# The Information Content of Dividend Changes and Earnings : A Test of Signal Mitigation

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## Abstract

If reported earnings and dividends convey similar information regarding economic earnings, the second of the two announcements, be it dividends or earnings, should be less informative than had it been the first announcement. We refer to this phenomenon as "signal mitigation," and show that: (1) dividend changes which follow earnings reports are less informative than those which precede earnings reports for both large and small firms; (2) earnings reports which follow dividend changes are less informative than those which precede dividend changes only for small firms; (3) the extent of signal mitigation differs between small and large firms; (4) signal mitigation exists only when the earnings and dividend announcements convey similar messages. Our results are consistent with the Miller and Rock(1985) model as modified to allow reported earnings and dividends to be noisy measures of current economic earnings, and investors to revise their expectations of economic earnings when they observe reported earnings and dividends. Our

results also suggest that dividend changes(earnings reports) convey value-pertinent information when they reflect additional information that: (1) becomes available subsequent to earnings reports(dividend-change announcements); and (2) contradicts the news conveyed by the preceding earnings announcement(dividend announcement).

## 1. Introduction

Miller and Rock(1985), hereafter MR, posited a model in which a dividend announcement and its corresponding earnings announcement convey similar messages regarding the firm's present economic earnings. If so, the second announcement, be it dividends or earnings, should be less informative than had it been the first announcement. In the context of our study, we refer to this phenomenon as signal mitigation. We first test whether reported earnings mitigate the information content of subsequent dividend changes by comparing the information content of dividend changes that follow earnings with those that precede earnings. We next test whether dividend changes mitigate the information content of subsequent earnings reports by comparing the information content of earnings announcements that follow dividend changes with those that precede dividend changes.

The marginal information content of a dividend change which follows an earnings report depends upon the extent to which the preceding earnings report reveals information pertaining to the firm's economic earnings. Similarly, the marginal information content of an earnings report which follows a dividend change depends upon the extent to which the preceding dividend change reveals information about the firm's economic earnings. We examine signal mitigation in relation to two factors that potentially influence the degree to which intervening announcements of reported earnings or dividend changes convey information about the firm's economic earnings. The first factor, firm size, is used to proxy for the precision of pre-disclosure information. The second factor, signal consistency, is used to proxy for the extent to which accounting earnings and dividend changes convey similar messages.

Lintner(1956) and Miller and Modigliani(1961) hypothesized that dividend changes are informative regarding the firm's future earnings pros-

pects.[1] Subsequent researchers have shown that dividend changes are associated with significant share price responses[2]. There is also extensive literature showing that earnings reports are associated with significant share price responses.[3] Some researchers have examined whether dividend changes(earnings reports) convey information incremental to that conveyed by earnings reports(dividend changes). Pettit(1972) argued that dividend changes are so informative that earnings convey little information over and above the dividend changes. On the other hand, Watts(1973), Gonedes(1978), and recently Leftwich and Zmijewski(1994) maintained that dividend changes convey little information once earnings are known. By ignoring the sequence of earnings and dividend-change announcements, these studies provided no evidence regarding whether earnings or dividend changes miti-gate the information content of subsequent dividend-change announcements or earnings reports, respectively.

Few emipirical studies have examined signal mitigation in the context of the two signals, dividends and earnings. Two exceptions are Healy and Palepu(1988) and Venkatesh(1989) who found that dividend initiations miti-gate the information content of subsequent earnings announcements. Show-ing that dividend omissions mitigate the information content of subsequent earnings announcements, Healy and Palepu also concluded that dividend initiations and omissions allow investors to enhance their predictions of sub-sequent earnings changes. Both studies provided evidence consistent with the signal mitigation hypothesis in the context of the dividend / earnings se-quence. However, they focused only on extreme dividend changes, and they are uninformative regarding the earnings / dividend sequence.

Aharony and Swary(1980) did examine the information content of dividends and earnings in the context of the dividend / earnings and the earn-ings / dividend sequences. They reported that the stock price reaction to

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1) The notion that dividends convey information regarding future earnings prospects is presumed in many dividend signalling models such as Bhattacharya(1979), Kalay(1980), John and Williams (1985), and Miller and Rock(1985)

2) See Penman(1983), Charest(1978), Aharony and Swary(1980), Asquith and Mullins(1983) and Woolridge(1983) and Dielman and Oppenheimer(1984).

3) See Foster(1986) for an extensive review of this literature.

dividend changes(earnings) announced after earnings(dividend changes) is of similar magnitude to that of dividend changes(earnings) announced before earnings(dividend changes).[4] Although these results conflict with the signal mitigation hypothesis, they cannot be considered as definitive due to the tests' low power for addressing the signal mitigation issue. More specifically, Aharony and Swary discarded dividend and earnings announcements separated by ten or fewer trading days, the very announcements where signal mitigation is most likely to be observed; they confined dividend and earnings announcements to occur in the same fiscal quarter, a procedure which obscures the identity of the preceding and following signals,[5] and they did not utilize proxies for the extent of signal mitigation(e.g., firm size and signal consistency) in their empirical tests. Our study utilizes a methodology which does not have these limitations.

We develop a model of Bayesian expectation revision in which earnings and dividend announcements are competing, noisy signals of the firm's true economic earnings, which may or may not provide consistent signals regarding economic earnings. The analytical model adapts the MR model in two ways: (1) reported earnings and dividend changes are noisy signals of current economic earnings; (2) investors revise their expectations of the current economic earnings shock when they observe reported earnings and dividends. We provide empirical results that reported earnings do mitigating the information content of nearby, subsequent dividend changes when the two signals are consistent. The extent of signal mitigation is complete for large firms and incomplete for small firms. We also provide empirical results

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4) Brown, Choi and Kim(1994) reported that the information content of dividend changes(earnings) increases with the length of time elapsed since the previous earnings(dividend) announcement, supporting the notion that there exists interdependency between two nearby dividend and earnings announcements.

5) Consider the sequence, earnings(January 20), dividend(March 30), and earnings(April 7), for a firm with a December 31 fiscal year end. Aharony and Swary pair the January 20 earnings with the March 30 dividend, and treat the January 20 earnings as preceding the March 30 dividend. However, if earnings and their nearby dividends convey similar information, it is likely that the March 30 dividend mitigates the information content of April 7 earnings, rather than the January 20 earnings mitigating the information content of the March 30 dividend. In contrast to Aharony and Swary(1980), our methodology focuses on classification based on proximity in time of announcements. As discussed in Section II. B., we pair the March 30 dividend with the April 7 earnings, and treat the March 30 dividend as preceding the April 7 earnings.

that, for small firms only, dividend changes mitigate the information content of nearby, subsequent earnings reports when the two signals are consistent. The extent of signal mitigation is complete for small firms and absent for large firms. We show that signal mitigation does not exist when the earnings and dividend announcements convey inconsistent messages.

The paper proceeds as follows. Section 2 develops the model and the hypotheses. Section 3 discusses the data and methodology. The empirical results are presented in Section 4. Section 5 contains a summary and conclusion.

