressions are all corrected for heteroskedasticity using the White (1980) methodology. Zhou and Swan (2002) show that due to non-linear threshold effects the Tobit methodology should be superior. Hence in Panel B of Table 4 the "all inclusive" methodology is repeated for both "Standard Tobit" and "Tobit fixed effects" in columns 1 and 2 so as to allow for the left censoring of market based pay. Approximately 23% of executives in the sample receive no market-based pay at all so that MDR is zero. One consequence of recognizing this left-censorship is to overcome the downward bias in many of the OLS coefficients. For example, typically both the Standard Tobit and Tobit fixed effects regression coefficients for the liquidity variables are greater in magnitude compared with OLS. These robustness findings suggest that boards adopt a non-linear threshold incentive mechanism as predicted by Zhou and Swan (2002).

Our results consistently support the hypothesis that greater stock liquidity increases the alignment between managers and shareholders and thus confirm all the theoretical predictions of H-T set out in Section II above. Share turnover and stock price informativeness are positive and significant, and the bid-ask spread is negative and significant, in all specifications.[14] The effects are also large in magnitude; a one-standard deviation increase in share turnover would increase MDR from 32% to just under 40%. This is twice as large as the absolute effect of the bid-ask spread, which in turn has a larger effect than a similar change in size measured as sales or market capitalization, leverage, or market to book. A two-standard deviation change in share turnover has a larger effect than that of utility regulation. The informativeness measure has the smallest effect among our liquidity measures, but informativeness still has a larger effect than size or leverage. Our simulations in Table 4, Panel D, indicate that it is more significant than many of the traditional explanations. The dummy for stocks traded on NASDAQ is both negative and significant. This is to be expected since our turnover figures for such stocks overstate liquidity because of double counting of trades. Hence a correction is required. Finally, the explanatory power achieved by using our stock trading measures exceeds that of using the standard measures of size, risk, and industry many times over. Adding the three liquidity variables to the 17 traditional variables and the (unreported) industry and year dummies raises the R^2 0.138 to 0.197, an increase of 43%.

Like Bryan et al (2000) who examine the mix of option incentives, virtually all our MDR results are strongly supportive of existing hypotheses. Our test of investment opportunities using the market to book ratio (Tobin's Q) indicates a positive and significant effect for both OLS and fixed effects. The proportion of existing shares privately held by executives at fiscal year opening is both negative in all cases and highly statistically significant. Thus while boards cannot mandate that executives privately hold a significant proportion of the existing shares on issue and stock options tend to be cashed in rather than converted to shares and held, the issuance of new option grants is strongly negatively influenced by such holdings. Thus existing pay performance sensitivity due to share holdings acts as a substitute for means directly under board control to raise sensitivity to stock price. These findings support the proposition that stock options are issued in a manner consistent with shareholder interests.

None of the authors who investigate the impact of existing shares held by the executive examine the impact of the existing stock of options held by the executive on new option grants. Most likely, the reason has been the difficulty of obtaining meaningful estimates of the pay-performance sensitivity of existing option holdings. Our methodology described above allows us to accomplish this for the first time. As with the proportion of shares outstanding held by the executive, the expected sign for existing option holdings is negative if we suppose diminishing marginal expected incentive benefits from additional option grants. However, our results depend on whether standard OLS/Tobit or

[14] While we report regressions based on the log of the bid-ask spread to reduce the right-skewness due to impact of stocks with high bid-ask spreads we also reran all regressions utilizing simply the bid-ask spread. It made no significant difference to the results.

OLS/Tobit fixed effects is utilized. The OLS and Tobit methodology consistently yields positive and statistically significant signs while fixed effects yields negative and highly significant signs. The OLS/Tobit methodology emphasizes the cross-sectional effect while fixed effects allows for inter-firm heterogeneity and compares each firm with itself over time.

Similar to Bryan et al (2000), we find a negative effect of leverage on stock-based pay. This supports John and John's (1993) model of asset substitution as well as Garvey and Swan (1992a, b) who model managerial incentive systems based on leverage and the conflict with equity-based incentives. Our measure of cash availability, free cash flow deflated by total assets, has a consistently negative effect on stock-based compensation in all specifications. Our findings thus support those of Core and Guay (1999) who found cash constrains were a significant explanatory factor for option grants.

Our measure of company focus is both positive and statistically significant, utilizing only the traditional type of explanation for the allocation of options given in column 1. Thus it would appear that focused firms issue more market-based incentives to managers. This presumably reflects the difficulty of motivating divisional managers using a single share price for the company as a whole. However, once we introduce liquidity factors in column 2 the sign is reversed but is no longer statistically significant. This may be because more focused firms attract greater trading interest and hence are more liquid. This suggests that the well-known conglomerate discount may reflect lower liquidity and lack of trading interest.

The use of market-based incentive compensation tends to increase in firm size but at a decreasing rate. Two proxies, market capitalization and the dollar value of total sales, together with their squares, are utilized as size measures with both sets of proxies providing a consistent story both with respect to OLS and fixed effects. As H-T point out, scale or size is most likely also a proxy for greater liquidity and more active informed 'speculators'. Hence this strong size effect is not surprising. However, alternative interpretations are possible with the suggestion from Demsetz and Lehn (1985) and Core and Guay (1999; 2002) that monitoring difficulties are likely to increase in firm size.

In keeping with earlier findings, CEOs tend to receive a greater portion of their compensation in the form of shares and options than do other executives. In keeping with this analysis we find using "all inclusive" Tobit fixed effects that for CEO's the predicted MDR using the CEO dummy term is 6.6% higher than for non-CEOs. Undertaking the same analysis for Bonus Proportion (Column 3 of Table 5 below) shows that the premium for CEOs relative to non-CEOs is very small at 0.84%. Thus market-based incentives are much more heavily used for CEOs relative to non-CEOs consistent with the greater difficulty of internally monitoring CEOs relative to non-CEOs. Note also that dual CEO-Board Chairs have a significantly lower proportion of external monitoring via options and restricted stock. Table 8 below shows that this is more than offset by a much higher proportion of privately held shares of nearly 7% utilizing the Tobit fixed effects methodology.

Further robustness checks are reported in *Panel C* of Table 4. Our fixed effects regressions essentially convert the panel data to a form of time series analysis with each stock acting as its own control in *Panels A* and *B* while Tobit and Tobit fixed effects in *Panel B* corrects for threshold effects. In *Panel C* the panel data by executive is converted from a panel dataset into a purely cross-sectional executive database by averaging all the elements of each executive's remuneration together with the observations on the firm level variables over the number of years the executive appears in the database. The MDR regressions from *Panel A* of Table 4 are then repeated using OLS with the purely cross-sectional database to see if time series effects drive our earlier results. The three liquidity variables have the same effects as before. In the second column the analysis is repeated using firm fixed effects[15] and once again similar results are obtained. For both OLS and fixed effects the adjusted R^2 at 0.272 and 0.606 respectively are at even higher levels of explanation than in *Panels A* and *B*.

In order to subject our findings to a severe robustness test and to rank the effect of each of our 21 most significant explanatory variables, our Robustness Simulation *Panel D* of Table 4 constructs a total of 900 random samples from our complete dataset of 45,658 executive years. The first 100 random samples are taken with a sample size of 10% of the entire sample, the next 100 samples from 20% of the full data set, and so on up to 90% of the entire sample, making up the 900 samples in total. Unlike nearly all previous work which relies on a single dataset with the most observations, we recognize that there is nothing sacrosanct about this one sample which could by chance provide just the results which were expected. Findings are far more robust if they are not dependent on any one sample size or even any one sample. Hence our selection of 900 random samples and nine sample sizes. A forward selection regression procedure is then used to rank the number of times a variable is included in these 900 regressions, to compute the step mean with a low mean indicating greater explanatory power with the most significant variable included first and showing the order in which it is included, the incremental R-Squared of each variable as it is introduced, the mean value of each estimated coefficient and, finally, its average *t* value.

Two sets of results are reported: the first set taking up the first five columns excludes the industry and year dummy controls so as to give more weight to the explanatory variables. In a two-stage procedure it also removes the potentially distorting effect of outliers by first removing observations that have a statistically significant effect on the absolutes values of estimated coefficients (*t* values greater than 1.96).

In the first five columns the three liquidity or trading variables make up the top three most significant variables. Our main liquidity proxy, the log of the annual share turnover came in number one with 900 appearances, an average rank or step mean of 1.16, a partial R-Squared of 0.1461, a positive coefficient of 0.084 and an average *t* value of 29.2. The significance of all 21 variables is ranked by this method. This is followed by our second liquidity proxy, the log of the bid-ask spread,

[15] Fixed effects would not normally be possible in a cross-sectional database. However, in this case the cross-section is at the executive level, not firm level, and there are multiple executives in each firm.

which also appears in every simulation with a score of 2.24, a partial R-Squared of 0.0457, a negative sign of –0.0612 and a *t* value of 20.7. The significance of the liquidity variables is summarized in the third last row in which the sum of the incremental R-Squares for the liquidity variables is 0.2212 and for the liquidity explanation plus 17 non-liquidity or traditional explanations the overall explanation is 0.2793. This means that the three liquidity explanations based on H-T contribute 79% of the overall level of explanation leaving only a small residue for the remaining 17 explanations.

In the second set of five columns in Table 4, *Panel D* the dependent variable is not the raw or observed MDR but rather random samples from the set of 45,658 residuals from an OLS regression of all the industry and year control variables on MDR. We thus simulate the impact of the liquidity and traditional variables after taking account of the full set of controls. Moreover we don't remove influential observations as in the first five columns. This tends to favor the contribution of traditional rather than liquidity variables. Once again, the log of turnover as our most important liquidity proxy comes in first with 900 appearances, a step mean of 1.03 and a partial R Squared of 0.0698, an average *t* value of 27.54 and a coefficient mean of 0.0843 but now the second highest scoring variable is the initial pay-performance sensitivity of existing stock holdings by the executive with a step mean of 3.32, a partial R Squared of only 0.008 and an average coefficient of –0.7062 indicating substitutability with options allocation. Our second liquidity variable, log of the bid-ask spread, is the third variable with a step rank of 4.44 and the second highest partial R Squared of 0.0126, an average *t* value of 4.06 and an average coefficient of the expected negative sign, - 0.0113. Once again, in all, 21 variables are ranked in this way. Summing the partial R Squared's of the liquidity variables provides an incremental explanation level of 0.0866 for the liquidity variables and 0.1299 overall indicating a 66% contribution of the liquidity variables to the overall explanation. These simulation results demonstrate that our results for our liquidity variables are in no way dependent on sample size or technique and that turnover, the bid- ask spread and informativeness are always highly ranked.

C. Regression analysis of Bonus Proportion and Total Incentive Proportion of Remuneration

While stock-based pay has been the fastest-growing portion of executive compensation, it is not the only source of incentives under the control of the board. Bonuses and long-term incentive payments can be and are linked to performance, most often to accounting-based measures (Murphy, 1999). The difference is that bonus payments are at the discretion of the compensation committee of the board whereas, once the terms of options have been set, the payoff depends entirely on subsequent share price performance. This is why we refer to the latter as 'delegation of monitoring to the market' while the bonus proportion must be adjudicated by the board itself playing the monitoring role, *i.e.*, internal monitoring. While the H-T model has ambiguous predictions about the relationship between market liquidity and accounting-based compensation, it seems a worthwhile empirical issue to briefly investigate since accounting-based incentives are the only effective substitute for stock-based pay.

