Noise Hedging and Executive Compensation

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Overview of the Paper

- This paper challenges the conventional wisdom that options compensation incentivizes managers to *not* hedge risk; rather, we find that options encourage *some* forms of hedging, while discouraging other forms.
- The conventional wisdom overlooks the impact of options compensation on managerial incentives to ensure that earnings shocks are "informative" concerning the firm's future earnings opportunities.
- We show (analytically and empirically) that options compensation incentivizes managers to hedge "noise" risk and expose the firm to "signal" risk.

Previous Corporate Risk Management Literature

- Corporate risk management adds value by
  - reducing (the expected value of) taxes;
  - reducing (the expected value of) financial distress costs;
  - and facilitating optimal investment.
- Furthermore, the design of the managerial compensation contract is an important corporate risk management determinant.

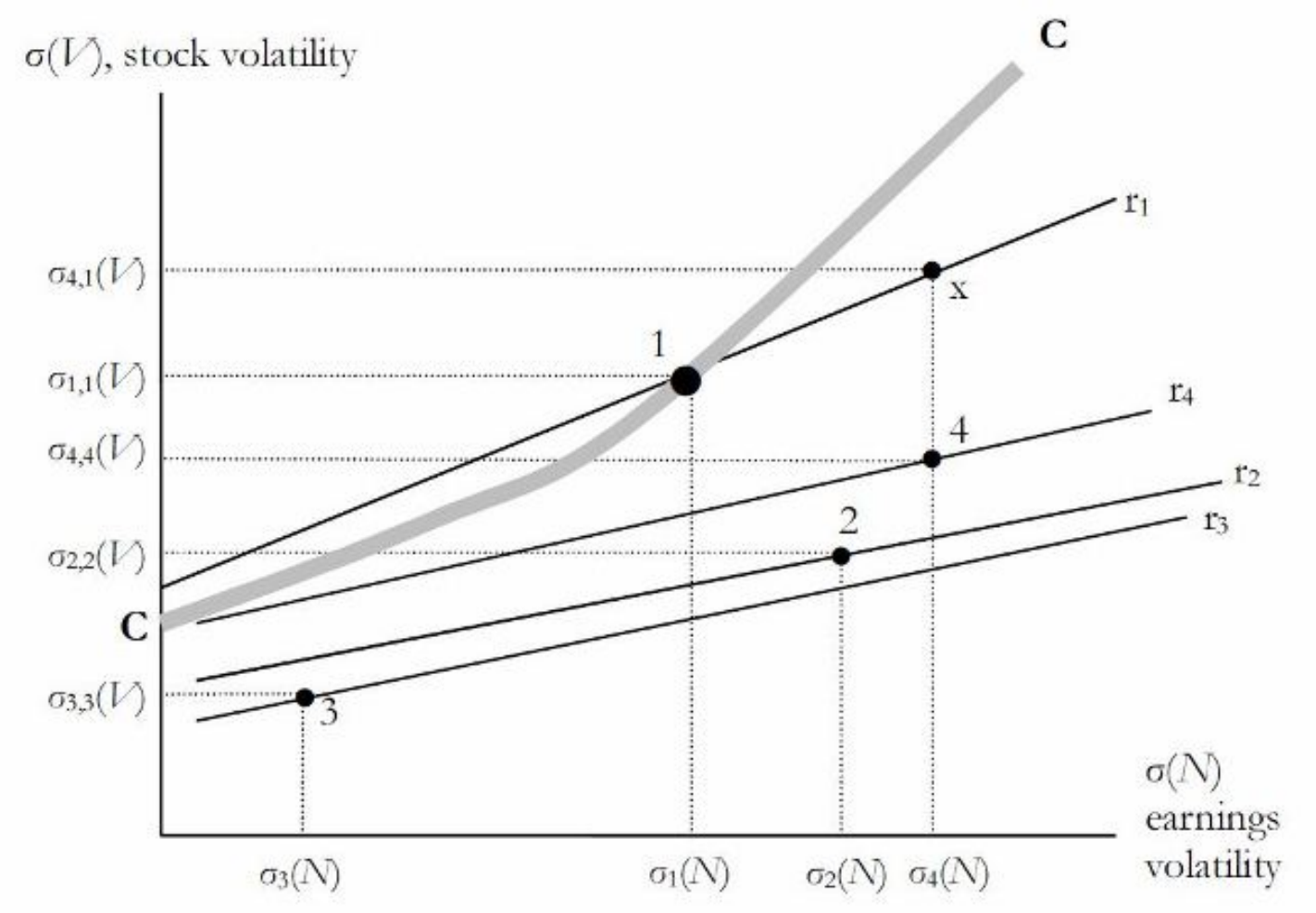
Noise versus signal

- "Noise hedging' reduces the impact of events which have no significant long-run effect on earnings, so that the firm's "true" financial condition can be seen more clearly by investors; e.g.,
  - weather-related sales and earnings shocks are (typically) temporary and can be hedged using weather derivatives.
  - catastrophic property risks can be hedged by purchasing insurance.
- "Signal" risks are "informative" risks which have a significant long-run effect on earnings; e.g., risks related to the discovery, procurement, production, and distribution of the firm's products.

Model overview

- Managers and investors observe the *overall level* of earnings; only managers can decompose earnings into informative and uninformative components.
- Managers *implement* risk management (hedging) strategy S_i and investors *believe* that strategy S_j is employed.
  - Strategy choices include 1) hedge noise (S_1), 2) hedge signal (S_2), 3) hedge noise and signal (S_3), and 4) not hedging (S_4).
- Optimal compensation contract design combines stock options and share ownership along with firing provisions, resulting in a fully revealing subgame-perfect equilibrium in which the manager retains "signal" risks but hedges "noise" risks; i.e., the equilibrium strategy-belief pair is (S_1, S_1).