## 2. Hypotheses Development

### 2.1. The Model

If current earnings and dividends convey identical information regarding firm value(e.g., economic earnings prospects), the second of the two announcements, be it dividends or reported earnings, will have no announcement effects. The latter announcement will neither enhance predictions of future earnings nor will it impact stock returns. Alternatively, if the second announcement conveys information about firm value incremental to what is revealed by the first announcement, the second announcement will enhance predictions of future earnings and impact stock returns.

We adapt the MR cash flow identity model to test signal mitigation, i. e., whether the impact of a dividend or earnings signal on the firm's share price is reduced by the preceding signal. The MR model describes the evolution of a firm's(economic) earnings stream, X, as follows:

$$X_1 = F(I_0) + \tilde{\varepsilon}_1 \tag{1a}$$

$$X_2 = F(I_1) + \tilde{\varepsilon}_2 \tag{1b}$$

$$E(\tilde{\varepsilon}_2 \mid \varepsilon_1) = \gamma\varepsilon_1 \tag{1c}$$

where $E_0(\tilde{\varepsilon}_1)=E_0(\tilde{\varepsilon}_2)=0$. At t=0(the past), the firm made an investment of $I_0$, which produces current earnings $(X_1)$, defined as the output of the production function $(F(I_0))$ plus an earnings shock $(\tilde{\varepsilon}_1)$. At t=1(the present), $X_1$ plus any additional funds raised $(B_1)$ are used for dividend payments$(D_1)$ and investments$(I_1)$. This is the firm's cash flow identity. $I_1$ and $\gamma$ are

assumed to be known and fixed at t=0. The MR model also assumes that the dividends are net of external financing($B_1$). The investment of $I_1$ yields the period 2 (the future) earnings ($X_2$) which consist of $F(I_1)$ plus an earnings shock($\tilde{\varepsilon}_2$). While the time 0 expectations of both shocks are zero, the equation (1c) suggests that the earnings shock in period 2 is partially antici-pated at time 1 once $\varepsilon_1$ is revealed. Given the cash flow identity, either the period 1 dividend ($D_1$) or the period 1 earnings report ($X_1$) fully reveals $\varepsilon_1$. Thus, in the MR model, the first announcement is fully revealing and the second announcement is redundant.

Our model replaces some of the MR model assumptions to allow sub-sequent earnings or dividends to be non-redundant. First, following Myers (1986) and as suggested by Miller and Rock(1985, p.1047), we define reported earnings to be equal to economic earnings plus accounting fog($\tilde{\eta}_1$). The period 1 reported earnings ($X_1^R$) are:

$$X_1^R = X_1 + \tilde{\eta}_1 \tag{2}$$

where $\tilde{\eta}_1$ is assumed to be normally distributed with zero mean and variance of $U_\eta$, i.e.,

$$\tilde{\eta}_1 \sim N(0, U_\eta)$$

We also allow dividends to be a noisy signal of economic earnings, which will not be known until external financing ($B_1$) and investments ($I_1$) are fully observed. Until the time that all the components of the cash flow identity are known, a dividend announcement entails reassessment of the size of investments ($I_1(D_1)$) and the extent of external financing requirements ($B(D_1)$).[6] The economic earnings implied by the dividend announcement ($X_1^D$) also measures current economic earnings with error:

$$X_1^D = D_1 + [I_1(D_1) - B_1(D_1))]$$
$$= X_1 + u_1 \tag{3}$$

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6) We assume that the determination of $I_1$ may not be at the Fisherian optimum due to many reasons including time inconsistency(see Miler and Rock 1985). Given that investment decisions and exter-nal financing decisions are not as regularly disclosed as earnings and / or dividends, we assume that $I_1$ and $B_1$ are uncertain when dividends are announced. Recall that in the simplest form of the MR model, $I_1$ is known at t=0.

where $\tilde{u}_1$ is the prediction error, independent of $\tilde{\eta}_1$, distributed normally with zero mean and variance $U_u$, i. e.,

$$\tilde{u}_1 \sim N(0, U_u)$$

Secondly, we assume that investors do not know the exact distribution function of $\tilde{\varepsilon}_1$ and that they treat the mean of $\tilde{\varepsilon}_1$ as a random variable.[7] More formally,

$$\tilde{\varepsilon}_1 \sim N(\tilde{\mu}_1, U_\varepsilon)$$

where $\tilde{\mu}_1$ is the unknown mean of $\tilde{\varepsilon}_1$ and $U_\varepsilon$ is its variance. At $t=t_0$, prior to the disclosure of either earnings or dividends, investors' expectations of the period 1 economic earnings shock are assumed to be distributed as :[8]

$$\tilde{\mu}_1 \sim N(m_1, V_1) \tag{4}$$

where $m_1$ and $V_1$ are the mean and variance of the unobservable mean of the economic earnings shock, $\tilde{\mu}_1$. More specifically, $m_1$ is the mean of investors' expectations of the period 1 economic earnings shock and $V_1$ is the degree of divergence among investors' expectations.

## (1) Announcement Effects of the Earnings / Dividend Sequence

Consider first the earnings / dividend announcement sequence. At $t=t_1$, management observes the economic earnings shock$(\varepsilon_1)$ and it makes an earnings announcement $(X_1^R)$:

$$X_1^R = F(I_0) + \delta_1 \tag{5}$$

where $\delta_1 = (\tilde{\varepsilon}_1 + \tilde{\mu}_1)$. Upon observing reported earnings, investors revise their expectations of $X_1$ via their revisions of $\tilde{\mu}_1$. Using the known earnings persistence parameter, investors also revise their expectations of $X_2$. Following the Bayesian revision rule and the MR valuation model, the announcement ef-

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7) This is a standard technique formalizing the Bayesian learning theory(DeGroot 1970 and BarYosef and Venezia 1988), which is introduced in order to allow a revision of expectations in response to new information.

8) The time sequence when earnings precede dividends is as follows: t=0 is the end of the last period when the $I_0$ decision is made; $t=t_0$ is the point immediately prior to the time when management observes $\tilde{\varepsilon}_1$(i. e., t=1): $t=t_1$ is when the firm reports its earnings; and $t=t_2$ is when the firm makes its dividend announcement. When dividends precede earnings, the dividend is announced at $t=t_1$ and the earnings are announced at $t=t_2$.

fect of the reported earnings which precedes dividends, AE(EBD), is(see Appendix for its derivation):

$$AE(EBD) = (1-h_e)(\delta_1 - m_1)[1 + \gamma / (1 + i)] \tag{6}$$

where $h_e = (U_\eta + V_1)$ and i is the rate of interest. The term $(1-h_e)(\delta_1 - m_1)$ represents the revision in the market's assessment of the firm's economic earnings shock in response to the earnings announcement.