Table 5 regresses the fraction of total compensation in the form of bonus or long-term incentive payments on the same set of explanatory variables used for MDR in Table 4. The first three columns of results consistently support the hypothesis that firms with less liquid stocks depend more heavily on bonus incentives and are less willing to delegate monitoring of executives to the stock market.

Place Table 5 about here

The final three columns of results recognize that MDR and the proportion of compensation paid as a bonus could tend to be negatively correlated by construction if the fixed salary component has certain properties. Specifically, MDR and the bonus fraction plus the fraction of fixed pay in the form of salary and other annual compensation must sum to one. If the salary component of pay is constant across firms, MDR and the bonus fraction will be perfectly negatively correlated and total incentives (bonus plus stock-based compensation) as a fraction of total compensation will be the same for all firms. In fact, the correlation between MDR and the bonus fraction is only –43% and MDR is strongly positively related to total incentives. Moreover, as Table 5 shows, the total fraction of pay "at risk" due to incentives is strongly related to market liquidity.

Our analyses to this point do not directly estimate the linkage of stock-based executive compensation relative to shares on issue. This has been the more traditional approach based on incentive intensity and alignment which we now address.

V. Empirical Tests of Incentive Intensity

A. The sensitivity of total compensation to shareholder wealth

The fraction of total compensation in the form of stock or options, or alternatively in the form of bonuses, are intuitive and robust measures of the alignment of managers and shareholders' incentives. Modern compensation research starting from Jensen and Murphy (1990), however, has favored the more direct approach of computing incentive intensities which is the change in total compensation for a given change in shareholder wealth. Aggarwal and Samwick (1999) argue convincingly that that appropriate way to estimate this relationship is in a regression of *total* compensation on various controls along with changes in market value, with hypothesized determinants of incentive pay specified as interaction terms with the increase in shareholder value. The main advantage being that the pattern of responses to risk aversion on the part of executives is estimated simultaneously together with the pay performance sensitivities. A downside is that the introduction of interaction terms can introduce multi-colinearity and potential coefficient instability.

Table 6 reports our estimates based on this approach. The coefficients on our market trading proxies indicate the change in total compensation for a change in a specified proxy for liquidity. These variables along with the Aggarwal and Samwick measure of risk, which is the company variance rank, are included as controls. The coefficients of interest are the interaction terms between our liquidity measures and dollar returns, which test whether compensation is more sensitive to shareholder returns for more liquid stocks.

Place Table 6 about here

The first two columns of results based on our panel data use respectively OLS and fixed effects. They leave out our liquidity measures but include other controls. In both specifications, we replicate Aggarwal and Samwick's (1999) result that riskier firms tend to use less incentive pay, and our coefficients are of comparable magnitude. The next two columns add our three liquidity terms together with their corresponding interaction terms with the dollar value of returns. The next two column pairs exclude the bid-ask spread interaction and the final pair of columns excludes the informativeness interaction. All three sets of OLS specification regressions incorporating share turnover show that executives of more liquid companies are paid more. This reflects the strong association between stock turnover and the allocation of executive options. Moreover, executives of companies with low bid-ask spreads are consistently paid more, most likely for the same reason. The evidence from informativeness is more mixed.

The coefficient on the interaction between dollar return and share turnover in all three column pairs shows that total compensation is more sensitive to stock performance when the stock is more liquid. This is true regardless of whether OLS or fixed effects are utilized. Thus our earlier results for incentive mix and MDR are confirmed for incentive intensity. Across both pairs of columns incorporating the bid-ask spread, the next result is less consistent with our theory; there is a tendency for firms with wider spreads to use stock prices more in determining compensation, although the effect is insignificant after controlling for executive fixed effects. The informativeness interaction term provides more support for our theory. Firms with more informative stock prices according to our measure use the stock price more intensively in compensating their executives. This is insignificant using OLS but the effect is greatly strengthened after controlling for executive fixed effects.

The turnover measure clearly dominates the others in economic significance. With all variables at their mean values, an executive would gain approximately $24 for each $1000 increase in his/her employer's market value. If turnover increases by one standard deviation, from 133% to approximately 280%, the sensitivity of CEO wealth to stock price increases to $29 per $1000, an increase of 20%. A one standard deviation increase in the spread or informativeness increases pay-performance sensitivity by less than 5%. To compare our results to those of Aggarwal-Samwick (1999), a one standard deviation increase in dollar risk reduces pay sensitivity by approximately 30%. Thus, the effect of turnover is of the same order of importance as the effect of risk, and the two effects seem to be independent.

Some new findings based on dummy variable controls for executive title and gender are also potentially of interest. Of the top five most highly paid executives board membership results in a sizeable total remuneration premium ranging between $978,000 to $1,042,000. Of the board members the dual CEO-Chairman receives the highest premium followed by the CEO. Both the Chief Financial Officer (CFO) and females are slightly penalized relative to the top five in general, although for females it is not generally statistically significant.

B. Direct estimates of the incentive intensity effects of option and stockholdings

The Garen (1994) and Aggarwal and Samwick (1999) methodologies utilizing interaction terms are effective in terms of incorporating both incentive intensity effects and risk borne by executives simultaneously, together with liquidity explanations, but not for examining a very large range of other explanatory variables because multicollinarity effects tend to become overwhelming. In Table 7 we now examine the determinants of the full range of executive pay-performance sensitivity variables for the top five most highly paid executives; executive option grants, executive option holdings and total executive pay-performance sensitivity incorporating privately held shares, constructed using Yermack's (1995) methodology described above. The total pay-performance sensitivity is the sum of the sensitivity due to option holdings and restricted stock plus sensitivity due to shares held, all measured at the end of the firm's fiscal year. We report OLS and OLS fixed effect results in Panel A using White corrected *t*-statistics. Since Tobit methodology, both standard and fixed effects, copes better with threshold effects we report these in Panel B.

Place Table 7 about here

Our findings with respect to the incentive strength of option grants measured as of the date of the grant and shown in the first two columns of *Panel A* and *B* are quite similar to that of our incentive mix variable, MDR. With respect to our main liquidity proxy, stock turnover, our findings are not quite as overwhelmingly significant since they are fully upheld using OLS and standard Tobit but lack significance when fixed effects is used. It must be recognized that fixed effects is a very hard taskmaster when there may be very little variation in stock turnover over time for a given stock. A sign reversal occurs with the use of the log of the bid-ask spread, as it did using the Aggarwal-Samwick (1999) methodology. All econometric methodologies show a very strong positive rather than negative relationship between the sensitivity and the bid-ask spread. By contrast the relationship with MDR was consistently positive. This reversal could be because one aspect of liquidity has an entirely different impact on sensitivity or, more likely, because the bid-ask spread incorporates scale effects (the simple correlation coefficient with market capitalization is –0.4) and the sensitivity measures do not correct for scale factors and executive quality unlike the MDR measure. The informativeness measure is positive and significant and is thus similar to its use with MDR.

Pay-performance sensitivity of option grants rises at a diminishing rate with respect to market capitalization using OLS and Tobit, falls with risk, the debt ratio, scaled free cash flow and opening executive shareholding sensitivity. However, it is consistently positively related to opening pay-performance sensitivity of option holdings. Surprisingly, initial option allocations are rewarded by even higher allocations. To him that hath shall be given more. This could represent CEO entrenchment or board capture or simply the nature of many stock option plans which once in place provide for ongoing increments. It also draws attention to the weaknesses of the sensitivity measure relative to MDR. The latter is less affected by size considerations and makes allowances for the quality of management as reflected in overall compensation. Moreover, sensitivity is unaffected by growth options as proxied by Tobin's *Q*.

Option holdings pay-performance sensitivity behaves in a similar way to new option grants with respect to the three liquidity variables. However, it does not show the same responses with respect to scale variables and is positively related to growth options. In other respects it is similar to option grants. The total executive pay performance sensitivity including privately held shares behaves quite differently from one of its major components, option holdings, because of the dominating influence of shares held. For example, both standard OLS and Tobit results indicate a negative relationship to stock turnover. Informativeness of order flow, however, continues to have a positive sign.

The pay-performance sensitivity of shares held individually by members of the group of the top five most highly paid executives is explained in Table 8 by the same liquidity and control variables which have been used in all tables up until now. In many ways the sensitivity of share holdings is the exact opposite of the allocation of option grants and MDR. It is strongly negatively related to stock turnover but positively related to the bid-ask spread. Consequently, inside ownership by managers is associated with illiquidity, both in terms of turnover and transaction costs. This could be because inside ownership automatically discourages liquidity trading by taking some shares out of the reach of liquidity traders as in H-T. It could also be because the inside owners of firms with low intrinsic liquidity see less benefit from selling down their stake or that insiders see more benefit from allocating stock to managers when liquidity is low to facilitate incentive alignment and at the same time discourage the allocation of options. These are difficult issues to address.

Despite these difficulties, our previous finding in Tables 4 and 7 that option grants and existing executive share holdings are very close substitutes has an important bearing on the issue. Stock illiquidity results in both high managerial ownership and limited use of stock options as an incentive device. Thus, as is predicted by H-T, inside ownership by executives promoting incentive alignment and external monitoring by informed traders tend to be substitutes. Given the very different characteristics and motivations for stock ownership and executive option allocations the usual practice of lumping together both types of incentives into a single incentive intensity measure may be misguided.

Turning now to our informativeness measure utilizing both standard OLS and Tobit, we find that it is the only liquidity variable to explain executive shareholdings in the same direction as MDR. This remains something of a puzzle. These three powerful liquidity effects persist even after allowing for fixed effects. It is diminishing at a reducing rate in our scale measures using both standard OLS and Tobit. This is also the opposite of both MDR and the pay-performance sensitivity of option grants. This may be because high sensitivity is concentrated in the smaller stocks, perhaps due to executive wealth constraints or because smaller stocks are less liquid. It seems unlikely that agency problems are more severe in smaller stocks. The association with scale is very much weaker using fixed effects. These findings are consistent with our earlier findings with respect to the allocation of option grants, both as measured by MDR and the sensitivity of option grants, in that they complement existing executive shareholdings. Also there is evidence of lower executive

shareholding sensitivity for the regulated energy sector. This is consistent with Demsetz and Lehn (1985).

