Noise Hedging and Executive Compensation

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This paper challenges the conventional wisdom that options discourage managers from hedging.

The problem with the conventional wisdom is that it overlooks the impact of options compensation on managerial incentives to ensure that earnings shocks are “informative”.

We show (analytically and empirically) that options compensation actually encourages “noise” hedging.
First, we describe and define 1) the earnings generation process, 2) how earnings expectations by managers ("insiders") and investors ("outsiders") are determined, and 3) how earnings surprises have informational content for investors.

Next, we describe hedging strategies available to managers (hedge noise, hedge signal, hedge noise and signal and not hedging) and derive the informational content of earnings surprises under each strategy. We find that noise hedging is the most informationally efficient hedging strategy.
The following step is to show that noise hedging results in the greatest stock price volatility. We then develop a compensation scheme which induces managers to pursue that strategy in equilibrium.

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.
Notation

- \( N_t = N_0 + \sum_{j=0}^{t-1} \phi^{t-j} m_j \), where \( \phi \) is the rate of decay of informative shocks, assumed deterministic and known to all parties;
- \( m_t \) is a random shock to period-\( t \) cash flow that carries information about future cash flow, whereas \( u_t \) is an uninformative random shock;
Notation (continued)

- \( E(\cdot) \) without superscript denotes expectation with full information on \( N_t, m_t \) and \( u_t \);
- \( E^I(\cdot) \) denotes expectation held by investors with incomplete information on \( N_t, m_t \) and \( u_t \); and
- \( E_t(\cdot) \) denotes expectation at the beginning of period \( t \).
Earnings surprises with full information

We start by modeling managerial earnings expectations, in that all three components of earnings are known:

\[ N_0 = \underline{N}_0 + m_0 + u_0. \]  \hspace{1cm} (1)

Since \( E(m) = E(u) = 0 \), the beginning-of-period earnings expectation is:

\[ E_0(\underline{N}_0) = \underline{N}_0. \]  \hspace{1cm} (2)
Similarly, for any period $t$, the realized value of earnings is

$$N_t = N_0 + \sum_{j=0}^{t-1} \phi^{t-j} m_j + m_t + u_t$$

$$= N_0 + \phi [(N_{t-1} - N_0) - u_{t-1}] + (m_t + u_t) \quad (3)$$

Thus the manager holds the period $t$ expectation

$$E_t(N_t) = N_0 + \phi [(N_{t-1} - N_0) - u_{t-1}] \quad (4)$$
Earnings surprises with partial information

At \( t-1 \), investors observe \( N_{t-1} \) but not its composition. Thus investors form conditional expectations

\[
E^I_t(m_{t-1}) = E(m_{t-1} | N_0, \ldots, N_{t-1}) \quad \text{and} \quad E^I_t(u_{t-1}) = E(u_{t-1} | N_0, \ldots, N_{t-1}).
\]

At \( t \), investors hold the following conditional expectation on \( N_t \):

\[
E^I_t(N_t) = N_0 + \sum_{j=0}^{t-1} \phi^{t-j} E(m_j | N_0, \ldots, N_{t-1})
\]

\[
= N_0 + \phi [(N_{t-1} - N_0) - E(u_{t-1} | N_0, \ldots, N_{t-1})]. \quad (5)
\]
Informational content of earnings surprises

A key element of our analysis is the stock price response to earnings announcements. Since we wish to evaluate the merits of options in executive compensation, we are interested in the effect of earnings surprises on stock price volatility.

\[ ES_t = N_t - \mathbb{E}_t^I(N_t) = (m_t + u_t) - \varphi[(u_{t-1} - \mathbb{E}(u_{t-1})|N_0, \ldots, N_{t-1})]. \] (6)
The equity value immediately before the earnings announcement at period $t$ is:

$$V_t^- = \frac{N_0}{k} + \frac{E^I_t (N_t - N_0)}{k + (1 - \varphi)(1 - k)} \equiv \frac{N_0}{k} + \frac{E^I_t (N_t - N_0)}{\hat{k}},$$

where $k$ represents the cost of equity capital and $\hat{k} \equiv k + (1 - \varphi)(1 - k)$. Immediately after the announcement the equity value will be

$$V_t^+ = N_t + (1 - k)\left(\frac{N_0}{k} + \frac{E^I_{t+1} (N_{t+1} - N_0)}{\hat{k}}\right).$$
The equity value immediately before the next earnings announcement (at $t+1$) will be

$$V_{t+1}^- = \frac{N_0}{k} + \frac{E_{t+1}^I (N_{t+1} - N_0)}{\hat{k}}. \quad (9)$$