As both $U_\eta$ and $V_1$ are non-negative, $h_e$ is bounded by the unit interval. The parameter $h_e$ approaches unity when $V_1$ approaches zero. In this case, the pre-disclosure information is so "pure" that the information in reported earnings is known prior to the report, and both earnings and subsequent dividends are uninformative. The parameter $h_e$ equals zero either when $U_\eta$ equals zero or $V_1$ approaches infinity. When $U_\eta$ equals zero, the information conveyed in the reported earnings is so precise that investors rely entirely on it to revise their expectations regarding the economic earnings shock(i. e., $X_1^R = X_1$), and the subsequent dividend announcement is redundant. When $V_1$ approaches infinity, the earnings report is informative provided that $U_\eta$ exceeds zero.

When dividends are announced at $t=t_2$, investors' assessment of economic earnings $(X_1^D)$ can be expressed from equations (1a) and (3):

$$X_1^D = F(I_0) + \theta_1 \tag{7}$$

where $\theta_1 = (\tilde{\varepsilon}_1 + \tilde{u}_1)$. The announcement effect of the dividend(after the earnings announcement) on the firm's share price is(see Appendix for its derivation):

$$AE(DAE) = (1-h_d)[(\theta_1 - m_1) - (1-h_e)(\delta_1 - m_1)][1+\gamma / (1+i)] \tag{8}$$

where $h_d = (U_u) / (U_u + h_e V_1)$. As $U_u$ and $V_1$ are non-negative and $0 \le h_e \le 1$, $h_d$ is bounded by the unit interval. Since $(1-h_e)(\delta_1 - m_1)[1+\gamma / (1+i)]$ is the earnings announcement effect in equation (6), the dividend announcement effect is closer to zero than it would be in the absence of the preceding earnings announcement provided that $(\theta_1 - m_1)$ and $(\delta_1 - m_1)$ have the same sign.[9]

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9) As will be shown below, the announcement effect of the dividend not preceded by an earnings report is$(1- \ell_d)(\theta_1 - m_1)[1+\gamma / (1+i)]$, where $\ell_d = (U_u) / (U_u + V_1)$, bounded by the unit interval.

## (2) Announcement Effects of the Dividend / Earnings Sequence

Consider the dividend / earnings announcement sequence. At $t=t_1$, management observes the economic earnings shock($\varepsilon_1$), and it makes a dividend announcement($D_1$), which is useful in predicting the investment requirement and the extent of external financing requirements, thus $X_1^p$. In this setting, as shown in Appendix, the effect of the dividend announcement which precedes earnings, AE(DBE), is :

$$AE(DBE) = (1 - \ell_d)(\theta_1 - m_1)[1 + \gamma / (1+i)] \tag{9}$$

where $\ell_d = (U_u) / (U_u + V_1)$, bounded by the unit interval. The term $(1 - \ell_d)$ $(\theta_1 - m_1)$ represents the revision in the market's assement of the firm's economic earnings shock in response to the dividend-change announcement.

When earnings are announced subsequently at $t=t_2$, the announcement effect of the earnings (after dividend announcement) on the firm's share price is (see Appendix for its derivation) :

$$AE(EAD) = (1 - \ell_e)[(\delta_1 - m_1) - (1 - \ell_d)(\theta_1 - m_1)][1 + \gamma / (1+i)]. \tag{10}$$

where $\ell_e = (U_\eta) / (U_\eta + \ell_d V_1)$, which is bounded by the unit interval. Since $(1 - \ell_d)(\theta_1 - m_1)$ $[1 + \gamma / (1+i)]$ is the dividend announcement effect in equation (9), the earnings announcement effect is closer to zero than it would be in the absence of the preceding dividend announcement provided that $(\delta_1 - m_1)$ and $(\theta_1 - m_1)$ have the same sign.

### 2. 2. The Propositions

Earnings mitigation of the information content of subsequent dividends is observed by comparing AE(DAE) in equation (8) with AE(DBE) in equation (9). Similarly, dividend mitigation of the information content of subsequent reported earnings is observed by comparing AE(EAD) in equation (10) with AE(EBD) in equation (6). Two propositions are stated below (see Appendix for proof):

*Proposition 1* : A dividend signal is less informative when it is announced after earnings than when it is announced before earnings, if the two signals convey consistent messages in terms of the sign of signal surprise. That is, ceteris paribus,

$\text{AE(DAE)} < \text{AE(DBE)}$ **if** $(\theta_1 - m_1) > 0$ **and** $(\delta_1 - m_1) > 0$;

$\text{AE(DBE)} < \text{AE(DAE)}$ **if** $(\theta_1 - m_1) < 0$ **and** $(\delta_1 - m_1) < 0$.

*Proposition 2* : An earnings signal is less informative when it is announced after a dividend than when it is announced before a dividend, if the two signals convey consistent messages in terms of the sign of signal surprise. That is, ceteris paribus,

$\text{AE(EAD)} < \text{AE(EBD)}$ if $(\theta_1 - m_1) > 0$ and $(\delta_1 - m_1) > 0$ :

$\text{AE(EBD)} < \text{AE(EAD)}$ if $(\theta_1 - m_1) < 0$ and $(\delta_1 - m_1) < 0$.

Signal consistency is a sufficient, but not a necessary, condition for both propositions of signal mitigation. Thus, when the signs of the signals differ, the prediction regarding signal mitigation is ambiguous.

## 3. Methodology and Sample Design

### 3. 1. Methodology

#### (1) Measuring Signal Mitigation

In order to measure the information content of dividend changes and earnings announcements, we use the standard approach of associating abnormal stock returns with unexpected dividends and unexpected earnings, respectively. Abnormal returns $(XR_i)$ for stock i are calculated over two days, $[-1, 0]$, where 0 is the day that the dividend-change or earnings announcement is reported in *The Wall Street Journal Index*, and abnormal returns are obtained from the CRSP Excess Returns File.

The measure of unanticipated dividends($UDIV_i$) for firm i is defined as :

$$UDIV_i = [DIV_{iq} - DIV_{i, q-1}] / DIV_{i, q-1} \tag{11}$$

where $DIV_{iq}$ is the dividend per share for firm i in quarter q, adjusted for stock splits and stock dividends. This measure can be considered to be the "dividend surprise"(Aharony and Swary 1980, Brickley 1983, Handjinicolau and Kalay 1984, and Kane, Lee, and Marcus 1984).

The measure of unanticipated earnings($UEARN_i$) is defined as :

$$UEARN_i = [EPS_{iq} - E(EPS_{iq})] / |E(EPS_{iq})| \tag{12}$$

where $EPS_{iq}$ is the earnings per share for firm i for quarter adjusted for

stock splits and dividends : $(E(EPS_{iq})=EPS_{i,q-4} + \Delta_i$ ; and $\Delta_i$ is the average of the seasonal differences in earnings per share for the past 20 quarters, $q-20$ to $q-1$.[10] This measure can be considered to be the "earnings surprise"(Brown and Kennelly 1972, Foster 1977, and Foster, Olsen, and Shevlin 1984).