Place Table 8 about here

Except for the standard Tobit coefficient for which there is a complementary arrangement, share sensitivity is unrelated to initial option holdings sensitivity. It is also unrelated to company focus. In view of the sizeable earlier literature it is surprisingly largely unrelated to the volatility risk associated with market capitalization, except for the standard OLS results which are supportive of earlier results. Demsetz and Lehn (1985) expect to find a positive relationship between idiosyncratic risk and executive shareholdings because risk is seen as a proxy for noise in the contracting environment, which can be overcome by greater incentive alignment. Thus our results do not fully confirm Demsetz and Lehn (1995) in this respect. The most probable reason for this is that the present study includes both firm risk and liquidity variables whereas Demsetz and Lehn (1985) include only proxies for firm risk. There is a strong correlation between stock turnover and share price volatility (0.65 from Table 2 above) and also between the bid-ask spread and the standard deviation of market capitalization (-0.42 also from Table 2 above). We do not necessarily expect to find an unambiguous positive relationship between the sensitivity of stock holdings and risks borne by executives because any benefits from overcoming a noisier environment can be offset by the personal risks taken on by managers that may not be fully diversifiable. With respect to the pay performance sensitivity of option grants and holdings shown in Table 7 above, we found a strong negative association with risk using both OLS and fixed effects which is consistent with risk aversion rather than noise in the contracting relationship.

The standard OLS and Tobit results indicate that shareholder sensitivity is related positively to Tobin's *Q* and thus to growth options and negatively related to the debt ratio. Share holdings have these features in common with both MDR and the pay-performance sensitivity of option grants. However, our findings with respect to option grant allocations are robust to fixed effects but not when applied to executive shareholdings.

It may well be the case that the use of fixed effects to explain executive shareholdings is inappropriate. By their very nature executive shareholdings provide some degree of control as well as incentives. Controlling shareholdings being excluded from "free float" are generally illiquid and hence will not vary much over time. Perhaps the best one can hope for is to capture cross-sectional effects.

The findings with respect to the executive title dummies are of interest. Executive directors on the board hold considerably more shares than do executives ranked in the top five most highly paid generally, as do CEOs who hold the dual title of chairman. CEOs who are not also the chair have smaller but still significantly higher shareholdings and Chief Financial Officers (CFOs) have smaller holdings. Holdings are unrelated to gender. Perhaps it is no coincidence that these shareholding rankings approximate the total remuneration rankings from Table 6 above.

In Table 9 all the top five executive information is aggregated to the firm level and two related measures of the pay-performance sensitivity of the remaining staff make up the dependent variables: the "All other staff pay-performance sensitivity" and this sensitivity expressed on a per-employee basis. The reason for expressing staff option sensitivity on a per-employee basis, in common with Core and Guay (2001), is because in most organizations the number of staff in executive or managerial positions is likely to be higher the higher is the number of employees. Organizations with larger internal labor markets are likely to allocate more options. Results with both standard OLS and OLS fixed effects are shown.

Place Table 9 about here

Our findings with respect to the overall pay-performance sensitivity of all staff excluding the top five shown in the first three columns are not too dissimilar to our earlier findings shown in Table 7 for the pay-performance sensitivity of the top five executives. Taking the overall pay-performance sensitivity, all three liquidity variables are positive and significant using standard OLS but unlike the top five are not robust to fixed effects except for the bid-ask spread. On a per-employee basis both the bid-ask spread and informativeness are positive and significant but turnover ceases to be. Surprisingly, staff in companies with growth prospects as indicated by Tobin's Q are allocated fewer options in terms of overall sensitivity but is positive and highly significant on a per-employee basis for both OLS and fixed effects. Core and Guay (2001) find their analogue to Tobin's *Q*, the market to book value, positive using both specifications. Non-top five staff in regulated firms has a lower sensitivity as expected but using OLS is higher on a per-employee basis. However, scale effects in the form of market capitalization and sales and risk effects seem to be irrelevant on an overall basis but increase at a diminishing rate on a per-employee basis using OLS. Scaled free cash flow is negative and significant on a per-employee basis but only using OLS. Core and Guay (2001) find similar results for cash constraints.[16]

As Core and Guay (2001) find, option allocations to non-top five staff are highly complementary with the option holdings of the top five executives. This remains true regardless of the basis or estimation method. If the board regards options as being desirable for the most senior executives then this remains true at the more junior levels. There is a strong pass-down effect from the most senior to the more junior. While staff options are used more readily when shareholdings by the top five executives are low, this is only statistically significant on an employee basis and using OLS.

Like Demsetz and Lehn (1985) before them, Core and Guay (2001) use idiosyncratic risk as a proxy for noise in the operating environment. Hence they are not surprised to find a positive and significant relationship between risk and the allocation of options to other than the five most highly paid executives. In contrast to Core and Guay (2001) we find that option sensitivity is invariant to our risk measure, the standard deviation of market capitalization. The positive sign and significant results for idiosyncratic risk, both for overall sensitivity and on a per-employee basis, found by

[16] Core and Guay do not undertake fixed effect regressions.

Core and Guay (2001) are almost certainly due to their exclusion of all three liquidity proxies. Given the difficulty faced by executives at all levels in diversifying in the face of potentially high levels of idiosyncratic risk, we would expect to find either a negative relationship between risk and the granting of executive options or an ambiguous relationship due to the contracting environment operating as well.

VI. Conclusions

We show that while the model of Holmstrom and Tirole (1993) was not presented in terms of directly observable variables, it can be transformed to yield the prediction that firms with more trading volume and whose prices respond more to order flow should use more stock-based incentives for their employees. Empirically, firms with more liquid stock, as measured by stock turnover, lower relative bid-ask spreads and higher informativeness of order-flow, have strikingly higher usage of options and market-sensitive pay as a fraction of total compensation. Thus the higher the "quality" of the stock price as determined by these characteristics, the greater their use in incentive contracts. Equivalently and contrary to widely held beliefs, there appears to be a *closer* alignment of interests due to board-determined incentive allocations between shareholders and executives for highly liquid stocks than for illiquid stocks. This effect exceeds that of eleven other explanations including firm size, risk, growth options, cash constraints, and focus or industry regulation effects. In fact, our simulations utilizing 900 random samples show that three liquidity proxies explain up to 79% of the variation leaving 17 traditional variables to explain only the remaining 21%.

We have focused on explicit incentive-alignment through the use of compensation contracts. We cannot dismiss the possibility that boards and shareholders in less liquid firms are able to directly monitor their managers and make more effective use of bonuses. Thus they would not need to use stock-based pay. In fact, we find that bonus pay is utilized more by illiquid firms and stock-based pay by liquid firms. Hence we find an unexpected degree of substitutability, depending on liquidity. Our results are definitely inconsistent with the view that managers of firms with liquid shares ignore the interests of their shareholders. In summary, our results show that boards delegate monitoring of executives to active market traders when the stock is liquid and undertake internal monitoring using bonus schemes when the stock is relatively illiquid.

Our results have considerable implications for the theory of the firm. They help to explain why we do not see just one firm and one share price in the world at one extreme and every firm fully focused with its own stock price at the other. First, conglomerates or unfocused firms will wish to undertake equity spin-offs or carve-outs to secure additional stock-based information and to encourage external monitoring by informed traders. Hence it is not surprising that in 94% of cases carve-outs result in the establishment of equity-based executive compensation schemes based on the former subsidiaries stock (Schipper and Smith, 1986). Such compensation schemes are a way of harnessing the information content in the newly established share price. Second, they expose the

limitations on divisional structures and conglomerates since their managers and divisional heads can only be motivated via internally monitored bonus schemes or claims on the stock value of the parent. Second, they explain the limitations on divisional structures and conglomerates.

Third, they help to explain why conglomerates continue to exist. Non-market accounting-based incentives are adequate in many cases and not all carve-outs can achieve the necessary liquidity required for effective monitoring by traders. Such external monitoring is inherently costly and must either be subsidized by noise traders or by the firm's founders when the company is floated.[17] Our empirical results demonstrate for the first time that managerial ownership is strongly associated with both low stock turnover and high bid-ask spreads. It is thus related to illiquidity. These liquidity aspects complement Holmstrom's (1979) theoretical demonstration that as the observability of a risk-adverse agent's actions increases, monitoring of actions will replace second-best sharing relationships based on outcomes. We show the crucial importance of this external monitoring in the allocation of market-based incentives to executives. Hence, far from agency problems disappearing with higher incentive alignment, they can in fact be exacerbated as both market liquidity and external monitoring are curtailed. Finally, conglomerates are typically relatively illiquid since informed traders and noise traders alike cannot understand their actions due to complexity. This liquidity constraint imposes a natural limit on the ability of such firms to successfully expand and helps to explain the conglomerate stock price discount. We show that the apparent reluctance of conglomerates to utilize market-based compensation is due to the lack of liquidity in stock trading for such firms.

[17] A third alternative is that noise traders gain utility from trading itself and are thus willing to subsidize informed traders so long as the market remains sufficiently liquid. However, the higher are transaction costs the lower will be asset prices (Swan, 2002).

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Table 1. Panel A: Univariate descriptive statistics for observations utilized in the model

Variable	Min	Max	Mean	Median	StdDev
Mkt Delegation Ratio	0.00	1.0000	0.3222	0.2892	0.2747
Total remun $000	0.00	690,700	1,624.919	763.552	5,317.223
Bonus propn of remun grant date	0.00	1.0000	0.2148	0.1895	0.1770
Black Scholes value of option grants $000	0.00	217,600	739.197	152.274	3,177.087
Black Scholes hedge ratio	0.00	1.0000	0.5164	0.6443	0.3419
Prop total remun in incentives	0.00	1.0000	0.5758	0.6088	0.2435
Exec shares propn of total outs shares	0.00	0.6460	0.0082	0.00	0.0382
Option holdings pay perf sens at FY end	0.00	0.1826	0.0032	0.0011	0.0070
Value of restricted share grants $000	0.00	685,800	133.064	0.00	3,692.604
Total pay perf sens at FY end	0.00	0.6509	0.0118	0.0020	0.0382
Executive option grants pay perf sens	0.00	0.1586	$8.319*10^{-4}$	$1.911*10^{-4}$	0.0025
All other staff optn grants pay perf sens	0.00	0.9339	0.0160	0.0079	0.0343
All other staff optn grants pay perf sens per employee	0.00	0.0094	$2.037*10^{-5}$	$1.340*10^{-6}$	$1.729*10^{-4}$
Total assets $m	5.325	701,200	6,190.247	1,128.797	23,120
Mkt cap $m	2.168	478,000	5,028.560	1,154.362	15,660
Ann sales $m	0.00	185,000	4,045.179	1,133.842	10,410
Propnl mkt return	-0.9297	9.495	0.1707	0.1075	0.5348
Share price volatility	0.00	2.130	0.3458	0.3100	0.1570
Dollar return $m	-22,150	179,000	844.076	72.876	5,318.418
Std dev of mkt cap $m	0.00	99,540	1,079.638	340.729	2,814.168
Ann share turn	0.0238	27.057	1.327	0.8381	1.516
Avg t-wtd bid-ask sprd	$4.235*10^{-4}$	0.4777	0.0112	0.0074	0.0141
Tobins Q ratio	0.0382	37.913	1.743	1.258	1.596
Long Term Debt as propn of total mkt cap	0.00	0.9817	0.1760	0.1322	0.1700
Free cash flow scaled by total assets	-1.172	0.7413	0.0050	0.0110	0.0990
Company variance rank (cumulative distribution fn)	$8.866*10^{-4}$	1.0000	0.5225	0.5335	0.2869
SIC wtd Herfindahl index computed using distance	0.4791	1.0000	0.9854	1.0000	0.0400
Informativeness of order flow	$1.000*10^{-4}$	0.1472	0.0062	0.0049	0.0050

Table 1. Panel B: Descriptive statistics on a fiscal year basis for period, 1992-1999. All dollar values are in $000 in constant prices of 30 June, 2000.