Thus, the change in share price forecast with the announcement of $N_t$ will be:

$$\Delta V = V_{t+1}^- - E_t^I (V_{t+1}^-) = \frac{E_{t+1}^I (N_{t+1}) - E_t^I (N_{t+1})}{\hat{k}}, \quad (10)$$

The *information content* of an earnings announcement, $IC_t$, is the numerator of equation (10).
STRATEGY S1: Firm hedges only uninformative shocks $u$

\[ Y_t = N_t - u_t = N_0 + \varphi[(N_{t-1} - N_0) - u_{t-1}] + m_t \]
\[ = N_0 + \varphi(Y_{t-1} - N_0) + m_t \]  \hspace{1cm} (11)

\[ E_t^I(Y_t) = N_0 + \varphi[(N_{t-1} - N_0) - u_{t-1}] \]
\[ = N_0 + \varphi(Y_{t-1} - N_0). \]  \hspace{1cm} (12)

Under S1 (noise hedging), there is no information asymmetry; (11) and (12) apply for both managers and investors. Thus,

\[ ES_t = Y_t - E_t^I(Y_t) = m_t, \]  \hspace{1cm} (13)

and

\[ IC_t = \varphi ES_t = \varphi m_t. \]  \hspace{1cm} (14)
Proposition 1. If investors’ beliefs correspond with hedge strategies chosen by managers and if $\phi < 1$, then the informative shock, $m$, is fully revealed in announced earnings if and only if managers hedge only the uninformative risk.
STRATEGY S2: Firm hedges only informative shocks $m$

\[
Y_t = N_t - m_t \\
= N_0 + \varphi[(N_{t-1} - N_0 - u_{t-1}) + u_t \\
= N_0 + \varphi[(Y_{t-1} - N_0) + m_{t-1} - u_{t-1}] + u_t
\]

(15)

\[
E_t^I(Y_t) = N_0 + \varphi[(Y_{t-1} - N_0) + E(m_{t-1}|N_0, \ldots, N_{t-1}) \\
- E(u_{t-1}|N_0, \ldots, N_{t-1})].
\]

(16)

Signal hedging also worsens the information asymmetry between managers and investors by purging signal and leaving noise in place; thus

\[
IC_t = \varphi[ES_t - E(m_t|N_0, \ldots, N_t) + E(u_t|N_0, \ldots, N_t)].
\]

(18)
STRATEGY S3. Firm hedges informative shocks $m$ and uninformative shocks $u$

\[
Y_t = N_t - m_t - u_t \\
= N_0 + \varphi[(Y_{t-1} - N_0) + m_{t-1}],
\]

\hspace{1cm} (19)

and

\[
E^I_t(Y_t) = N_0 + \varphi[(Y_{t-1} - N_0) + E(m_{t-1}|N_0, \ldots, N_{t-1})].
\]

\hspace{1cm} (20)
$ES_t = \varphi m_{t-1}$. \hspace{1cm} (21)

$I C_t = \varphi ES_t = \varphi^2 m_{t-1}$. \hspace{1cm} (22)
As shown previously, with full information, the firm will hedge neither signal nor noise. Thus the realized value of earnings is

\[
N_t = N_0 + \sum_{j=0}^{t-1} \phi^{t-j} m_j + m_t + u_t
\]

\[
= N_0 + \varphi [(N_{t-1} - N_0) - u_{t-1}] + (m_t + u_t) \quad (3)
\]

and the manager holds the period t expectation

\[
E_t(N_t) = N_0 + \varphi [(N_{t-1} - N_0) - u_{t-1}]. \quad (4)
\]
Assumptions

- Assumption A1(a): Investors are mean-variance optimizers (have quadratic utility).