The equation used to test the impact of earnings announcements on the information content of subsequent dividend changes is :

$$XRD_i = b_0 + b_1{}^*(1-MITIG_i)^*UDIV_i + b_2{}^*MITIG_i{}^*UDIV_i + e_{it} \qquad (13)$$

where $XRD_i$=the two-day abnormal return around the announcement of dividend change for firm i ; and $MITIG_i$=1 for a dividend change announced after earnings and 0 otherwise. The coefficient $b_1$ is the elasticity of market reaction to UDIV for the dividend changes not preceded by earnings. The coefficient $b_2$ is the same for the dividend changes preceded by earnings. As UDIV is a proxy for the change in the market's assessment of the firm's economic earnings shock in response to the dividend-change announcement (i.e., $(1- \ell_d)(\theta_1-m_1)$ in equation (9)), we expect $b_1$ to be positive. The "signal mitigation hypothesis" suggests that the preceding earnings report enables investors to revise their expectations of the firm's economic earnings shock and thus *reduce* the degree of expectation revision in response to the subsequent dividend announcement, given that the two signals are consistent(see equation (8)). Thus, given that the UDIV for the dividend changes preceded by earnings reports does not reflect the reduction in expectation revision, we expect the coefficient $b_2$ to be smaller than the coefficient $b_1$.[11]

The difference between $b_1$ and $b_2$ measures the degree of mitigation in the

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10) In order to control for outliers, we assigned the value of $\pm100\%$ to those UEARNs which exceeded 100% in absolute value.

11) The "signal mitigation hypothesis" suggests that AE(DAE) is closer to zero than AE(DBE) is to zero because$(1-h_d)[(\theta_1-m_1)-(1-h_e)(\theta_1-m_1)]$ in equation (8) is *smaller* (in absolute value) than $(1- \ell_d)(\theta_1-m_1)$ in equation (9), provided that the two signals are consistent. To see this, define : UDIV=$(1- \ell_d)(\theta_1-m_1)$ and UDIV*=$(1-h_d)[(\theta_1-m_1)-(1-h_e)(\delta_1-m_1)]$. Then, UDIV*=k UDIV where k<1 if $(\theta_1-m_1)$ and $(\delta_1-m_1)$ are of the same sign. If the elasticity of market reaction to UDIV is independent of signal sequencing, $b_1$ UDIV*=$b_1$k UDIV where $b_1$k is captured by the $b_2$ coefficient in equation (13). Since k<1, it follows that $b_2<b_1$. See Healy and Palepu (1988) for a similar discussion.

information content of a dividend change attributable to the intervening earnings announcement.

The equation used to test the impact of dividend announcements on the information content of subsequent earnings announcements is :

$$XRE_i = b_0 + b_1{}^*(1-MITIG_i)^*UEARN_i + b_2{}^*MITIG_i{}^*UEARN_i + e_{it} \quad (14)$$

where : $XRE_i$ = the two-day abnormal return around the announcement of reported earnings of firm i : $MITIG_i$ = 1 for earnings announced after a dividend change and 0 otherwise.

The coefficient $b_1$ is the elasticity of market reaction to UEARN for the earnings announcements not preceded by dividend-change announcements. The coefficient $b_2$ is the same for the earnings announcements preceded by dividend-change announcements. As UEARN is a proxy for the change in the market's assessment of the firm's economic earnings shock in response to the earnings announcement(i.e., $(1-h_e)(\delta_1-m_1)$ in equation (6)), we expect $b_1$ to be positive. The "signal mitigation hypothesis" suggests that the preceding dividend-change announcement enables investors to revise their expectations of the firm's economic earnings shock and thus reduce the degree of expectation revision in response to the subsequent earnings announcement, given that the two signals are consistent(see equation (10)). Thus, given that the UEARN for the earnings announcement preceded by a dividend change does not reflect the reduction in expectation revision, we expect the coefficient $b_2$ to be smaller than the coefficient $b_1$.[12] The difference between $b_1$ and $b_2$ measures the degree of mitigation in the information content of earnings attributable to the intervening dividend-change announcement.

### (2) Firm Size as a Partitioning Variable

Firm size is a proxy for the precision of pre-disclosure information. As there are more information production and dissemination activities pertaining to large firms than small firms(Grant 1980, Atiase 1985, and

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12) The prediction for the $b_2$ coefficient in equation (14) can be made in a manner similar to that for the $b_2$ coefficient in equation (13) discussed earlier.

Bhushan 1989), large firms have relatively more precise pre-disclosure infor-
mation at $t=t_0$.[13] This suggests that $1/V_1$ is greater for large firms(i.e., their
$h_e$ or $\ell_d$ is closer to one), and hence their AE(EBD) in equation (6) and
AE(DBE) in equation (9) are relatively closer to zero. Thus, the coefficient
$b_1$ in equations (13) and (14) should be relatively greater for small firms.[14]

Whether the coefficient $b_2$ in equations (13) and (14) is relatively larger
for small firms depends upon the size-related differential in the information
precision following the intervening signal. If post-earnings, pre-dividend in-
formation precision is relatively higher for large firms, the $b_2$ coefficient in
equation (13) will be relatively larger for small firms. On the other hand, if
the information in earnings announcements is considerably more precise for
small firms(i.e., their $1/U_\eta$ is substantially higher) so that precision of their
post-earnings, pre-dividend information is relatively higher, the $b_2$ coef-
ficient in equation (13) will be relatively smaller for small firms.[15] Similarly,
if post-dividend, pre-earnings information precision is relatively higher for

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13) More generally, the pre-disclosure information precision is positively related to the number of in-
terim information signals, and negatively related to the variance of the signals and the non-nega-
tive common correlation among the signals(Brown, Richardson, and Schwager 1987). Assume that
there are n normally distributed, information signals available to the market between $t=0$ and
$t=t_0$ where each of the n signals $\{Y_1, Y_2, \cdots, Y_n\}$ has a common variance of $U_y$ and a common corre-
lation of $\rho$. The pre-disclosure information precision($\tau$, which is the inverse of $V_1$) is then equal to
: $\tau = n/[1+(n-1)\rho]\, U_y$. As large firms tend to have a relatively larger n (and possibly a smaller
$U_y$ and/or $\rho$), it is straightforward that larger firms have more precise, pre-disclosure infor-
mation environments.

14) These predictions assume that the earnings presistence parameter $\gamma$ and discount rate i do not dif-
fer between small and large firms. However, as firms size is positively correlated with $\gamma$ and nega-
tively correlated with i(Easton and Zmijewski 1989), the smaller $b_1$ coefficient for large firms
should provide stronger support for the contention that the pre-disclosure information precision is
higher for large firms than for small firms.