Company fiscal year	1992	1993	1994	1995	1996	1997	1998	1999
Total companies in database	1,566	1,677	1,743	1,847	1,975	1,984	1,890	1,682
Total executives in database	8,004	9,736	10,580	11,033	11,544	11,685	10,730	8,667
Total CEO's in database	432	1,154	1,543	1,590	1,640	1,660	1,714	1,672
Total non-CEO's in database	7,576	8,601	9,061	9,460	9,945	10,056	9,041	7,006
Total executive years in database	8,025	9,797	10,656	11,127	11,676	11,797	10,824	8,712
CEO total compensation as at grant date	2,529.46	2,365.90	2,423.29	2,628.01	3,454.35	4,319.01	5,039.24	5,627.47
CEO option grants as at grant date	640.31	814.97	986.51	1,067.74	1,672.89	2,348.21	2,715.59	3,506.78
CEO restricted stock grants	251.03	167.78	147.74	173.48	231.02	280.45	720.46	346.45
CEO base salary	766.30	647.86	598.84	600.85	603.85	606.46	614.62	618.12
CEO bonus	623.59	504.46	502.02	549.10	645.73	662.96	636.33	735.73
CEO LTIP	177.47	120.65	94.28	133.48	184.41	203.94	174.40	202.31
Non-CEO total compensation as at grant date	874.17	866.28	914.76	1,019.34	1,191.01	1,510.59	1,674.82	2,189.33
Non-CEO option grants as at grant date	244.26	264.05	321.95	378.94	498.26	756.45	838.12	1,236.56
Non-CEO restricted stock grants	66.20	60.22	56.10	64.77	79.71	109.73	168.97	157.85
Non-CEO base salary	311.45	289.79	283.96	285.20	283.76	287.10	302.72	327.77
Non-CEO bonus	174.16	174.44	184.77	190.59	215.75	232.09	238.93	305.13
Non-CEO LTIP	45.05	31.78	32.14	50.66	57.08	63.98	58.07	71.30

Table 2. Univariate pairwise correlations

Variable	MDR	Bnus prpn	BS vl opn grts	Pp ttl remn incs	Exec / ttl shres	Opn hldg PPS	Total PPS	Optn grts PPS	Ttl assts	Mkt cap	Ann sales	Prpn mkt retn	Share price volat	$ retn	SD mkt cap	Ann share turn	Tobins Q	LT Dbt/ mt cp	FCF scled	Rel rk	S Hfl index	Ln Turn	Ln BAS	Infm or fw
Mkt Dlegn Ratio	1																							
Bonus propn remun	-0.43	1																						
Blk Scl val optn gnts	0.28	-0.09	1																					
Prp ttl remun incnt	0.73	0.21	0.23	1																				
Exec shrs ppn shrs	-0.10	-0.00	0.01	-0.10	1																			
Opn hldg pay pf sens	0.21	-0.08	0.18	0.16	0.12	1																		
Total pay perf sens	-0.05	-0.02	0.05	-0.07	0.96	0.30	1																	
Opn grts pay perf sen	0.41	-0.19	0.31	0.29	0.05	0.57	0.16	1																
Total assets	0.05	0.14	0.13	0.16	-0.04	-0.07	-0.05	-0.06	1															
Mkt cap	0.11	0.11	0.19	0.19	-0.03	-0.09	-0.05	-0.07	0.48	1														
Ann sales	0.06	0.15	0.09	0.17	-0.05	-0.11	-0.07	-0.08	0.68	0.60	1													
Propnl mkt return	0.08	0.12	0.16	0.16	0.02	0.07	0.04	0.04	0.03	0.10	0.02	1												
Share price volat	0.23	-0.26	0.05	0.06	0.05	0.27	0.10	0.24	-0.16	-0.17	-0.20	0.09	1											
Dollar return	0.08	0.08	0.23	0.15	-0.01	-0.04	-0.02	-0.03	0.31	0.84	0.38	0.22	-0.08	1										
Std dev of mkt cap	0.13	0.09	0.16	0.21	-0.04	-0.09	-0.05	-0.07	0.45	0.94	0.60	0.03	-0.12	0.69	1									
Ann share turn	0.28	-0.18	0.11	0.16	-0.01	0.17	0.02	0.15	-0.09	-0.06	-0.10	0.19	0.58	-0.01	-0.02	1								
Tobins Q ratio	0.20	-0.06	0.19	0.16	0.05	0.09	0.06	0.05	-0.10	0.22	-0.06	0.43	0.21	0.28	0.20	0.32	1							
LT Dbt/ total mkt cap	-0.15	-0.04	-0.07	-0.18	-0.05	-0.07	-0.07	-0.04	0.05	-0.09	0.05	-0.21	-0.14	-0.09	-0.10	-0.21	-0.43	1						
Free csh flow scaled	-0.01	0.15	0.05	0.09	0.01	-0.06	-0.00	-0.06	0.01	0.09	0.03	0.15	-0.17	0.10	0.09	-0.04	0.13	-0.15	1					
Rel rank bd on risk	0.25	0.15	0.15	0.39	-0.09	-0.15	-0.12	-0.14	0.31	0.40	0.42	-0.06	-0.17	0.21	0.46	0.08	0.15	-0.12	0.11	1				
SIC wtd Herfi index	0.03	-0.10	0.00	-0.04	0.01	0.05	0.02	0.04	-0.07	-0.08	-0.09	0.03	0.15	-0.05	-0.07	0.13	0.09	-0.07	-0.00	-0.09	1			
Ln(Ann share turn)	0.33	-0.21	0.10	0.19	-0.03	0.20	0.01	0.18	-0.10	-0.08	-0.10	0.13	0.65	-0.02	-0.02	0.84	0.28	-0.20	-0.06	0.09	0.16	1		
Ln(bid-ask sprd)	-0.14	-0.25	-0.14	-0.33	0.11	0.17	0.13	0.17	-0.29	-0.40	-0.37	-0.08	0.44	-0.26	-0.42	0.06	-0.07	0.06	-0.17	-0.74	0.14	0.11	1	
Inform of order flow	0.28	-0.18	0.11	0.18	0.01	0.14	0.03	0.13	0.02	0.11	0.03	0.03	0.51	0.10	0.17	0.57	0.29	-0.16	-0.08	0.20	0.07	0.57	0.01	1

Table 3. Explaining decile ranks

	Decile rank of Ann Share Turnover			Decile rank of Bid Ask Spread			Decile rank of Informativeness Coefficient		
	Mkt Delegation Ratio	Bonus Prpn of Remun	Prop Total Remun in Incentives	Mkt Delegation Ratio	Bonus Prpn of Remun	Prop Total Remun in Incentives	Mkt Delegation Ratio	Bonus Prpn of Remun	Prop Total Remun in Incentives
1	0.177	0.248	0.469	0.434	0.268	0.740	0.214	0.236	0.489
2	0.232	0.252	0.527	0.366	0.279	0.683	0.216	0.248	0.505
3	0.265	0.260	0.569	0.326	0.254	0.621	0.254	0.237	0.536
4	0.279	0.249	0.567	0.325	0.231	0.596	0.287	0.235	0.563
5	0.306	0.233	0.578	0.316	0.238	0.596	0.309	0.238	0.584
6	0.324	0.228	0.591	0.294	0.215	0.548	0.324	0.218	0.584
7	0.344	0.206	0.592	0.279	0.200	0.519	0.339	0.218	0.597
8	0.368	0.178	0.585	0.299	0.168	0.504	0.372	0.205	0.614
9	0.424	0.153	0.610	0.305	0.160	0.499	0.405	0.180	0.619
10	0.504	0.141	0.668	0.278	0.135	0.453	0.502	0.132	0.667

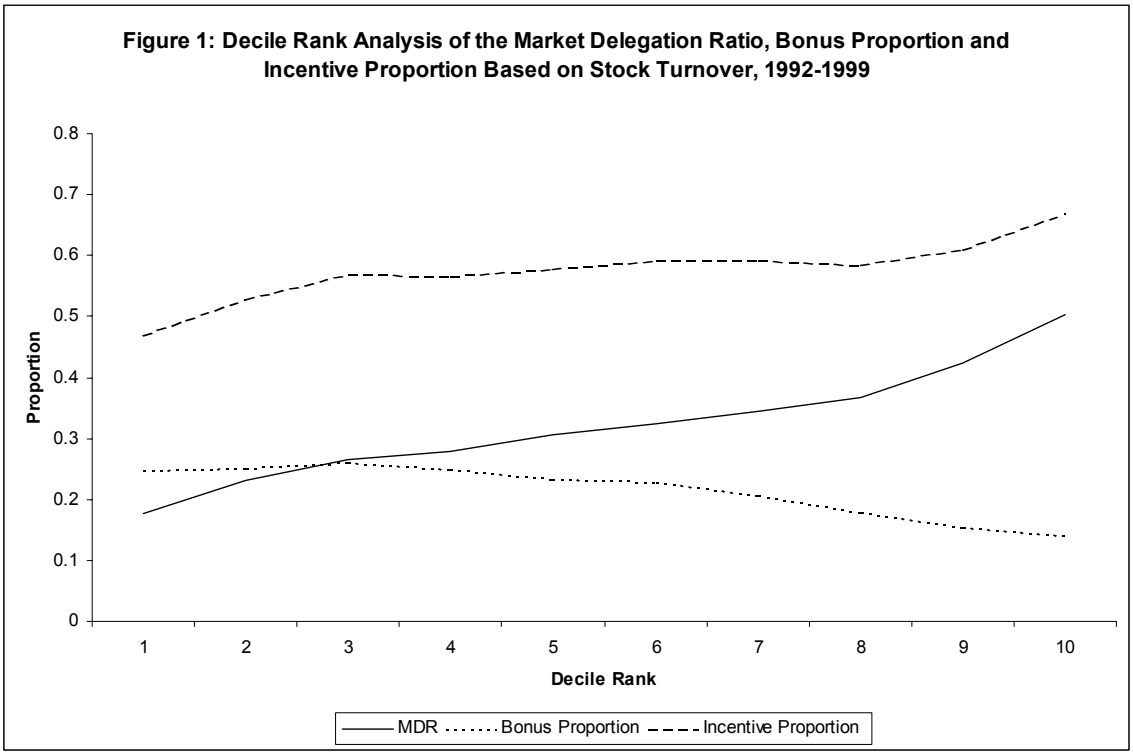

Table 4 Explaining the Market Sensitive Proportion of Total Executive Pay given by the Market Delegation Ratio (MDR). ***Panel A: Regressions*** incorporating both Industry and Year Dummies (not reported)