- Assumption A1(b): Earnings shocks are normally distributed.

Note: Assumptions A1 justify the use of the Kalman filter technique, which is required in order to prove the corollary to Proposition 2, which is that hedging strategy S1 (noise hedging) results in the greatest stock price volatility amongst the four possible strategies that are considered. Technically, if Assumptions A1 hold, then the Kalman filter technique yields the best linear approximation of the current state and the forecast of a future state when only the first two moments of the distribution of shocks are known.

- Assumption A2: Managers use the same hedging strategy in every period and the same compensation scheme has been in place for a long time.
Assumptions (continued)

- Assumption A3: Informative ("m") shocks have a non-degenerate distribution.
  
  In other words, it’s possible to calculate the variance of the informative shocks ("m") distribution.

- Assumption A4: The uninformative earnings shocks are uncorrelated with the price of the market portfolio of securities.
  
  This assumption ensures that noise hedging does not alter the firm’s beta and cost of capital.
Hedging strategy and stock price volatility

Proposition 2.

(a) If investors can either observe or infer the hedging strategy, assumptions A1–A3 hold, and informative shocks decay exponentially with time ($\varphi < 1$), then:

1. $\text{Var}(IC_t^{(1)}) > \text{Var}(IC_t^{(3)})$;

2. $\text{Var}(IC_t^{(1)}) \geq \text{Var}(IC_t^{(4)})$ and $\text{Var}(IC_t^{(3)}) \geq \text{Var}(IC_t^{(2)})$

where, in both cases, equalities hold if the distribution of uninformative shocks is degenerate ($\sigma_u = 0$) and, keeping other things equal, $\text{Var}(IC_t^{(2)})$ and $\text{Var}(IC_t^{(4)})$ decrease monotonically as $\sigma_u$ increases; and

3. There is a value of $\sigma_u / \sigma_m$ for which $\text{Var}(IC_t^{(4)}) = \text{Var}(IC_t^{(3)})$ and above which $\text{Var}(IC_t^{(4)}) < \text{Var}(IC_t^{(3)})$. 
(b) If there is no decay of informative shocks ($\varphi = 1$), then $\text{Var}(IC_t^{(i)})$ is independent of hedging strategy.

If A4 holds, the same statements can be made of stock price variances; in particular:

**Corollary.** If A4 holds and $\varphi < 1$, hedging strategy S1 results in greatest stock price volatility.
Compensation Contract Design

The diagram illustrates the relationship between stock volatility ($\sigma(V)$) and earnings volatility ($\sigma(N)$) in the context of compensation contract design. The graph shows different lines labeled $r_1$, $r_2$, $r_3$, and $r_4$, each representing different risk-return trade-offs. Points 1, 2, 3, and 4 on the graph indicate specific combinations of stock and earnings volatility, which are critical in assessing the effectiveness of compensation contracts in hedging against noise.

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Figure 1 depicts potential equilibria shown in the stock volatility/earnings volatility $\sigma_{i,j}(V), \sigma_i(N)$ space. Figure 1 has been drawn to show inequalities derived under Proposition 2 and its corollary:

\[
\begin{align*}
\sigma_{1,1}(V) &> \sigma_{2,2}(V) ; \sigma_{3,3}(V) ; \sigma_{4,4}(V) \\
\sigma_4(N) &> \sigma_1(N) ; \sigma_2(N) ; \\
\sigma_1(V) &< \sigma_1(N) ; \sigma_2(N) ; \text{ and} \\
r_1 &> r_2 : r_3 : r_4
\end{align*}
\]
Compensation Contract Design (continued)

\[
c(\Theta, i, j) = -\alpha \int_{-\infty}^{F} dG(x; i, j) + g \int_{F}^{\infty} V(x; i, j) dG(x; i, j)
\]

penalty function (firing trigger)