15) To see that post-earnings, pre-dividend information precision(i.e., $V_1(t=t_1)$), is enhanced by the
intervening earnings announcement, notice that $V_1(t=t_1)=h_e V_1$ where $h_e=(U_\eta)/(U_\eta+V_1)$. It is
thus straightforward that $\partial V_1(t=t_1)/\partial U_\eta > 0$ and $\partial V_1(t=t_1)/\partial(1/U_\eta) < 0$. That is, the more precise
the earnings information, the higher the precision of the post-earnings, pre-dividend information,
and thus the lower the information content of the subsequent dividend. If, for instance, $1/U_\eta$ is
relatively higher for large firms(for instance, it may be easier for investors to "see through the ac-
counting fog" for large firms), the precision of the post-earnings, pre-dividend information will be
relatively higher for large firms.

large firms, the $b_2$ coefficient in equation (14) will be relatively larger for small firms. On the other hand, if $1/U_u$ is substantially higher for small firms so that the precision of their post-dividend, pre-earnings information is relatively higher, the $b_2$ coefficient in equation (14) will be relatively smaller for small firms. By using firm size as a partitioning variable and observing the results, we will be able to determine the extent to which the relative precision of the intervening announcement between small and large firms affects the differential amount of remaining uncertainty to be resolved via the second announcement.[16]

## 3. 2. Sample Design

The study is based on a sample of 470 dividend-change announcements and their corresponding earnings announcements for 252 NYSE firms for the 1980-1983 period. Firms are selected that paid dividends continuously during the 1979-1983 period and which appear in the CRSP Monthly Master File. The requirement of continuous dividend payment was imposed to eliminate dividend initiations, omissions, and resumptions which might lead to differential market reactions relative to changes in continued dividends(Asquith and Mullins 1983 and Dielman and Oppenheimer 1984). Specially-designated dividends were eliminated because these have a different market reaction than do increases in regular dividends(Brickley 1983). Dividend changes announced at the time of or immediately following stock splits or stock dividends were eliminated because the price effects of these dividends is potentially confounded by the information content of stock splits and stock dividends (Fama, Fisher, Jensen and Roll 1969, Bar-Yosef and Brown 1977, and Grinblatt, Masulis and Titman 1984).

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16) The use of firm size as a partitioning variable also helps control for cross-sectional differences in the earnings persistence parameter $\gamma$ and the discount rate i. As shown in the equations for earnings and dividend announcement effects, the elasticity of the market reaction to UEARN and UDIV is also affected by $\gamma$ and i. Thus, any systematic differences in $\gamma$ and i between firms that announce earnings(diviends) before dividends(earnings) and those that announce earnings (dividends) after dividends(earnings) could cause the $b_2$ coefficient to be smaller than the $b_1$ coefficient even if there is no signal mitigation. Since firm size is correlated with both $\gamma$ and i (Easton and Zmijewski 1989), the use of firm size as a partitioning variable helps alleviate these problems.

Firms were classified into a small-firm group and a large-firm group based on the market value of the firm's equity at the beginning of each year of the four-year sample period. The large-and small-firm samples consist of firms that are classified in the largest-and smallest-firm quartiles, respectively. Firms in the middle two quartiles are eliminated as they are deemed to be neither small nor large.

Dividend changes were classified into those which preceded and those which followed the nearest earnings report. The methodology is similar to Venkatesh(1989). Operationally, we counted the number of trading days between the two consecutive earnings announcements surrounding each dividend change and determined the midpoint date. The sample was then split according to whether the dividend announcement took place before or after the midpoint date. If the dividend change took place before the midpoint date, the dividends were considered to be after the earnings(DAE). If the dividend change took place after the midpoint date, the dividends were considered to be before the earnings(DBE). The earnings paired with dividends in the DAE subsample are considered to be in the earnings-before-dividend(EBD) subsample. Likewise, the earnings paired with dividends in the DBE subsample are considered to be in the earnings-after-dividend(EAD) subsample. If the dividend change took place during the ten-day period (nine-day period, if the midpoint date is an integer) surrounding the midpoint date, the dividend observation was omitted.

Those dividend changes announced fewer than three trading days apart from their corresponding earnings announcements were eliminated, because it is difficult to disentangle the incremental valuation implications of each of the two announcements. In order to minimize the impact of intervening changes in business and economic conditions on the market's assessment of the valuation implications of the dividend-change announcements(thus obscuring the mitigation effect), we first examine only those dividends(or earnings) which were announced within ten days after the corresponding earnings (or dividend) announcements. Longer time horizons are used later to examine the effect of time proximity on signal mitigation.

Table 1 reports how dividend-change signals and earnings signals are sequenced for small / large firms and for dividend increases / decreases. It is evident that there are fewer dividend-change observations for small firms

Table 1

Frequency Distribution of the 470 Dividend Change Announcements[a]

| Category | Dividend Changes Before Earnings[b] | | | Dividend Changes After Earnings[c] | | | Total |
|---|---|---|---|---|---|---|---|
| | 3−10 | 11−20 | 21+ | 3−10 | 11−20 | 21+ | |
| Dividend Increases: | | | | | | | |
| Small Firms | 28 | 29 | 17 | 43 | 39 | 11 | 167 |
| Large Firms | 36 | 42 | 25 | 104 | 45 | 21 | 273 |
| Total | 64 | 71 | 42 | 147 | 84 | 32 | 440 |
| Dividend Decreases: | | | | | | | |
| Small Firms | 1 | 3 | 2 | 4 | 3 | 1 | 14 |
| Large Firms | 1 | 5 | 0 | 6 | 3 | 1 | 16 |
| Total | 2 | 8 | 2 | 10 | 6 | 2 | 30 |

[a] Announcement dates of dividend changes and earnings are obtained from *The Wall Street Journal Index.*

[b] The sample consists of dividend changes that occur three to ten, 11 to 20, and more than 2C trading days prior to an earnings announcement.

[c] The sample consists of dividend changes that occur three to ten, 11 to 20, and more than 20 trading days after an earnings announcement.

than for large firms. More than one half of the dividend-change announcements are preceded by earnings announcements, and more than one half of the sampled dividend changes after earnings follow closely after their corresponding earnings.

## 4. Empirical Results

4. 1. The Information Content of Dividend Changes Around Earnings Announcements

(1) Earnings Mitigation of the Information Content of Dividend Changes

Table 2 presents OLS regression results of equation (13) for the small-and large-firm samples separately. As mentioned earlier, dividend changes that

## Table 2

### The Information Content of Dividend Changes
### around Earnings Announcements(t-values in parentheses)

$$XRD_i = b_0 + b_1^*(1 - MITIG_i^*) \ UDIV_i + b_2^* MITIG_i^* UDIV_i + e_1{}^a$$

|  | $b_0$ | $b_1$ | $b_2$ | N | F | Adj. $R^2$ |
|---|---|---|---|---|---|---|
| **Small Firms** |  |  |  |  |  |  |
|  | −0.001 | 0.121 | 0.058 | 127 | 13.4** | .164 |
|  | (−0.43) | (4.67)** | (2.66)** |  |  |  |
| **Large Firms** |  |  |  |  |  |  |
|  | −0.001 | 0.038 | 0.000 | 219 | 4.9** | .035 |
|  | (−0.67) | (3.11)** | (0.03) |  |  |  |

$^a$ $XRD_i$=two-day(−1,0) abnormal return for dividend-change announcement i.