Dependent variable	**Mkt Delegation Ratio at Grant Date**					
	Standard OLS			**OLS Fixed Effects**		
	Traditional	**All Inclusive**	**Liquidity Only**	**Traditional**	**All Inclusive**	**Liquidity Only**
Ln(Ann share turn)		0.0868*** (39.842)	0.0875*** (41.537)		0.0225*** (5.773)	0.0179*** (4.598)
Ln(bid-ask sprd)		-0.0238*** (9.519)	-0.0546*** (26.902)		-0.0239*** (5.139)	-0.0411*** (9.279)
Informativeness of order flow		3.470*** (11.345)	5.558*** (18.648)		1.652*** (4.539)	1.708*** (4.726)
NASDAQ dum		-0.0193*** (4.694)	0.0099* (2.560)		0.0152 (0.302)	0.0417 (0.828)
Tobins Q ratio	0.0253*** (27.291)	0.0129*** (13.773)		0.0111*** (7.229)	0.0094*** (5.998)	
Optn hldngs pay perf sens at FY start	2.114*** (10.851)	0.8114*** (4.258)		-2.590*** (13.366)	-2.623*** (13.551)	
Exec shares propn of total outs shares at FY start	-0.8277*** (24.734)	-0.7000*** (21.542)		-0.4774*** (15.402)	-0.4766*** (15.398)	
Std dev of mkt cap	$1.846*10^{-5}$*** (14.250)	$5.000*10^{-6}$*** (3.909)		$-1.920*10^{-7}$ (0.131)	$-1.923*10^{-6}$ (1.304)	
LT Debt as propn of ttl mkt cap	-0.0686*** (8.086)	-0.0488*** (5.782)		-0.0627*** (4.226)	-0.0490** (3.245)	
Free cash flow scaled by Ttl assets	-0.1799*** (14.370)	-0.1108*** (8.990)		-0.0430** (2.767)	-0.0350* (2.253)	
SIC wtd Herfindahl index computed using distance	0.1163*** (3.803)	-0.0164 (0.547)		0.0209 (0.373)	0.0041 (0.074)	
Regulated energy utilities	-0.2081*** (24.262)	-0.1670*** (19.971)		0.1563** (3.033)	0.1963** (2.743)	
Mkt cap	$-1.028*10^{-6}$*** (3.787)	$1.526*10^{-6}$*** (5.732)		$2.333*10^{-6}$*** (6.984)	$2.470*10^{-6}$*** (7.362)	
Square of mkt cap	$-7.964*10^{-12}$*** (11.757)	$-8.194*10^{-12}$*** (12.410)		$-5.114*10^{-12}$*** (6.154)	$-4.764*10^{-12}$*** (5.720)	
Ann sales	$2.541*10^{-6}$*** (7.302)	$1.210*10^{-6}$*** (3.428)		$1.663*10^{-6}$ (1.637)	$1.258*10^{-6}$ (1.237)	
Square of annual sales	$-2.142*10^{-11}$*** (9.269)	$-1.309*10^{-11}$*** (5.602)		$-6.539*10^{-12}$ (0.940)	$-4.606*10^{-12}$ (0.662)	
CEO dum	0.0543*** (8.830)	0.0547*** (9.210)	0.0495*** (8.260)	0.0499*** (9.249)	0.0495*** (9.187)	0.0349*** (6.499)
CHMN and CEO dum	-0.0136* (2.054)	-0.0207** (3.223)	-0.0349*** (5.369)	-0.0227*** (3.855)	-0.0225*** (3.826)	-0.0301*** (5.114)
CFO dum	0.0049 (1.295)	0.0069 (1.895)	0.0062 (1.674)	0.0124*** (3.826)	0.0120*** (3.713)	0.0128*** (3.955)
Exec director	-0.0156*** (4.965)	-0.0040 (1.319)	-0.0065* (2.136)	0.0238*** (8.202)	0.0239*** (8.264)	0.0134*** (4.704)
Female	0.0211** (3.105)	0.0148* (2.245)	0.0162* (2.425)	0.0033 (0.531)	0.0038 (0.607)	0.0059 (0.941)
Intercept	0.1632*** (5.239)	0.2083*** (6.173)	-0.0761*** (6.722)	0.0835 (1.271)	-0.0300 (0.346)	0.0780 (1.840)
Adj R^2	0.138	0.197	0.166	0.396	0.397	0.389
F value	229.841	311.511	379.653	20.247	20.344	19.796
No. of observations	45,658	45,658	45,658	45,658	45,658	45,658

***Significant at 0.1% level
**Significant at 1% level
*Significant at 5% level

Table 4. Explaining the Market Sensitive Proportion of Total Executive Pay given by the Market Delegation Ratio (MDR). ***Panel B: Robustness Tests Using Tobit Regressions,*** incorporating both Industry and Year Dummies (not reported).

	Mkt Delegation Ratio at Grant Date	
	Standard Tobit	**Tobit Fixed Effects**
Ln(Ann share turn)	0.0986***	0.0259***
	(35.463)	(5.278)
Ln(bid-ask sprd)	-0.0325***	-0.0231***
	(10.211)	(3.953)
Inform of order flow	3.609***	2.389***
	(9.243)	(4.975)
NASDAQ dum	-0.0252***	0.0171
	(4.809)	(0.279)
Tobins Q ratio	0.0130***	0.0104***
	(11.007)	(5.320)
Option holdings pay perf sens at FY start	0.7874**	-3.475***
	(3.218)	(13.751)
Exec shares propn of total outs shares at FY start	-1.235***	-0.8532***
	(25.284)	(18.784)
Std dev of mkt cap	$3.480*10^{-6}$*	$-4.637*10^{-6}$*
	(2.143)	(2.577)
LT Debt as propn of total mkt cap	-0.0686***	-0.0654***
	(6.339)	(3.444)
Free cash flow deflated by Total assets	-0.1367***	-0.0371
	(8.754)	(1.930)
SIC wtd Herfindahl index computed using distance	-0.0769*	-0.0302
	(2.036)	(0.435)
Regulated energy utilities	-0.2111***	0.2407**
	(19.786)	(2.746)
Mkt cap	$2.028*10^{-6}$***	$2.860*10^{-6}$***
	(5.532)	(5.906)
Square of mkt cap	$-1.032*10^{-11}$***	$-6.261*10^{-12}$***
	(9.707)	(4.056)
Ann sales	$2.127*10^{-6}$***	$1.418*10^{-6}$
	(4.789)	(1.128)
Square of annual sales	$-1.787*10^{-11}$***	$-4.963*10^{-12}$
	(6.100)	(0.575)
CEO dum	0.0722***	0.0658***
	(9.530)	(9.696)
CHMN and CEO dum	-0.0231**	-0.0293***
	(2.827)	(3.975)
CFO dum	0.0092*	0.0172***
	(2.009)	(4.270)
Exec director	-0.0170***	0.0203***
	(4.376)	(5.569)
Female	0.0163*	0.0022
	(1.967)	(0.280)
Intercept	0.1900***	-0.0616
	(4.449)	(0.574)
Adj R^2	0.193	0.281
F value	10,923.27	17,879.76
No. of observations	45,696	45,696
Non-censored	35,240	35,240
Left-censored	10,456	10,456

***Significant at 0.1% level
**Significant at 1% level
*Significant at 5% level

Table 4. Explaining the Market Sensitive Proportion of Total Executive Pay given by the Market Delegation Ratio (MDR). ***Panel C: Cros-sectional Analysis Robustness Check*** **aggregating the observations on each executive over the entire period he/she is in the database.** Industry and Year effects are also included but not reported.

Dependent	**Market Delegation Ratio at Grant Date Cross Sectional Test**	
	Standard OLS	**OLS fixed effects**
Ln(Ann share turn)	0.1128***	0.1234***
	(46.262)	(17.280)
Ln(bid-ask sprd)	-0.0495***	-0.1474***
	(18.843)	(20.568)
Inform of order flow	5.001***	1.098***
	(16.576)	(3.315)
Tobins Q ratio	-0.0026**	-0.0066**
	(3.044)	(3.137)
LT Debt as propn of total mkt cap	-0.0821***	0.2089***
	(7.774)	(8.016)
Free cash flow deflated by Total assets	-0.0523**	-0.0175
	(2.663)	(0.530)
SIC wtd Herfindahl index computed using distance	-0.1197**	-0.0877
	(2.669)	(0.897)
Mkt cap	$3.565*10^{-6}$***	$4.881*10^{-6}$***
	(11.944)	(10.138)
Square of mkt cap	$-1.105*10^{-11}$***	$-1.083*10^{-11}$***
	(9.499)	(6.861)
Ann sales	$-8.921*10^{-7}$	$-1.287*10^{-6}$
	(1.939)	(0.928)
Square of annual sales	$-1.950*10^{-12}$	$-7.236*10^{-12}$
	(0.613)	(0.834)
Intercept	0.1888***	-0.6423***
	(3.971)	(4.911)
Adj R^2	0.272	0.606
F value	454.035	14.104
No. of observations	13,306	13,306

***Significant at 0.1% level
**Significant at 1% level
*Significant at 5% level

***Table 4: Panel D; Stepwise Simulations* with MDR as the dependent variable using 900 simulations in all, taking increments of the sample size from 10% to 90% using 100 random sample replications from the 45,658 records at each step.** In the first set of five columns no industry or year control variables are utilized but any influential observation with a statistically significant *t*-value of 1.96 or above has been removed so as to lessen the impact of outliers. In the second set of columns the dependent variable is the residuals from MDR after regressing all the industry and year control variables on MDR. However, no influential observations have been removed. The contributions of liquidity and traditional variables to the overall explanation have been found by summing the respective partial R^2's.

	No Controls or Outliers					**Full Industry and Year Controls with Outliers**				
	Appears	**Step Mean**	**Partial Rsquare Mean**	**Estim Mean**	**Tvalue Mean**	**Appears**	**Step Mean**	**Partial Rsquare Mean**	**Estim Mean**	**Tvalue Mean**
Ln(Ann share turn)	900	1.16	0.1461	0.0840	29.20	900	1.03	0.0698	0.0843	27.54
Ln(bid-ask sprd)	900	2.24	0.0457	-0.0612	20.70	850	4.44	0.0126	-0.0113	4.06
Inform of order flow	897	3.49	0.0281	7.3801	16.98	855	8.78	0.0029	2.4484	5.61
Regulated energy utilities	898	4.65	0.0127	-0.1018	16.41	882	8.19	0.0026	0.0611	8.86
Tobins Q ratio	889	5.54	0.0114	0.0156	12.46	882	5.18	0.0053	0.0123	9.09
Exec shares propn of total outs shares at FY start	900	5.54	0.0090	-0.7870	17.37	900	3.32	0.0080	-0.7062	14.78
CEO dum	897	7.92	0.0041	0.0748	9.66	882	7.08	0.0026	0.0474	6.37
Option holdings pay perf sens at FY start	871	9.42	0.0031	2.2920	8.10	733	14.51	0.0007	0.8739	3.24
Std dev of mkt cap	824	11.13	0.0051	0.0000	5.31	805	8.58	0.0075	0.0000	3.98
Square of mkt cap	873	11.36	0.0026	0.0000	10.03	877	8.86	0.0033	0.0000	8.34
Free cash flow deflated by Total assets	847	11.53	0.0017	-0.1037	6.24	870	8.00	0.0025	-0.1283	7.14
Mkt cap	810	13.23	0.0022	0.0000	5.82	809	10.96	0.0039	0.0000	4.92
CFO dum	880	13.50	0.0008	0.0222	4.53	325	18.29	0.0001	0.0115	1.83
Square of annual sales	772	13.51	0.0014	0.0000	5.46	850	10.97	0.0020	0.0000	6.90
NASDAQ dum	808	13.52	0.0013	0.0198	4.27	834	12.40	0.0013	-0.0287	5.24
Exec director	820	14.55	0.0007	-0.0172	4.33	327	16.43	0.0004	0.0017	2.17
Female	788	15.59	0.0005	0.0307	3.60	636	16.28	0.0003	0.0220	2.45
CHMN and CEO dum	800	15.63	0.0005	-0.0314	3.70	712	16.16	0.0003	-0.0214	2.45
Ann sales	695	15.88	0.0011	0.0000	4.69	819	11.47	0.0020	0.0000	5.86
LT Debt as propn of total mkt cap	729	16.42	0.0007	-0.0265	3.12	850	11.54	0.0013	-0.0697	5.86
SIC wtd Herfindahl index comd using distance	620	17.11	0.0005	0.0321	2.91	496	15.67	0.0005	0.0332	2.62
Contribution of liquidity variables to explanation			0.2212					0.0866		
Overall explanation			0.2793					0.1299		
Liquidity share of overall explanation			0.79198					0.6667		