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

shares

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 \( Si-Sj \).
Noise Hedging Equation

\[
NOISEHEDG E_{j,t} = \alpha_0 + \alpha_1 \text{OPTION}_P C T_{j,t} + \alpha_2 \text{BONUS}_P C T_{j,t} \\
+ \alpha_3 \text{LEVERAGE}_{j,t} + \alpha_4 \text{GINDEX}_{j,t} + \alpha_5 \text{SIZE}_{j,t} \\
+ \alpha_6 \text{DIVYIELD}_{j,t} + \sum_{t=2}^{6} \alpha_{t+5} \text{YEAR}_t + \varepsilon_{j,t}.
\] (26)

where

\[
NOISEHEDG E_{j,t} = \frac{\text{TRS1YR}_{j,t}}{\text{EPSEXCHG}_{j,t}} \\
= \frac{\text{% change in stock price (incl dividends)}_{j,t}}{\text{% change in earnings}_{j,t}}.
\]
Option Percent and Bonus Equations

\[ \text{OPTION\_PCT}_{j,t} = \frac{\text{BLK\_VALUE}_{j,t}}{TDC_{1,j,t}} \]

= % of firm j’s year t

CEO compensation in the form of options; and

\[ \text{BONUS\_PCT}_{j,t} = \frac{\text{BONUS}_{j,t}}{TDC_{1,j,t}} \]

= % of firm js year t CEO compensation

in the form of bonuses.
### Leverage and Index Equations

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>( LEVERAGE_{j,t} )</td>
<td>firm ( j )'s year ( t ) total liabilities/firm ( j )'s year ( t ) total assets = Compustat Data Item 45/Compustat Data Item 12</td>
</tr>
<tr>
<td>( GINDEX_{j,t} )</td>
<td>the Gompers, Ishii, and Metrick (2003) governance index for firm ( j ) in year ( t )</td>
</tr>
<tr>
<td>( SIZE_{j,t} )</td>
<td>( \ln(\text{firm } j \text{'s year } t \text{ book value of assets}) = \text{natural logarithm of Compustat Data Item 12} )</td>
</tr>
<tr>
<td>( DIVYIELD_{j,t} )</td>
<td>firm ( j )'s year ( t ) dividend/firm ( j )'s year ( t ) stock price</td>
</tr>
</tbody>
</table>
Tobin’s $q$ and other Equations

\[
\text{TOBIN'S } q_{j,t} = \beta_0 + \beta_1 \text{NOISEHEDGE}_{j,t} + \beta_2 \text{STOCK ELAST}_{T_j,t} \\
+ \beta_3 \text{EARN ELAST}_{T_j,t} + \beta_4 \text{EPSEXCHG}_{j,t} \\
+ \beta_5 \text{GINDEX}_{j,t} + \beta_6 \text{LEVERAG}_{E_j,t} \\
+ \beta_7 \text{ADVERTISING}_{G_j,t} + \beta_8 \text{ADVERT}_{DUM}_{j,t} \\
+ \beta_9 \text{RESEARCH}_{H_j,t} + \beta_{10} \text{RESEARCH}_{DUM}_{j,t} \\
+ \beta_{11} \text{MKTSHARE}_{E_j,t} + \xi_{j,t}. \tag{27}
\]
Tobin’s q and other Equations