$UNIV_i = (DIV_{iq} - DIV_{i,q-1} / DIV_{i,q-1}$.

MITIG$_i$ = 1 if dividend changes are announced not less than three nor more than ten trading days after an earnings announcement and 0 if dividend changes are announced at least three trading days prior to an earnings announcement.

** Significant at the .01 level. Two-tailed tested for $b_0$. One-tailed tests for $b_1$ and $b_2$.

follow earnings by more than ten days are excluded. Since, as shown in Propositions 1 and 2, signal consistency is a sufficient(not a necessary) condition for signal mitigation, we do not distinguish between consistent and inconsistent signals in this table. The $b_1$ coefficient is significantly positive for both the small-and large-firm samples, implying that unmitigated dividend changes are informative regardless of firm size. Consistent with the signal mitigation hypothesis, the $b_2$ coefficient is significantly smaller than the $b_1$ coefficient for both the small-and large-firm samples, suggesting that the information content of dividend changes is mitigated by their antecedent earings.[17] More specifically, a 10-percent increase in dividends per share for

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17) While not shown in the table, the t-statistic for the difference between the two coefficients is 1.96 for the small-firm sample and 2.07 for the large-firm sample.

small firms increases stock price by 1.21 percent if the dividend is announced prior to earnings, compared with only a 0.58 percent increase in stock price if the dividend is announced after earnings. Similarly, for large firms, a 10-percent increase in unmitigated dividends increases stock price by 0.38 percent, but the same increase for mitigated dividends leaves stock price virtually unchanged.

In order to examine whether firm size impacts significantly upon the information content of dividend changes and signal mitigation, we estimate a regression similar to equation (13), but include a size-dummy variable (one for a firm in the large-firm group and zero for a firm in the small-firm group). For brevity, we do not provide these results in the table. As expected, the $b_1$ coefficient for the small-firm sample is significantly larger than that of the large-firm sample(the t-statistic for the difference in the $b_1$ coefficients is 3. 38, significant at the 0.01 level). Consistent with the contention that pre-disclosure information precision$(1 / V_1)$ is relatively higher for larger firms, the unmitigated dividend changes for the smaller firms are relatively more informative. Similarly, the $b_2$ coefficient for the small-firm sample is significantly larger than that of the large-firm sample(the t-statistic for the difference is 2.44, significant at the 0.01 level). This is consistent with the contention that post-earnings, pre-dividend information precision is relatively higher for larger firms.

Despite signal mitigation, the $b_2$ coefficient for small firms is significant at the one-percent level, suggesting that signal mitigation is not complete for these firms. In contrast, the $b_2$ coefficient for large firms is *not* significantly greater than zero, suggesting that signal mitigation is complete for these firms. The observed differences in the information content of mitigated signals for small versus large firms suggest that the reported earnings of large firms are sufficiently revealing, leaving little incremental information to be revealed by their subsequent dividend-change announcements. This result is consistent with the view that there are considerably more information acquisition and dissemination activities for large firms,[18] enabling

18) Consistent with this scenario, information available in *The Wall Street Journal Index*(*WSJI*) regarding small firms is generally confined to earnings and dividends. In contrast, *the WSJI* contains far more information regarding large firms. See Thompson, Olsen, and Dietrich (1987) for details.

the market to ascertain the noise of their reported earnings at $t=t_1$(i.e., the $1/U_\eta$ is high). Alternatively, the information in small firms' reported earnings may not be precise enough to reveal the nature of the economic earnings shock (i.e., $1/U_\eta$ is low), so their subsequent dividend announcements are informative.[19]

(2) Signal Consistency and Earnings Mitigation of the Information Content of Dividend Changes

In general, dividend increases (decreases) follow earnings which are higher (lower) than expected, and the earnings and dividend signals convey similar messages. However, dividend increases (decreases) occasionally follow earnings that are lower (higher) than expected, making the message conveyed by the earnings inconsistent with the message in the subsequent dividend change. As shown in propositions 1 and 2, signal mitigation pertains to consistent signals. The empirical results presented to this point have not distinguished between consistent and inconsistent signals. We now modify the regression model to examine the impact of signal consistency on signal mitigation. More specifically, we modify equation (13) :

$$XRD_i = b_0 + b_1{}^*(1-MITIG_i)^*UDIV_i + b_2{}^*MITIG_i{}^*CONSIG_i{}^*UDIV_i$$
$$+ b_3{}^*MITIG_i{}^*(1-CONSIG_i)^*UDIV_i + e_{it} \qquad (15)$$

where : $MIGIT_i = 1$ for a dividend change announced after earnings and 0 otherwise : $CONSIG_i = 1$ for a dividend change, announced after earnings, when UDIV is of the same sign as the share price response to the preceding earnings and 0 otherwise.

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19) The discussion in the text is based on the assumption of the MR model that the persistence parameter is known to the market. An alternative explanation for the difference in the $b_2$ coefficients between small and large firms is that dividend changes provide information about the unknown earnings persistence parameter. It is conceivable that the persistence parameter is known for large but not small firms. If dividend changes signal earnings persistence(Lintner 1956 and Miller 1986), the observed difference in the coefficients may reflect the asymmetry in the investors' perception of earnings persistence between small and large firms. See Miller (1986) for further details.

In equation (15), we use the sign of the price reaction to the earnings announcement as a proxy for whether the earnings news is "good"(positive reaction) or "bad" (negative reaction) (Foster, Olsen, and Shevlin 1984). This refinement of the signal mitigation hypothesis suggests that the coefficient $b_2$ should be smaller than the coefficient $b_3$.

Signal consistency can be examined in another dimension. When the earnings and dividend signals are announced close in time, the underlying information set which the first signal is based on, is likely to be similar to the information set upon which the second signal is based. However, when the two signals are far apart, it is less likely that they convey similar messages because of the changing ecnomic and business conditions during the time elapsed between the two signals. In order to test whether or not time proximity impacts the extent of signal mitigation, we estimate equation (15) three times : first, for dividend changes that occur within three to ten days following their reported earnings ; second, for that larger set of dividend changes that occur within three to 20 days following their earnings ; and third, for that even larger set of dividend changes that follow earnings by at least three days. We expect the $b_2$ coefficient to become larger as the time period is extended to include more, but farther apart, dividend-after-earnings observations.

The results of equation (15) are reported in table 3. Not surprisingly, the $b_1$ coefficients are nearly the same as those in table 2 for both small and large firms. For small firms, the $b_2$ coefficients are significantly smaller than the $b_1$ coefficients for all three DAE periods, while the $b_3$ coefficients are insignificantly smaller than the $b_1$ coefficients, suggesting that significant signal mitigation occurs only when the two signals are consistent. Signal mitigation for consistent signals is incomplete for small firms for all three DAE periods (i. e., the $b_2$ coefficients are significantly positive for all three DAE periods). The results for small firms are consistent with the predictions made in proposition 1. As expected, the $b_2$ coefficient increases and becomes more significant as the DAE time period is extended to include more, farther away dividend changes. This result implies that signal mitigation pertains more to dividend changes of small firms that are in close proximity to their preceding earnings reports.