Compensation Contract Design



Compensation Contract Design

$$c(\Theta, i, j) = \underbrace{-\alpha \int_{-\infty}^{F} dG(x; i, j)}_{\text{penalty function (firing trigger)}} + \underbrace{g \int_{F}^{\infty} V(x; i, j)\, dG(x; i, j)}_{\text{shares}}$$

$$+ \underbrace{h \int_{\kappa}^{\infty} [V(x; i, j) - K]\, dG(x; i, j)}_{\text{options}},$$

where $x \equiv ES_t$, $\Theta = \{\alpha, g, h, F, K\}$ is the set of investor controls, $G(x; i, j)$ is the distribution of earnings surprises when hedging strategy profile is Si-Sj, and $V(x; i, j)$ is the stock price at the end of the period corresponding to earnings surprise x when hedging strategy profile is Si-Sj.

Empirical Model Structure

- 2SLS (fixed effects) regression strategy
  - In the first (noise hedging) equation, we empirically calibrate how the choice of hedge strategy (proxied for by the earnings response coefficient), is induced by the compensation design.
  - In the second (Tobin's q) equation, we take the "fitted" noise hedging variable from the first equation and use it as a right-hand side variable to determine how the firm's market value is affected by the manager's choice of hedge strategy.

Table 1. Number of Firms by Year

Year	Number of Firms
1993	446
1995	646
1998	737
2000	673
2002	659
2004	883
Total	4,044

Table 2. Summary Statistics

Variable	N	Mean	Standard Deviation	Minimum	Maximum
NOISEHEDGE	4,044	0.7267	6.0058	-60.2172	146.7973
TOBIN'S q	4,044	2.0017	1.447	0.5552	16.6483
TDC1	4,035	$4,388.13	$8,118.21	$0.00	$230,033.70
BLK_VALUE	4,035	$2,138.13	$6,658.95	$0.00	$201,405.60
OPTION_PCT	4,035	33.03%	27.66%	0.00%	100.00%
BONUS	4,035	$766.67	$1,361.38	$0.00	$30,402.45
BONUS_PCT	4,035	19.93%	16.79%	0.00%	98.75%
STOCK_ELAST	4,044	0.9092	11.2823	-53.3213	59.0015
EARN_ELAST	4,044	0.7291	6.4121	-27.5425	33.5984
GINDEX	4,044	9.3395	2.7488	2	18
EPSEXCHG	4,044	14.39%	137.82%	-917.31%	1762.50%
LEVERAGE	4,037	0.5402	0.2106	0.026	2.1944
MKTSHARE	4,044	2.86%	6.26%	0.00%	94.78%
ADVERT_DUM	4,044	29.60%	45.65%	0.00%	100.00%
ADVERTISING	4,044	1.33%	3.91%	0.00%	58.21%
RESEARCH	4,044	2.27%	4.36%	0.00%	60.48%
RESEARCH_DUM	4,044	0.5448	0.4981	0	1
NET INCOME	4,044	$304.38	$981.49	$4,038.17	$17,046.00
SALES	4,044	$4,437.56	$9,825.23	$0.41	$171,652.00
TOTAL ASSETS	4,044	$10,434.91	$55,771.56	$59.58	$1,484,101.00
SIZE	4,044	7.4958	1.5622	4.0873	14.2103
DIVYIELD	4,044	1.47%	5.01%	0.00%	298.11%