where

\[ \text{STOCK\_ELAST}_{j,t} = \frac{TDC1\_PCT_{j,t}}{\text{TRS1YR}_{j,t}}; \]
\[ \text{EARN\_ELAST}_{j,t} = \frac{TDC1\_PCT_{j,t}}{\text{EPSEXCHG}_{j,t}}; \]
\[ \text{EPSEXCHG}_{j,t} = \text{firm } j\text{'s year } t \text{ percentage change in earnings;} \]
\[ \text{GINDEX}_{j,t} = \text{the Gompers, Ishii, and Metrick governance index for firm } j \text{ in year } t; \]
\[ \text{ADVERTISING}_{j,t} = \text{firm } j\text{'s year } t \text{ advertising expenses as a percentage of total assets} = \text{Compustat Data Item 45/Compustat Data Item 12;} \]
\[ \text{ADVERT}_{DUM}_{j,t} = 0 \text{ if Compustat Data Item 45 is missing, and 1 otherwise;} \]
\[ \text{RESEARCH}_{j,t} = \text{firm } j\text{'s year } t \text{ research and development expenses as a percentage of total assets} = \text{Compustat Data Item 46/Compustat Data Item 12;} \]
\[ \text{RESEARCH}_{DUM}_{j,t} = 0 \text{ if Compustat Data Item 46 is missing, and 1 otherwise;} \] and
\[ \text{MKTSHARE}_{j,t} = \text{percent of firm } j\text{'s year } t \text{ sales as a percent of total industry year } t \text{ sales, where the industry is defined at the 3-digit NAICS level.} \]
### Table 1. Number of Firms by Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>446</td>
</tr>
<tr>
<td>1995</td>
<td>646</td>
</tr>
<tr>
<td>1998</td>
<td>737</td>
</tr>
<tr>
<td>2000</td>
<td>673</td>
</tr>
<tr>
<td>2002</td>
<td>659</td>
</tr>
<tr>
<td>2004</td>
<td>883</td>
</tr>
<tr>
<td>Total</td>
<td>4,044</td>
</tr>
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</table>
Table 2. Summary Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOISEHEDGE</td>
<td>4,044</td>
<td>0.7267</td>
<td>6.0068</td>
<td>-60.2172</td>
<td>146.7973</td>
</tr>
<tr>
<td>TOBIN’S q</td>
<td>4,044</td>
<td>2.0017</td>
<td>1.447</td>
<td>0.5552</td>
<td>16.6483</td>
</tr>
<tr>
<td>TDC1</td>
<td>4,035</td>
<td>$4,388.13</td>
<td>$8,118.21</td>
<td>$0.00</td>
<td>$230,033.70</td>
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<tr>
<td>BLK_VALUE</td>
<td>4,035</td>
<td>$2,138.13</td>
<td>$6,658.95</td>
<td>$0.00</td>
<td>$201,405.60</td>
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<tr>
<td>OPTION_PCT</td>
<td>4,035</td>
<td>33.03%</td>
<td>27.66%</td>
<td>0.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>BONUS</td>
<td>4,035</td>
<td>$766.67</td>
<td>$1,361.38</td>
<td>$0.00</td>
<td>$30,402.45</td>
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<tr>
<td>BONUS_PCT</td>
<td>4,035</td>
<td>19.93%</td>
<td>16.79%</td>
<td>0.00%</td>
<td>98.75%</td>
</tr>
<tr>
<td>STOCK_ELAST</td>
<td>4,044</td>
<td>0.9092</td>
<td>11.2823</td>
<td>-53.3213</td>
<td>59.0015</td>
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<tr>
<td>EARN_ELAST</td>
<td>4,044</td>
<td>0.7291</td>
<td>6.4121</td>
<td>-27.5425</td>
<td>33.5984</td>
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<tr>
<td>GINDEX</td>
<td>4,044</td>
<td>9.3305</td>
<td>2.7488</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>EPSEXCHG</td>
<td>4,044</td>
<td>14.39%</td>
<td>137.82%</td>
<td>-917.31%</td>
<td>1762.50%</td>
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<tr>
<td>LEVERAGE</td>
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<td>0.5402</td>
<td>0.2106</td>
<td>0.026</td>
<td>2.1944</td>
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<td>MKTSHARE</td>
<td>4,044</td>
<td>2.86%</td>
<td>6.26%</td>
<td>0.00%</td>
<td>94.78%</td>
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<tr>
<td>ADVERT_DUM</td>
<td>4,044</td>
<td>29.60%</td>
<td>45.65%</td>
<td>0.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>ADVERTISING</td>
<td>4,044</td>
<td>1.33%</td>
<td>3.91%</td>
<td>0.00%</td>
<td>58.21%</td>
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<td>RESEARCH</td>
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<td>2.27%</td>
<td>4.36%</td>
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<td>60.48%</td>
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<td>RESEARCH_DUM</td>
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<td>0.5448</td>
<td>0.4981</td>
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<td>NET INCOME</td>
<td>4,044</td>
<td>$304.38</td>
<td>$981.49</td>
<td>$4,038.17</td>
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<td>SALES</td>
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<td>$4,437.56</td>
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<td>$171,652.00</td>
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<td>TOTAL ASSETS</td>
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<td>$10,434.91</td>
<td>$55,771.56</td>
<td>$59.58</td>
<td>$1,484,101.00</td>
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<td>SIZE</td>
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<td>7.4958</td>
<td>1.5622</td>
<td>4.0873</td>
<td>14.2103</td>
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<tr>
<td>DIVYIELD</td>
<td>4,044</td>
<td>1.47%</td>
<td>5.01%</td>
<td>0.00%</td>
<td>298.11%</td>
</tr>
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</table>
Table 3. Fixed Effect Results for Regression Equation (26)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-stat</th>
<th>prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERCEPT</td>
<td>7.6682</td>
<td>2.9878</td>
<td>2.5700</td>
<td>0.0100</td>
</tr>
<tr>
<td>OPTION_PCT</td>
<td>0.0130</td>
<td>0.0069</td>
<td>1.8900</td>
<td>0.0600</td>
</tr>
<tr>
<td>BONUS_PCT</td>
<td>0.0086</td>
<td>0.0103</td>
<td>0.8400</td>
<td>0.4020</td>
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<tr>
<td>LEVERAGE</td>
<td>-0.1540</td>
<td>1.4575</td>
<td>-0.1100</td>
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<tr>
<td>GINDEX</td>
<td>-0.0986</td>
<td>0.1527</td>
<td>-0.6500</td>
<td>0.5180</td>
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<tr>
<td>SIZE</td>
<td>-0.9551</td>
<td>0.3938</td>
<td>-2.4300</td>
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<td>DIVYIELD</td>
<td>-0.0059</td>
<td>0.0242</td>
<td>-0.2400</td>
<td>0.8080</td>
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<tr>
<td>Indicator for 1995</td>
<td>1.0314</td>
<td>0.4378</td>
<td>2.3600</td>
<td>0.0190</td>
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<tr>
<td>Indicator for 1998</td>
<td>0.5026</td>
<td>0.5009</td>
<td>1.0000</td>
<td>0.3160</td>
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<tr>
<td>Indicator for 2000</td>
<td>0.9922</td>
<td>0.5575</td>
<td>1.7800</td>
<td>0.0750</td>
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<tr>
<td>Indicator for 2002</td>
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<td>0.6026</td>
<td>-0.2300</td>
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<tr>
<td>Indicator for 2004</td>
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<td>0.6434</td>
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<td>0.0980</td>
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</tbody>
</table>