Table 5. Additional Incentive Mix Regressions: Bonus Proportion and Incentive Proportion of Total Executive Compensation Utilizing both OLS and Tobit and incorporating both Industry and Year Dummies (not reported)

	Bonus Propn of Remun at Grant Date			Proportion Total Remun in Incentives at Grant Date		
	Standard OLS	**Standard Tobit**	**Tobit Fixed Effects**	**Standard OLS**	**Standard Tobit**	**Tobit Fixed Effects**
Ln(Ann share turn)	-0.0268***	-0.0284***	-0.0076**	0.0532***	0.0529***	0.0210***
	(18.626)	(16.637)	(2.916)	(28.496)	(28.001)	(6.602)
Ln(bid-ask sprd)	-0.0480***	-0.0601***	-0.0303***	-0.0695***	-0.0706***	-0.0370***
	(29.004)	(31.095)	(9.695)	(32.394)	(32.509)	(9.741)
Inform of order flow	-2.746***	-3.910***	-2.349***	1.426***	1.446***	0.4691
	(13.602)	(15.213)	(8.939)	(5.446)	(5.456)	(1.592)
NASDAQ dum	-0.0028	-0.0035	0.0301	-0.0276***	-0.0275***	0.0242
	(1.037)	(1.091)	(0.908)	(7.807)	(7.685)	(0.591)
Tobins Q ratio	-0.0024***	-0.0015*	0.0124***	0.0088***	0.0087***	0.0181***
	(3.854)	(2.037)	(11.590)	(10.964)	(10.667)	(14.136)
Option holdings pay perf sens at FY start	0.7225***	0.7873***	1.212***	1.732***	1.761***	-0.7941***
	(5.722)	(5.335)	(9.321)	(10.578)	(10.625)	(5.031)
Exec shares propn of ttl shares at FY start	$7.905*10^{-4}$	-0.0591*	-0.0455*	-0.6429***	-0.6689***	-0.4129***
	(0.037)	(2.322)	(2.113)	(23.024)	(23.526)	(16.256)
Std dev of mkt cap	$-7.616*10^{-6}$***	$-8.681*10^{-6}$***	$-5.746*10^{-6}$***	$-2.467*10^{-6}$*	$-2.463*10^{-6}$*	$-7.066*10^{-6}$***
	(8.985)	(8.931)	(5.936)	(2.255)	(2.225)	(5.917)
LT Debt as propn of total mkt cap	-0.0626***	-0.0857***	-0.2117***	-0.0957***	-0.0964***	-0.2019***
	(11.186)	(13.009)	(20.755)	(13.189)	(13.125)	(16.416)
Free cash flow scaled by Ttl assets	0.1710***	0.2198***	0.1739***	0.0563***	0.0581***	0.0560***
	(20.937)	(22.677)	(16.282)	(5.319)	(5.420)	(4.423)
SIC wtd Herfindahl index	-0.1968***	-0.2052***	-0.1725***	-0.2243***	-0.2266***	-0.1337**
	(9.931)	(8.993)	(4.620)	(8.727)	(8.714)	(2.921)
Regulated energy utilities	0.0207***	0.0304***	0.1930***	-0.1488***	-0.1491***	0.3834***
	(3.730)	(4.715)	(4.085)	(20.721)	(20.521)	(6.575)
Mkt cap	$4.739*10^{-7}$**	$4.420*10^{-7}$*	$-1.444*10^{-6}$***	$1.851*10^{-6}$***	$1.846*10^{-6}$***	$9.379*10^{-7}$***
	(2.686)	(2.187)	(6.543)	(8.104)	(7.986)	(3.435)
Square of mkt cap	$1.539*10^{-12}$***	$1.969*10^{-12}$***	$4.329*10^{-12}$***	$-6.400*10^{-12}$***	$-6.391*10^{-12}$***	$-4.150*10^{-13}$
	(3.516)	(3.942)	(7.981)	(11.283)	(11.137)	(0.612)
Ann sales	$2.112*10^{-6}$***	$2.422*10^{-6}$***	$-2.059*10^{-6}$**	$3.619*10^{-6}$***	$3.610*10^{-6}$***	$9.423*10^{-8}$
	(9.028)	(9.015)	(3.085)	(11.932)	(11.762)	(0.114)
Square of annual sales	$-4.938*10^{-12}$**	$-6.404*10^{-12}$***	$3.075*10^{-11}$***	$-2.087*10^{-11}$***	$-2.083*10^{-11}$***	$1.296*10^{-11}$*
	(3.189)	(3.610)	(6.479)	(10.397)	(10.256)	(2.287)
CEO dum	-0.0155***	-0.0147**	0.0084*	0.0292***	0.0297***	0.0417***
	(3.940)	(3.207)	(2.305)	(5.717)	(5.754)	(9.487)
CHMN and CEO dum	0.0236***	0.0249***	0.0078*	0.0070	0.0069	-0.0093
	(5.538)	(5.033)	(1.969)	(1.273)	(1.233)	(1.944)
CFO dum	-0.0046	-0.0038	-0.0017	$-6.147*10^{-4}$	$-3.685*10^{-4}$	0.0077**
	(1.934)	(1.372)	(0.808)	(0.197)	(0.117)	(2.935)
Exec director	0.0192***	0.0156***	$-6.450*10^{-4}$	0.0237***	0.0232***	0.0351***
	(9.529)	(6.648)	(0.333)	(9.055)	(8.779)	(14.892)
Female	-0.0155***	-0.0146**	-0.0035	-0.0027	-0.0025	-0.0050
	(3.561)	(2.892)	(0.856)	(0.473)	(0.437)	(0.998)
Intercept	0.1623***	0.0980***	0.0204	0.4298***	0.4261***	0.1068
	(7.257)	(3.802)	(0.354)	(14.822)	(14.523)	(1.508)
Adj R^2	0.150	0.149	0.385	0.245	0.246	0.500
F value	225.384	8,026.677	28,584.14	413.215	14,885.10	45,742.05
No. of observations	45,692	45,692	45,692	45,697	45,697	45,697
Non-censored	.	38,788	38,788	.	45,093	45,093
Left-censored	.	6,904	6,904	.	604	604

***Significant at 0.1% level
**Significant at 1% level
*Significant at 5% level

Table 6. Estimating Top Executive Pay-Performance Intensities Utilizing Total Board Determined Compensation as the Dependent Variable and incorporating both Industry and Year Dummies (not reported**)**

	Total Remuneration at Grant Date							
	Standard OLS	**OLS fixed effects**	**Standard OLS**	**OLS fixed effects**	**Standard OLS**	**OLS fixed effects**	**Standard OLS**	**OLS fixed effects**
	No liquidity terms		**All liquidity terms**		**No Bid Ask Spread Intern**		**No Informativeness Intern**	
Dollar return	1.189*** (8.802)	0.5380*** (3.338)	0.9335*** (6.687)	0.4615** (2.723)	1.159*** (8.514)	0.5737*** (3.511)	0.9041*** (6.492)	0.4005* (2.385)
Company variance rank	2928.448*** (33.516)	2012.493*** (7.065)	2345.373*** (17.075)	1602.108*** (4.802)	2888.929*** (32.380)	2057.326*** (6.857)	2451.985*** (18.424)	1599.905*** (4.848)
Compy vari rank x $ retn	-1.098*** (8.056)	-0.4532** (2.780)	-0.4861** (3.087)	-0.5861** (3.086)	-1.065*** (7.701)	-0.5234** (3.137)	-0.4585** (2.915)	-0.5522** (2.915)
Ln(Ann share turn)			122.138** (3.135)	-138.532 (1.550)	89.340* (2.311)	-68.593 (0.783)	183.233*** (5.436)	-130.287 (1.485)
Ln(Ann share turn) x $ return			0.0630*** (9.631)	0.0565*** (7.144)	0.0449*** (7.708)	0.0669*** (9.314)	0.0641*** (10.039)	0.0594*** (7.630)
Ln(bid-ask sprd)			-272.914*** (5.042)	-405.186*** (3.576)			-236.385*** (4.453)	-412.713*** (3.650)
Ln(bid-ask sprd) x Dol retn			0.0543*** (6.477)	-0.0273** (2.781)			0.0523*** (6.440)	-0.0350*** (3.745)
Inform of order flow			$2.047*10^4$** (3.160)	5620.092 (0.661)	$1.764*10^4$** (2.785)	3182.968 (0.375)		
Inform x $ return			0.6635 (1.137)	1.557* (2.409)	-0.1708 (0.302)	2.297*** (3.745)		
Regulated energy utilities	-1039.35*** (6.214)	-3735.238** (3.271)	-1066.58*** (6.300)	-3255.035** (2.843)	-996.626*** (5.901)	-3436.719** (3.007)	-1059.87*** (6.260)	-3139.452** (2.745)
CEO dum	925.635*** (7.640)	905.090*** (7.451)	892.945*** (7.377)	891.078*** (7.349)	884.625*** (7.304)	894.632*** (7.377)	898.988*** (7.426)	892.378*** (7.359)
Chm & CEO dum	890.523*** (6.775)	896.327*** (6.741)	905.026*** (6.891)	903.473*** (6.807)	923.161*** (7.028)	900.180*** (6.780)	899.054*** (6.846)	902.449*** (6.799)
CFO dum	-118.074 (1.581)	-124.329 (1.694)	-121.584 (1.631)	-133.022 (1.816)	-118.301 (1.586)	-132.025 (1.802)	-120.470 (1.616)	-131.980 (1.801)
Exec director	972.326*** (15.856)	1000.736*** (15.499)	1001.968*** (16.341)	1005.643*** (15.603)	997.769*** (16.265)	1005.495*** (15.597)	1000.672*** (16.318)	1005.529*** (15.600)
Female	121.843 (0.901)	-178.043 (1.265)	99.268 (0.735)	-173.851 (1.237)	100.955 (0.747)	-175.106 (1.246)	96.145 (0.712)	-174.386 (1.241)
Intercept	-547.914*** (3.328)	3117.076*** (3.982)	-1482.277*** (5.726)	840.717 (0.880)	-541.538** (3.238)	2718.429*** (3.446)	-1256.18*** (5.025)	719.332 (0.758)
Adj R^2	0.091	0.168	0.094	0.171	0.093	0.171	0.094	0.171
F value	191.311	6.973	159.275	7.078	168.179	7.070	170.110	7.082
No. of obsers	45,658	45,658	45,658	45,658	45,658	45,658	45,658	45, 658