Table 3. Fixed Effect Results for Regression Equation (26)

Variable	Coefficient	Std. Error	t-stat	prob.
INTERCEPT	7.6682	2.9878	2.5700	0.0100
OPTION_PCT	0.0130	0.0069	1.8900	0.0600
BONUS_PCT	0.0086	0.0103	0.8400	0.4020
LEVERAGE	-0.1540	1.4575	-0.1100	0.9160
GINDEX	-0.0986	0.1527	-0.6500	0.5180
SIZE	-0.9551	0.3938	-2.4300	0.0150
DIVYIELD	-0.0059	0.0242	-0.2400	0.8080
Indicator for 1995	1.0314	0.4378	2.3600	0.0190
Indicator for 1998	0.5026	0.5009	1.0000	0.3160
Indicator for 2000	0.9922	0.5575	1.7800	0.0750
Indicator for 2002	-0.1385	0.6026	-0.2300	0.8180
Indicator for 2004	1.0663	0.6434	1.6600	0.0980
R^2	1.23%			
N	4,028			

Table 4. Fixed Effect Results for Regression Equation (27)

Variable	Coefficient	Std. Error	t-stat	prob.
INTERCEPT	2.6347	0.2381	11.0700	0.0000
NOISEHEDGE	0.0092	0.0029	3.1500	0.0020
STOCK_ELAST	0.0028	0.0016	1.7200	0.0850
EARN_ELAST	0.0041	0.0029	1.4200	0.1560
EPSEXCHG	0.0007	0.0001	4.7200	0.0000
GINDEX	0.0041	0.0218	0.1900	0.8510
LEVERAGE	-0.8846	0.2074	-4.2700	0.0000
ADVERTISING	0.8841	1.0040	0.8800	0.3790
ADVERT_DUM	-0.2638	0.0799	-3.3000	0.0010
RESEARCH	2.6747	1.2349	2.1700	0.0300
RESEARCH_DUM	-0.1970	0.1470	-1.3400	0.1810
MKTSHARE	-2.0489	0.8472	-2.4200	0.0160
Indicator for 1995	0.1589	0.0664	2.3900	0.0170
Indicator for 1998	0.1501	0.0685	2.1900	0.0290
Indicator for 2000	-0.3730	0.0717	-5.2000	0.0000
Indicator for 2002	-0.1376	0.0707	-1.9400	0.0520
Indicator for 2004	2.6347	0.2381	11.0700	0.0000
R^2	8.04%			

Conclusion: Theory

- This paper
  - connects hedging strategy, shareholder welfare, and management incentives, through their respective roles in the revelation of information about a firm's earnings and its stock price;
  - analyzes how noise versus signal hedging affect the volatility of the stock price as well as the volatility of earnings.
  - explains an apparent paradox; i.e., investors incentivize managers to hedge noise (but not signal) via stock option compensation.

Conclusion: Evidence

- Our empirics: Firms which offer their CEO's proportionately higher options-related compensation exhibit stronger stock price responses to earnings changes and have higher Tobin's q's.
- Other empirics
  - Tufano (1996) does not distinguish between informative and uninformative risk; however, since gold price shocks are presumably "signal" shocks for gold firms, his finding (that managers compensated with options will tend not to hedge gold price risk) is not inconsistent with our model's predictions (i.e., don't hedge signal!).

Conclusion: Final Remarks

- Noise hedging is the most informationally efficient strategy among the four strategy alternatives. It makes earnings shocks as informative as possible, and results in the highest stock price volatility and sensitivity to new information.
- Finally, our empirical study shows that firms which offer their CEO's proportionately higher options-related compensation exhibit stronger stock price responses to earnings changes and have higher Tobin's q's.