R²: 1.23%
N: 4,028
Table 4. Fixed Effect Results for Regression Equation (27)

<table>
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<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-stat</th>
<th>prob.</th>
</tr>
</thead>
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<td>0.2381</td>
<td>11.070</td>
<td>0.0000</td>
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<tr>
<td>NOISEHEDGE</td>
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<td>0.0029</td>
<td>3.1500</td>
<td>0.0020</td>
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<td>STOCK_ELAST</td>
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<td>0.0016</td>
<td>1.7200</td>
<td>0.0850</td>
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<td>EARN_ELAST</td>
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<td>0.0029</td>
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<td>EPSEXCHG</td>
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<td>0.1900</td>
<td>0.8510</td>
</tr>
<tr>
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<td>0.2074</td>
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<tr>
<td>ADVERTISING</td>
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<td>1.0040</td>
<td>0.8800</td>
<td>0.3790</td>
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<tr>
<td>ADVERT_DUM</td>
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<td>0.0799</td>
<td>-3.3000</td>
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<tr>
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<td>0.0300</td>
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<td>0.1470</td>
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<td>MKTSHARE</td>
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<td>0.0160</td>
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<td>0.2381</td>
<td>11.0700</td>
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</table>

R²: 8.04%
N: 4,037
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 (e.g., buy insurance, hedge “non-core” risks) by 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**
  - Noise hedging increases the information content of earnings, earnings forecast accuracy and the earnings response coefficient (DeMarzo and Duffie (1995) and Breeden and Viswanathan (1998)).
  - Tufano (1996) does not distinguish between informative and uninformative risk; however, since gold price shocks are ”m” 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!).