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Dividend Signaling and Smoothing: A Note

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DIVIDEND SIGNALING AND SMOOTHING: A NOTE

ABSTRACT

This paper examines how a change in the firm's risk (thus, the firm's intrinsic value) affects optimal dividends when dividends serve to signal shareholders of the firm's value. If the signaling cost of dividend is less than a certain amount, managers have incentives to smooth dividend payout. An increase in the firm's risk (i.e., a decrease in the firm's intrinsic value) may lead the manager to increase dividends.
Introduction

Since Lintner [7], it has been a well-known fact that managers smooth dividend payout. In recent years, dividend smoothing has become an important issue in the study of stock market rationality; see Marsh and Merton [8, 9] and Kleidon [6, p.976]. For example, Marsh and Merton [8] suggest

If stock prices are rational, then why do dividends exhibit so little volatility relative to stock prices? ... managers choose dividend policies so as to smooth the effect of changes in intrinsic values (and hence, rational stock prices) on the change in dividends (p.495).

The objective of this paper is to integrate the dividend smoothing behavior into the signaling theory of dividends developed by Bhattacharya [3, 4] and others.\(^1\) Though the signaling theory has emerged to be a plausible explanation about why firms pay dividends,\(^2\) none of the earlier studies have explicitly considered the dividend smoothing behavior within the signaling equilibrium framework.

In brief, it will be shown that if the signaling cost of dividends is less than a certain amount, a decrease in the firm's intrinsic value leads the manager to increase dividends.

I. Model

For pedagogical purpose, the Bhattacharya model is simplified by the following assumptions, A1 through A7.

A1. There are two states of world and two periods. The beginning of the first period is denoted by \(t = 0\), the end of the first period by \(t = 1\), and the end of the second period by \(t = 2\).

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\(^1\) See John and Williams [5], Miller and Rock [10], and Ambarish, John and Williams [1], among others.

A2. There are two groups of risk averse shareholders, original shareholders and outside shareholders. Original shareholders sell the firm to outside shareholders at $t = 1$. Shareholders' certainty equivalent to random return, $R$, is expressed as $E(R) - \theta \sigma^2(R)$; where $E$ is the expectations operator, $\theta$ ($> 0$) is the risk aversion parameter, and $\sigma^2$ is the variance operator.

A3. There are two types of investment projects. At $t = 0$, the manager, acting on behalf of original shareholders, chooses either project g or project b. The manager's project choice is unobservable to outside shareholders. The costs of undertaking projects g and b are, respectively, $C_g$ and $C_b$; where $C_g > C_b$.

A4. The firm's realized earnings are also unobservable to outside shareholders. Let random variables $R_g$ and $R_b$ be earnings of projects g and b, respectively, at the end of each period with the following probability distributions:

\[
\begin{align*}
R_g & \quad \begin{cases} 
X + \beta e & \text{(state 1)} \\
X - \beta e & \text{(state 2)}
\end{cases} \\
R_b & \quad \begin{cases} 
X + e & \text{(state 1)} \\
X - e & \text{(state 2)}
\end{cases}
\end{align*}
\]

where $e$ is a positive constant, and $0 < \beta < 1$. The probability distributions are common knowledge. $E(R_g) = E(R_b)$, but $\sigma^2(R_g) < \sigma^2(R_b)$. Hereafter, we call project g the good project, and project b the bad project.
Definition. The (relative) risk of the good project is measured by $\beta$.\(^3\)

A5. There is no personal income tax.\(^4\)

A6. There is no time value of money.

A7. At $t = 0$, the manager publicly announces and commits the amount of dividends, $D$ ($X-\beta E < D < X+\beta E$), to be paid at $t = 1$ to original shareholders. If realized earnings exceed dividend commitment at $t = 1$, the excess is accrued to original shareholders. If realized earnings are short of dividend commitment, the shortfall is financed at the expense of original shareholders. The financing cost is $h (> 0)$ for every dollar borrowed.

In sum, at $t = 0$, the manager, acting on behalf of original shareholders, chooses either the good or bad project; and announces the amount of dividends to be paid at $t = 1$ for original shareholders. At $t = 1$, the firm's earnings are realized; dividends are paid to original shareholders; and the firm is sold to outside shareholders. At $t = 2$, the firm's earnings are realized; and the firm is liquidated with zero salvage value. Information asymmetry means that outside shareholders cannot observe the firm's project choice and realized earnings. The critical assumption to achieve a signaling equilibrium is that dividends are costly (i.e., financing costs if realized earnings are short of dividends).

Finally, the distributions of returns to original shareholders net of financing costs at $t = 1$, $R_i - F_i$ ($i = g$ or $b$), are described as follows:

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\(^3\) For example, suppose that the bad project represents the market portfolio. Then, $\beta = \text{Cov}(R_g, R_b)/\sigma^2(R_b)$.

\(^4\) In our analysis, personal tax is inconsequential to the signaling equilibrium itself.
Therefore,

\[ E(R_g - F_g) = X - 0.5h(D - X + \beta e), \]
\[ E(R_b - F_b) = X - 0.5h(D - X + e), \]
\[ \sigma^2(R_g - F_g) = 0.25(2\beta e + h(D - X + \beta e))^2, \]
\[ \sigma^2(R_b - F_b) = 0.25(2e + h(D - X + e))^2. \]

(1)

II. Signaling Equilibrium

A signaling equilibrium is established when outside shareholders' conjecture about the manager's project choice is self-fulfilled. For example, suppose outside shareholders' conjecture that the manager has chosen the good project. For a given price outside shareholders are willing to pay for the firm, \( V \), the manager's project choice will be consistent with outside shareholders' conjecture if and only if

\[ -C_g + [E(R_g - F_g) - \theta \sigma^2(R_g - F_g)] + V \]
\[ > -C_b + [E(R_b - F_b) - \theta \sigma^2(R_b - F_b)] + V. \]

(2)
Inequality (2) is re-written as

\[- C_g + X - 0.5h(D-X+\beta e) - 0.25\theta (2\beta e + h(D-X+\beta e))^2\]
\[> - C_b + X - 0.5h(D-X+e) - 0.25\theta (2e + h(D-X+e))^2.\]  

Inequality (3) is solved for \( D^* \) such that if \( D > D^* \), then outside shareholders' conjecture about the manager's project choice is self-fulfilled:

\[D^* = X - \frac{1}{\theta(2+h)} + \frac{2\Delta C}{\theta h(2+h)(1-\beta)e} - \frac{2+h}{2h} (1+\beta)e\]  

where \( \Delta C = C_g - C_b \).

Given that the manager has chosen the good project, the expected return to original shareholders is maximized when \( D = D^* \). Hence, \( D^* \) is called the optimal amount of dividends.\(^5\)

**Proposition.** Assume that \( h < \left[ \frac{2\sqrt{\Delta C}}{\sqrt{\theta(1-\beta)e}} - 2 \right] \). The optimal amount of dividends increases when the firm's risk increases.

(proof) \[\frac{\partial D^*}{\partial \beta} > 0 \text{ if and only if } (2+h)^2 < \frac{4\Delta C}{\theta(1-\beta)^2e^2}.\]

**III. Summary**

For dividends to serve as a signal of the firm's value, dividends should be costly, \( 0 < h \leq \infty \). If the signaling cost of dividends is less than a certain amount, managers smooth the effect of a change in the firm's intrinsic value on the change in dividends.

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\(^5\) We assume that the expected return from the good project with \( D^* \) is greater than that from the bad project with zero dividend.
REFERENCES