***Significant at 0.1% level
**Significant at 1% level
*Significant at 5% level

Table 7. Explaining Executive Pay-Performance Intensities for Option Grants, Option Holdings and Total Executive Pay-Performance Sensitivities Incorporating Shares Privately Held by Executives. ***Panel A: Utilizing OLS Regressions*** and incorporating both Industry and Year Dummies (not reported)

	Option grants pay perf sens grant date		**Option holdings pay perf sens at FY end**		**Total pay perf sens at FY end**	
	Standard OLS	**OLS fixed effects**	**Standard OLS**	**OLS fixed effects**	**Standard OLS**	**OLS fixed effects**
Ln(Ann share turn)	$3.786*10^{-4}$*** (18.735)	$-5.174*10^{-5}$ (1.307)	0.0015*** (27.176)	$-2.474*10^{-4}$* (2.533)	-0.0032*** (10.441)	$-4.679*10^{-4}$ (0.806)
Ln(bid-ask sprd)	$5.397*10^{-4}$*** (23.255)	$5.370*10^{-4}$*** (11.348)	0.0016*** (25.872)	$6.498*10^{-4}$*** (5.568)	0.0054*** (15.500)	0.0025*** (3.596)
Inform of order flow	0.0109*** (3.845)	0.0096** (2.602)	0.0305*** (3.927)	-0.0044 (0.487)	0.2078*** (4.846)	-0.0391 (0.726)
NASDAQ dum	$-2.571*10^{-4}$*** (6.730)	$6.295*10^{-4}$ (1.232)	-0.0010*** (9.989)	$8.062*10^{-4}$ (0.640)	0.0033*** (5.731)	$-4.822*10^{-4}$ (0.064)
Tobins Q ratio	$-2.984*10^{-6}$ (0.343)	$-1.593*10^{-5}$ (0.998)	$1.806*10^{-4}$*** (7.566)	$1.396*10^{-4}$*** (3.547)	0.0010*** (7.860)	$6.013*10^{-4}$* (2.569)
Option holdings pay perf sens at FY start	0.0789*** (44.553)	0.0399*** (20.250)				
Exec shares propn of total outs shares at FY start	-0.0010*** (3.458)	$-6.223*10^{-4}$* (1.978)	$-2.901*10^{-4}$ (0.350)	$5.533*10^{-4}$ (0.713)		
Std dev of mkt cap	$-5.013*10^{-8}$*** (4.235)	$-3.454*10^{-8}$* (2.317)	$-1.311*10^{-7}$*** (4.036)	$-8.670*10^{-8}$* (2.359)	$2.223*10^{-7}$ (1.240)	$-1.240*10^{-7}$ (0.568)
LT Debt as propn of total mkt cap	$-2.181*10^{-4}$** (2.779)	$6.511*10^{-5}$ (0.425)	$-8.457*10^{-4}$*** (3.925)	-0.0013*** (3.516)	-0.0076*** (6.381)	-0.0024 (1.079)
Free cash flow deflated by Total assets	$-7.619*10^{-4}$*** (6.649)	$8.574*10^{-5}$ (0.543)	-0.0032*** (10.051)	$5.381*10^{-4}$ (1.382)	$9.615*10^{-4}$ (0.555)	$3.870*10^{-4}$ (0.167)
SIC wtd Herfindahl index computed using distance	$-3.309*10^{-4}$ (1.190)	$-3.016*10^{-4}$ (0.528)	$-8.360*10^{-4}$ (1.095)	$6.241*10^{-4}$ (0.443)	0.0012 (0.287)	-0.0052 (0.624)
Regulated energy utilities	$-5.032*10^{-4}$*** (6.479)	$9.986*10^{-4}$ (1.372)	-0.0025*** (11.868)	0.0053** (2.957)	-0.0046*** (3.920)	-0.0150 (1.409)
Mkt cap	$8.836*10^{-9}$*** (3.575)	$2.520*10^{-9}$ (0.740)	$6.038*10^{-9}$ (0.890)	$-1.791*10^{-8}$* (2.132)	$-1.312*10^{-7}$*** (3.505)	$1.286*10^{-10}$ (0.003)
Square of mkt cap	$1.760*10^{-15}$ (0.287)	$1.034*10^{-14}$ (1.222)	$4.396*10^{-14}$** (2.609)	$6.227*10^{-14}$** (2.985)	$3.539*10^{-13}$*** (3.807)	$1.005*10^{-14}$ (0.081)
Ann sales $m	$1.153*10^{-9}$ (0.351)	$-1.415*10^{-8}$ (1.370)	$-4.273*10^{-8}$*** (4.746)	$-3.969*10^{-8}$ (1.558)	$-2.731*10^{-7}$*** (5.497)	$-1.626*10^{-8}$ (0.107)
Square of annual sales	$-5.763*10^{-15}$ (0.265)	$4.095*10^{-14}$ (0.579)	$3.059*10^{-13}$*** (5.134)	$1.815*10^{-13}$ (1.040)	$1.780*10^{-12}$*** (5.413)	$3.416*10^{-13}$ (0.329)
CEO dum	$7.606*10^{-4}$*** (13.771)	$8.198*10^{-4}$*** (14.956)	0.0047*** (31.424)	0.0043*** (31.794)	0.0088*** (10.569)	0.0103*** (12.893)
CHMN and CEO dum	$-4.989*10^{-4}$*** (8.359)	$-4.746*10^{-4}$*** (7.948)	-0.0011*** (6.860)	$-9.123*10^{-4}$*** (6.194)	0.0172*** (19.077)	0.0172*** (19.694)
CFO dum	$-9.555*10^{-5}$** (2.834)	$-9.326*10^{-5}$** (2.844)	$-1.101*10^{-4}$ (1.189)	$-2.138*10^{-4}$** (2.643)	-0.0017*** (3.300)	-0.0026*** (5.330)
Exec director	$3.075*10^{-4}$*** (10.869)	$4.721*10^{-4}$*** (16.050)	0.0025*** (32.231)	0.0028*** (39.467)	0.0174*** (41.358)	0.0146*** (34.599)
Female	$1.404*10^{-4}$* (2.300)	$-1.889*10^{-4}$** (3.004)	$3.248*10^{-4}$ (1.938)	$-8.069*10^{-4}$*** (5.203)	$5.664*10^{-4}$ (0.612)	$-9.359*10^{-4}$ (1.015)
Intercept	0.0036*** (11.487)	0.0020* (2.290)	0.0113*** (13.083)	$-8.903*10^{-5}$ (0.041)	0.0227*** (4.780)	0.0309* (2.385)
Adj R^2	0.138	0.227	0.196	0.418	0.176	0.308
F value	204.301	9.610	320.102	22.102	289.032	14.080
No. of observations	45,697	45,697	45,697	45,697	45,697	45,697

***Significant at 0.1% level
**Significant at 1% level
*Significant at 5% level

Table 7. Explaining Executive Pay-Performance Intensities for Option Grants, Option Holdings and Total Executive Pay-Performance Sensitivities Incorporating Shares Privately Held by Executives. ***Panel B: Utilizing Tobit Regressions*** and incorporating both Industry and Year Dummies (not reported)

	Option grants pay perf sens grant date		Option holdings pay perf sens at FY end		Total pay perf sens at FY end	
	Standard Tobit	**Tobit Fixed Effects**	**Standard Tobit**	**Tobit Fixed Effects**	**Standard Tobit**	**Tobit Fixed Effects**
Ln(Ann share turn)	$5.171*10^{-4}$*** (20.123)	$-4.694*10^{-5}$ (0.930)	0.0018*** (30.277)	$-1.513*10^{-4}$ (1.449)	-0.0027*** (8.804)	$-3.354*10^{-4}$ (0.576)
Ln(bid-ask sprd)	$5.186*10^{-4}$*** (17.747)	$6.376*10^{-4}$*** (10.556)	0.0019*** (26.930)	$8.291*10^{-4}$*** (6.659)	0.0056*** (15.585)	0.0027*** (3.890)
Inform of order flow	0.0148*** (4.147)	0.0186*** (3.831)	0.0244** (2.859)	-0.0085 (0.831)	0.1952*** (4.443)	-0.0436 (0.809)
NASDAQ dum	$-3.065*10^{-4}$*** (6.351)	$3.833*10^{-4}$ (0.612)	-0.0013*** (11.881)	$5.942*10^{-4}$ (0.454)	0.0029*** (4.943)	$-7.308*10^{-4}$ (0.098)
Tobins Q ratio	$-1.803*10^{-5}$ (1.649)	$-1.150*10^{-5}$ (0.577)	$1.935*10^{-4}$*** (7.534)	$1.539*10^{-4}$*** (3.726)	0.0011*** (7.974)	$6.069*10^{-4}$** (2.596)
Option holdings pay perf sens at FY start	0.1041*** (127.241)	0.0458*** (21.396)				
Exec shares propn of total outs shares at FY start	-0.0051*** (12.254)	-0.0034*** (7.482)	-0.0045*** (4.856)	-0.0019* (2.234)		
Std dev of mkt cap	$-8.830*10^{-8}$*** (5.647)	$-7.629*10^{-8}$*** (4.044)	$-1.319*10^{-7}$*** (3.771)	$-1.237*10^{-7}$** (3.218)	$2.274*10^{-7}$ (1.246)	$-1.751*10^{-7}$ (0.802)
LT Debt as propn of total mkt cap	$-4.491*10^{-4}$*** (4.499)	$-3.666*10^{-5}$ (0.187)	-0.0011*** (4.909)	-0.0017*** (4.121)	-0.0083*** (6.849)	-0.0024 (1.068)
Free cash flow scaled by ttl assets	$-9.730*10^{-4}$*** (6.755)	$9.450*10^{-5}$ (0.482)	-0.0032*** (9.441)	$7.497*10^{-4}$ (1.830)	0.0011 (0.646)	$9.425*10^{-4}$ (0.407)
SIC wtd Herfindahl index computed using distance	-0.0014*** (4.059)	-0.0013 (1.751)	-0.0023** (2.786)	$-4.518*10^{-4}$ (0.304)	-0.0011 (0.257)	-0.0071 (0.850)
Regulated energy utilities	-0.0012*** (11.923)	0.0011 (1.235)	-0.0044*** (18.985)	0.0055** (2.948)	-0.0061*** (5.082)	-0.0156 (1.469)
Mkt cap	$2.135*10^{-8}$*** (5.811)	$7.701*10^{-9}$ (1.566)	$1.237*10^{-8}$ (1.662)	$-1.752*10^{-8}$ (1.960)	$-1.272*10^{-7}$*** (3.339)	$-3.985*10^{-9}$ (0.080)
Square of mkt cap	$-3.916*10^{-14}$*** (3.407)	$2.204*10^{-15}$ (0.143)	$1.602*10^{-14}$ (0.831)	$6.974*10^{-14}$** (3.049)	$3.363*10^{-13}$*** (3.557)	$3.491*10^{-14}$ (0.282)
Ann sales	$1.564*10^{-8}$*** (3.787)	$-2.041*10^{-8}$ (1.569)	$-2.638*10^{-8}$** (2.715)	$-4.260*10^{-8}$ (1.576)	$-2.492*10^{-7}$*** (4.923)	$-3.350*10^{-8}$ (0.221)
Square of annual sales	$-8.707*10^{-14}$** (3.216)	$1.045*10^{-13}$ (1.153)	$2.106*10^{-13}$** (3.284)	$1.638*10^{-13}$ (0.891)	$1.645*10^{-12}$*** (4.914)	$4.674*10^{-13}$ (0.450)
CEO dum	$9.163*10^{-4}$*** (13.356)	0.0011*** (15.735)	0.0050*** (31.024)	0.0046*** (32.126)	0.0089*** (10.607)	0.0103*** (12.946)
CHMN and CEO dum	$-5.263*10^{-4}$*** (7.144)	$-6.313*10^{-4}$*** (8.509)	-0.0012*** (6.627)	-0.0010*** (6.479)	0.0172*** (18.784)	0.0171*** (19.717)
CFO dum	$-8.080*10^{-5}$ (1.889)	$-5.266*10^{-5}$ (1.266)	$-3.116*10^{-5}$ (0.310)	$-1.371*10^{-4}$ (1.587)	$-8.799*10^{-4}$ (1.692)	-0.0018*** (3.690)
Exec director	$9.729*10^{-5}$** (2.706)	$4.201*10^{-4}$*** (11.178)	0.0025*** (29.434)	0.0030*** (39.134)	0.0185*** (43.164)	0.0159*** (37.459)
Female	$1.537*10^{-4}$* (1.990)	$-2.265*10^{-4}$** (2.854)	$2.761*10^{-4}$ (1.517)	$-8.930*10^{-4}$*** (5.390)	$5.787*10^{-5}$ (0.061)	-0.0014 (1.555)
Intercept	0.0040*** (10.170)	0.0028* (2.522)	0.0132*** (14.217)	0.0012 (0.524)	0.0245*** (5.060)	0.0332* (2.567)
Adj R^2	0.125	0.128	0.191	0.311	0.177	0.329
F value	6,527.562	6,722.689	10,768.88	20,595.75	9,810.092	22,454.31
No. of observations	45,697	45,697	45,697	45,697	45,697	45,697
Non-censored	33,419	33,419	41,045	41,045	44,336	44,336
Left-censored	12278	12278	4652	4652	1361	1361