## Table 3

### Signal Consistency and the Information Content of Dividend Changes Around Earnings Announcements[a]

(t-values in parentheses)

$$XRD_i = b_0 + b_1^*(1 - MITIG_i)^* \ UDIV_i + b_2^*MITIG_i^*CONSIG_i^*UDIV_i$$
$$+ b_3^*MITIG_i^*(1 - CONSIG_i)^*UDIV_i + e_i^b$$

| | $b_0$ | $b_1$ | $b_2$ | $b_3$ | N | F | Adj. $R^2$ |
|---|---|---|---|---|---|---|---|
| **A. Small Firms** | | | | | | | |
| $3 \le DAE \le 10$ | −0.001 | 0.120 | 0.045 | 0.085 | 127 | 9.1** | .163 |
| | (−0.35) | (4.64)** | (1.76)* | (2.24)* | | | |
| $3 \le DAE \le 20$ | −0.02 | 0.122 | 0.050 | 0.073 | 167 | 10.1** | .141 |
| | (−0.65) | (4.84)** | (2.27)* | (2.25)* | | | |
| All DAEs | −0.004 | 0.125 | 0.065 | 0.081 | 179 | 11.7** | .152 |
| | (−1.19) | (4.89)** | (3.09)** | (2.47)** | | | |
| **B. Large Firms** | | | | | | | |
| $3 \le DAE \le 10$ | −0.001 | 0.038 | −0.028 | 0.042 | 219 | 5.5** | .058 |
| | (−0.74) | (3.17)** | (−1.52) | (1.92)* | | | |
| $3 \le DAE \le 20$ | −0.003 | 0.041 | 0.010 | 0.054 | 267 | 5.8** | .051 |
| | (−1.52) | (3.17)** | (0.63) | (2.95)** | | | |
| All DAEs | −0.004 | 0.042 | 0.031 | 0.056 | 289 | 6.9** | .058 |
| | (−2.07)* | (3.23)** | (2.02)* | (3.04)** | | | |

[a] The sample consists of dividend changes before earnings(DBE), and dividend changes that follow earnings (DAE) within three to ten, three to 20, and three to 20+trading days, respectively

[b] $XRD_i$ = two-day (−1,0) abnormal return for dividend-change announcement i.

$UDIV_i = (DIV_{iq} - DIV_{i,q-1}) / DIV_{i,q-1}$.

$MITIG_i$ = 1 if dividend changes are announced after an earnings announcement and 0 if dividend changes are announced before an earnings announcement.

$CONSIG_i$ = 1 if the sign of $UDIV_i$ is that of $XRE_i$ for the preceding earnings announcement and 0 otherwsie.

*(**) Significant at the .05(.01) level. Two-tailed tests for $b_0$. One-tailed tests for $b_1$ to $b_3$.

For large firms, the $b_2$ coefficients are insignificantly different from zero for dividend changes that occur within three to 20 days. However, the coefficient becomes significant when all dividend changes after earnings are included in the regression. These results suggest that signal mitigation for large firms is complete for consistent signals so long as dividend changes follow earnings within 20 days. They also suggest that the time proximity factor matters in signal mitigation. The $b_3$ coefficients for all three DAE periods are significant and larger than their counterpart $b_1$ coefficients, suggesting that signal mitigation for large firms does not pertain to inconsistent signals. Our findings allow for a better understanding of the Aharony and Swary (1980) results. By omitting dividend changes and earnings that occurred within ten trading days of each other and by failing to distinguish between consistent and inconsistent signals (i.e., both of these are attributes of the Aharony and Swary procedure), it is evident that one would be less likely to observe signal mitigation.

### 4. 2. The Information Content of Earnings Around Dividend-Change Announcements

(1) Dividend Mitigation of the Information Content of Earnings

In this section, we test whether or not dividend-change announcements mitigate the information content of subsequent earnings announcements. Table 4 presents OLS regression results of equation (14) for the small-and large-firm samples separately. As was the case with table 2, earnings announcements that follow dividends by more than ten days are excluded, and we do not distinguish between consistent and inconsistent signals. The $b_1$ coefficient is significantly positive for both the small-and large-firm samples, implying that unmitigated earnings announcements are informative regardless of firm size. For small firms, the $b_2$ coefficient is significantly smaller than the $b_1$ coefficient.[20] The evidence is consistent with the signal miti-

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20) While not reported in the table, the t-statistic for the difference between the two coefficients is 2.41.

## Table 4

### The Information Content of Earnings
### around Dividend-Change Announcements
(t-values in parentheses)

$$XRE_i = b_0 + {}^*b_1(1 - MITIG_i)^* \; UEARN_i + b_2^* MITIG_i^* UEARN_i + e_i{}^a$$

|  | $b_0$ | $b_1$ | $b_2$ | N | F | Adj. $R^2$ |
|---|---|---|---|---|---|---|
| Small Firms | 0.004 | 0.028 | −0.007 | 128 | 9.8** | .122 |
|  | (1.27) | (4.37)** | (−0.52) |  |  |  |
| Large Firms | 0.001 | 0.015 | 0.022 | 217 | 5.3* | .038 |
|  | (0.86) | (2.64)** | (1.89)* |  |  |  |

[a] $XRE_i$ = two-day(−1,0) abnormal return for earnings announcement i.

$UEARN_i = [EPS_{iq} - E(EPS_{iq})] / |E(EPS_{iq})|$, where $E(EPS_{iq}) = EPS_{iq,-4} + \Delta_i$. $\Delta_i$ is estimated using the 20 most recent quarters of earnings.

$MITIG_i$ = 1 if earnings are announced not less than three nor more than ten trading days after a dividend-change announcement and 0 if earnings are announced at least three trading days prior to a dividend-change announcement.

*(**) Significant at the .05(.01) level. Two-tailed tested for $b_0$. One-tailed tests for $b_1$ and $b_2$.

gation hypothesis, suggesting that the information content of earnings is mitigated by their antecedent dividend changes. For the large-firm sample, however, signal mitigation is not evident (the $b_2$ coefficient is insignificantly different from the $b_1$ coefficient).

In order to examine whether firm size affects the information content of earnings announcements, we estimate a regression similar to equation (14), but include a size-dummy variable (one for a firm in the large-firm group and zero for a firm in the small-firm group). For brevity, we do not provide these results in the table. As expected, the $b_1$ coefficient for the small-firm

sample is significantly larger than that of the large-firm sample (the t-statistic for the difference in the $b_1$ coefficients between the samples is 1.67, significant at the 0.05 level of a one-tail test). Consistent with the contention that pre-disclosure information precision $(1/V_1)$ is relatively higher for larger firms, reported earnings for the smaller firms are relatively more informative. The same, however, does not apply to the $b_2$ coefficient. The $b_2$ coefficient for the small-firm sample is negative and insignificantly different from zero, while the coefficient for the large-firm sample is significantly positive. This result suggests that the post-dividend, pre-earnings information precision is higher for small firms than large firms. It appears that small firms' dividend changes are so informative regarding the true economic earnings shock that the subsequent earnings do not have incremental information content. On the other hand, large firms' dividends are not so revealing that their subsequent earnings announcements are informative.

