Additional Notes for "Trends in Corporate Governance"

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Proof of Claim in Footnote 34

While it is true that a consequence of flatter hierarchies is more monitoring, this does not necessarily translate into a demand for tougher monitors (*i.e.,* greater δ). Regardless of δ, *all* boards monitor more in response to a flatter hierarchy. Shareholders will only demand tougher monitors if the consequence of a flatter hierarchy is to increase the marginal benefit of tougher monitors. How a flatter hierarchy affects this marginal benefit is potentially indeterminant. To see this, suppose that shareholders' preferences are captured by

$$\lambda\big(P^*V + (1 - P^*)\mu\big) - K(\delta)\,, \tag{1}$$

where $\lambda \in (0, 1]$ is the portion of expected firm value captured by the shareholders and $K(\cdot)$ is the cost of imposing and maintaining a board whose diligence level is δ.[1] The marginal benefit to increased diligence is, thus,

$$\lambda \frac{\partial P^*}{\partial \delta}(V - \mu)\,. \tag{2}$$

If (2) is decreasing in μ, then a consequence of flatter hierarchies will be to raise the demand for greater board diligence. Differentiating (2) with respect to μ yields:

$$\lambda \times \left(\underbrace{\frac{\partial P^*}{\partial \delta}}_{(+)} \underbrace{(\Phi - 1)}_{(-)} + \frac{\partial^2 P^*}{\partial \mu \partial \delta} \underbrace{(V - \mu)}_{(+)} \right)\;; \tag{3}$$

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[1] It seems reasonable to suppose that enhancing the diligence of the board is not without cost to the shareholders because otherwise why isn't every board maximally diligent?

hence, a sufficient condition for (2) to be decreasing in μ is that

$$\frac{\partial^2 P^*}{\partial\mu\partial\delta} \leq 0\,;$$

which holds, for example, if the directors' cost function, $c(\cdot)$, is $p^2/2$, for then $P^* = \delta(V-\mu)$, the cross-partial derivative of which is $\Phi - 1 < 0$.

Derivation of Expression 17

The CEO loses his job if

$$\hat{\mu} = \frac{\tau\mu + sy}{\tau + s} < -\Delta\,.$$

Hence, the cutoff condition (the analog of expression (2)) becomes

$$y < -\frac{\tau+s}{s}\Delta - \frac{\tau}{s}\mu \equiv \hat{Y}\,. \tag{4}$$

The firm's expected earnings if the board will receive the signal y are

$$\hat{V} = \int_{-\infty}^{\infty} \max\left\{-\Delta, \frac{\tau\mu+sy}{\tau+s}\right\}\sqrt{\frac{H}{2\pi}}e^{-\frac{H}{2}(y-\mu)^2}dy\,,$$

which, making the change of variables $z = \sqrt{H}(y-\mu)$, can be written

$$\begin{aligned} &= \int_{-\infty}^{\sqrt{H}(\hat{Y}-\mu)} -\Delta\phi(z)dz + \int_{\sqrt{H}(\hat{Y}-\mu)}^{\infty} \frac{\tau\mu + s\left(\mu + \frac{z}{\sqrt{H}}\right)}{\tau+s}\phi(z)dz \\ &= -\Delta\Phi\big(\sqrt{H}(\hat{Y}-\mu)\big) + \mu\left[1 - \Phi\big(\sqrt{H}(\hat{Y}-\mu)\big)\right] + \int_{\sqrt{H}(\hat{Y}-\mu)}^{\infty}\frac{\sqrt{H}}{\tau}z\phi(z)dz\,, \end{aligned} \tag{5}$$

where (5) uses the definition of H to simplify from the previous line. Hence,

$$\hat{V} = -\Delta\Phi\big(\sqrt{H}(\hat{Y}-\mu)\big) + \mu\left[1 - \Phi\big(\sqrt{H}(\hat{Y}-\mu)\big)\right] + \frac{\sqrt{H}}{\tau}\phi\big(\sqrt{H}(\hat{Y}-\mu)\big)\,,$$

which, using the symmetry of the standard normal about 0, can be written as

$$= (\mu+\Delta)\Phi\big(-\sqrt{H}(\hat{Y}-\mu)\big) + \frac{\sqrt{H}}{\tau}\phi\big(\sqrt{H}(\hat{Y}-\mu)\big) - \Delta\,. \tag{6}$$

From (4),

$$\hat{Y} - \mu = -\frac{\tau+s}{s}(\mu+\Delta)\,.$$

Using the definition of H, this yields

$$-\sqrt{H}(\hat{Y}-\mu) = \frac{\tau}{\sqrt{H}}(\mu+\Delta)\,.$$

Substituting the last expression into (6) yields expression (17) in the paper.