***Significant at 0.1% level
**Significant at 1% level
*Significant at 5% level

Table 8. Explaining the Pay-Performance Incentive Intensity of Shares Privately Held by Executives belonging to the Group of the Top Five Most Highly Paid Executives with the Share Holding as a Proportion of Total Outstanding Shares as the Dependent Variable and incorporating both Industry and Year Dummies (not reported)

	Executive shares as propn of total outs shares at fiscal year end			
	Standard OLS	**OLS fixed effects**	**Standard Tobit**	**Tobit Fixed Effects**
Ln(Ann share turn)	-0.0051***	$-1.640*10^{-4}$	-0.0198***	-0.0068**
	(16.146)	(0.274)	(13.359)	(2.762)
Ln(bid-ask sprd)	0.0034***	0.0016*	0.0226***	0.0063*
	(9.544)	(2.285)	(11.887)	(1.974)
Inform of order flow	0.2128***	-0.0231	0.8034***	0.2454
	(4.825)	(0.416)	(4.178)	(1.166)
NASDAQ dum	0.0050***	-0.0036	0.0161***	-0.0489
	(8.395)	(0.470)	(5.651)	(0.083)
Tobins Q ratio	$8.422*10^{-4}$***	$4.192*10^{-4}$	0.0042***	0.0012
	(6.221)	(1.738)	(6.854)	(1.298)
Option holdings pay perf sens at FY start	-0.0011	0.0079	0.9046***	0.1026
	(0.041)	(0.266)	(10.455)	(1.126)
Std dev of mkt cap	$3.946*10^{-7}$*	$-1.966*10^{-9}$	$-2.051*10^{-6}$	$-3.192*10^{-6}$
	(2.141)	(0.009)	(1.279)	(1.716)
LT Debt as propn of total mkt cap	-0.0066***	$-2.925*10^{-4}$	-0.0369***	-0.0096
	(5.439)	(0.126)	(6.091)	(0.924)
Free cash flow scaled by total assets	0.0042*	$-1.722*10^{-4}$	0.0057	-0.0079
	(2.357)	(0.072)	(0.692)	(0.838)
SIC wtd Herfindahl index computed using distance	$-7.757*10^{-4}$	-0.0048	-0.0150	-0.0340
	(0.179)	(0.562)	(0.679)	(0.773)
Regulated energy utilities	-0.0021	-0.0229*	-0.0906***	-0.0354
	(1.772)	(2.080)	(12.717)	(0.060)
Mkt cap	$-1.400*10^{-7}$***	$2.126*10^{-8}$	$-4.613*10^{-8}$	$-2.710*10^{-7}$
	(3.639)	(0.413)	(0.166)	(0.785)
Square of mkt cap	$2.997*10^{-13}$**	$-6.773*10^{-14}$	$2.254*10^{-12}$***	$1.557*10^{-12}$*
	(3.136)	(0.530)	(4.081)	(2.047)
Ann sales	$-2.540*10^{-7}$***	$4.249*10^{-8}$	$-6.787*10^{-6}$***	$1.814*10^{-6}$
	(4.971)	(0.272)	(15.485)	(1.226)
Square of annual sales	$1.611*10^{-12}$***	$1.075*10^{-13}$	$3.549*10^{-11}$***	$-1.934*10^{-11}$
	(4.765)	(0.101)	(10.427)	(0.625)
CEO dum	0.0046***	0.0065***	0.0202***	0.0243***
	(5.338)	(7.872)	(6.846)	(9.122)
Chmn and CEO dum	0.0183***	0.0182***	0.0454***	0.0695***
	(19.803)	(20.256)	(14.690)	(23.058)
CFO dum	-0.0017**	-0.0024***	-0.0135***	-0.0126***
	(3.201)	(4.876)	(4.128)	(4.929)
Exec director	0.0147***	0.0115***	0.1431***	0.1251***
	(33.750)	(25.940)	(59.136)	(57.721)
Female	$9.169*10^{-4}$	$9.004*10^{-5}$	-0.0015	-0.0046
	(0.965)	(0.095)	(0.260)	(0.816)
Intercept	0.0122*	0.0311*	-0.0734**	0.0057
	(2.502)	(2.329)	(2.932)	(0.010)
Adj R^2	0.129	0.265	0.107	0.136
F value	194.795	11.579	5,472.075	7,199.756
No. of observations	45,697	45,697	45,697	45,697
Non-censored	.	.	6,965	6,965
Left-censored	.	.	38,732	38,732

***Significant at 0.1% level
**Significant at 1% level
*Significant at 5% level

Table 9. Explaining Pay-Performance Sensitivities for All Staff other than the Top Five Executives, both on a Total and Per Employee Basis and incorporating both Industry and Year Dummies (not reported)

	All Other Staff Option Grants Pay Perf. Sensitivity		**All Other Staff Option Grants Pay Perf. Sensitivity Per Employee**	
	Standard OLS	**OLS fixed effects**	**Standard OLS**	**OLS fixed effects**
Ln(Ann share turn)	0.0033*** (4.907)	0.0020 (1.748)	$-1.986*10^{-6}$ (1.026)	$-4.728*10^{-6}$ (1.535)
Ln(bid-ask sprd)	0.0051*** (6.869)	0.0075*** (5.397)	$2.103*10^{-5}$*** (9.900)	$3.260*10^{-5}$*** (8.632)
Inform of order flow	0.6351*** (6.338)	0.1557 (1.400)	0.0011*** (3.743)	$-4.838*10^{-4}$ (1.602)
NASDAQ dum	$-4.053*10^{-4}$ (0.335)		$-2.167*10^{-6}$ (0.620)	
Tobins Q ratio	$-6.779*10^{-4}$* (2.494)	$-4.465*10^{-4}$ (1.012)	$2.571*10^{-6}$** (3.280)	$6.376*10^{-6}$*** (5.291)
Executive option holdings pay perf sens at FY start	0.1047*** (6.512)	0.1302*** (4.618)	$7.624*10^{-4}$*** (16.495)	$8.374*10^{-4}$*** (10.912)
Exec shares propn of total outs shares at FY start	-0.0070 (1.862)	-0.0135 (1.773)	$-2.807*10^{-5}$** (2.585)	$-3.027*10^{-5}$ (1.462)
Std dev of mkt cap	$3.251*10^{-7}$ (0.838)	$2.876*10^{-7}$ (0.658)	$-1.021*10^{-9}$ (0.904)	$1.015*10^{-9}$ (0.848)
LT Debt as propn of total mkt cap	-0.0057* (2.251)	0.0034 (0.768)	$-5.043*10^{-5}$*** (6.860)	$-1.527*10^{-5}$ (1.265)
Free cash flow deflated by Total assets	-0.0047 (1.277)	-0.0031 (0.691)	$-1.133*10^{-4}$*** (10.648)	$-4.814*10^{-6}$ (0.393)
SIC wtd Herfindahl index computed using distance	-0.0023 (0.256)	0.0060 (0.364)	$2.093*10^{-6}$ (0.082)	$2.913*10^{-5}$ (0.651)
Regulated energy utilities	-0.0081** (3.150)	-0.0064 (0.444)	$2.101*10^{-5}$** (2.829)	$1.153*10^{-5}$ (0.296)
Mkt cap	$-4.141*10^{-8}$ (0.526)	$6.599*10^{-8}$ (0.690)	$-2.661*10^{-11}$ (0.115)	$-3.213*10^{-10}$ (1.207)
Square of mkt cap	$1.883*10^{-14}$ (0.100)	$-1.441*10^{-13}$ (0.614)	$5.083*10^{-16}$ (0.936)	$2.510*10^{-16}$ (0.394)
Ann sales	$3.231*10^{-8}$ (0.301)	$-6.067*10^{-9}$ (0.020)	$1.511*10^{-9}$*** (4.883)	$8.052*10^{-10}$ (0.964)
Square of annual sales	$-4.075*10^{-13}$ (0.586)	$-5.312*10^{-13}$ (0.257)	$-8.373*10^{-15}$*** (4.185)	$-2.599*10^{-15}$ (0.461)
Intercept	0.0390*** (3.908)	0.0321 (1.590)	$8.347*10^{-5}$** (2.902)	$8.594*10^{-5}$ (1.569)
Adj R^2	0.082	0.344	0.115	0.439
F value	21.541	3.520	30.804	4.728
No. of observations	7,167	7,079	7,091	6,999