An interesting implication of this result is that dividend mitigation of the information content of earnings needs to be considered in addition to firm size when studying the effects of earnings announcements. Atiase (1985) and Foster, Olsen, and Shevlin (1984) have shown that earnings announcements of small firms are more informative than those of large firms. We present evidence which shows that this result is conditional upon signal sequencing. More specifically, once dividend changes have been announced, earnings of small firms are less informative than those of large firms.

## (2) Signal Consistency and Dividend Mitigation of the Information Content of Earnings

In this section, we examine whether or not signal consistency, in terms of both similarity in the direction of signal surprises and the proximity of signals, affects the extent to which dividend changes mitigate the information content of subsequent earnings announcements. In order to test the hypothesis that signal consistency strengthens the extent of signal mitigation, we modify equation (14) :

$$XRE_i = b_0 + b_1{}^*(1-MITIG_i){}^*UEARN_i + b_2{}^*MITIG_i{}^*CONSIG_i{}^*UEARN_i$$
$$+ b_3{}^*MITIG_i{}^*(1-CONSIG_i){}^*UEARN_i + e_{it} \qquad (16)$$

## Table 5
### Signal Consistency and the Information Content of Earnings around Dividend Change Announcements[a]
(t-values in parentheses)

$$XRE_i = b_0 + b_1^*(1-MITIG_i)^* \, UEARN_i + b_2 MITIG_i^* CONSIG_i^* EARN_i$$
$$+ b_3 MITIG_i^*(1-CONSIG_i)^* UEARN_i + e_i^b$$

| | $b_0$ | $b_1$ | $b_2$ | $b_3$ | N | F | Adj. $R^2$ |
|---|---|---|---|---|---|---|---|
| **A. Small Firms** | | | | | | | |
| $3 \leq EAD \leq 10$ | 0.004 | 0.028 | −0.012 | 0.007 | 128 | 6.6** | .117 |
| | (1.28) | (4.35)** | (−0.78) | (0.28) | | | |
| $3 \leq DAE \leq 20$ | 0.004 | 0.028 | 0.005 | 0.024 | 159 | 7.6** | .111 |
| | (1.43) | (4.57)** | (0.46) | (1.35) | | | |
| All DAEs | 0.003 | 0.029 | 0.008 | 0.019 | 178 | 8.0** | .106 |
| | (0.96) | (4.67)** | (0.95) | (1.31) | | | |
| | | | | | | | |
| **B. Large Firms** | | | | | | | |
| $3 \leq DAE \leq 10$ | 0.002 | 0.015 | 0.016 | 0.027 | 217 | 3.6* | .034 |
| | (0.92) | (2.64)** | (0.93) | (1.68)* | | | |
| $3 \leq DAE \leq 20$ | 0.001 | 0.015 | 0.015 | 0.027 | 264 | 5.0** | .044 |
| | (0.90) | (2.66)** | (1.77)* | (2.22)* | | | |
| All DAEs | 0.002 | 0.015 | 0.017 | 0.028 | 289 | 5.5** | .045 |
| | (0.99) | (2.56)** | (1.98)* | (2.48)** | | | |

[a] The sample consists of dividend changes (EBD), and earnings that follow dividend changes (EAD) within three to ten, three to 20, and three to 20+trading days, respectively

[b] $XRD_i$ = two-day (−1,0) abnormal return for dividend-change announcement i.

$UEARN_i = [EPS_{iq} - E(EPS_{iq}) / |E(EPS_{iq})|$, where $E(EPS_{iq}) = EPS_{iq-4} + \Delta_i$. $\Delta_i$ is estimated using the 20 most recent quarters of earnings.

$MITIG_i$ = 1 if earnings are announced after a dividend change announcement and 0 if earnings are announced before a dividend change announcement.

$CONSIG_i$ = 1 if the sign of $UEARN_{iq}$ is the same as that of $XRD_{iq}$ for the preceding dividend-change announcement and 0 otherwise.

*(**) Significant at the .05(.01) level. Two-tailed tested for $b_0$. One-tailed tests for $b_1$ to $b_3$.

where : $\text{MITIG}_i = 1$ for earnings announced after a dividend change and 0 otherwise : $\text{CONSIG}_i = 1$ for earnings announced after a dividend change, when UEARN is of the same sign as the share price response to the preceding dividend change and 0 otherwise.

In equation (16), we use the sign of the price reaction to the dividend-change announcement as a proxy for whether the dividend news is "good"(positive reaction) or "bad"(negative reaction). Consistent with this refinement of the signal mitigation hypothesis, the coefficient $b_2$ is expected to be smaller than the coefficient $b_3$. In order to test whether or not time proximity impacts the extent of signal mitigation, we estimate equation (16) for earnings observations that occur within three to ten days following their dividends, for that larger set of earnings announcements that occur within three to 20 days following their dividends, and for that even larger set of earnings observations that follow dividends by at least three days. We expect that the $b_2$ coefficient to become larger as we extend the time period to include more, but farther apart, earnings-after-dividend observations.

The results of equation (16) are reported in table 5. The $b_1$ coefficients are similar to those in table 4 for both small and large firms. Also similar to the table 4 results, the dividend mitigation of earnings is complete for small firms, regardless of signal consistency and time proximity. The $b_2$ coefficients for small firms are insignificantly greater than zero for all three EAD period categories, and although not reported, the t-statistics for differences between the $b_1$ and $b_2$ coefficients are all significant at the 0.05 level. Moreover, the $b_3$ coefficients are insignificantly greater than zero for all three EAD periods, suggesting that dividend-change signals for small firms are so informative that they preempt their subsequent earnings announcements.[21] For large firms, we find no evidence of signal mitigation, even when the two signals are consistent (i.e., the $b_2$ coefficients are not smaller than the $b_1$ coefficients for any of the three EAD categories).

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21) While the $b_3$ coefficients are smaller than their corresponding $b_1$ coefficients, the differences are not statistically significant. The results are not surprising given that our propositions predict that signal mitigation pertains more to consistent signals than to inconsistent signals.

The size-related results reported in tables 2 through 5 suggest that firm size influences the viability and effectiveness of dividend signalling. For small firms, dividend changes completely mitigate the information content of subsequent earnings reports (tables 4 and 5), while earnings reports do not completely mitigate the information content of subsequent dividend changes (table 2 and 3). For large firms, however, dividend changes have no impact on the information content of subsequent earnings reports (table 4 and 5), and earnings completely mitigate the information content of subsequent dividend changes, announced in close proximity (tables 2 and 3). The results indicate that dividend signalling is a more viable strategy for small firms than for large firms.

## 5. Summary and Conclusion

If reported earnings and dividends convey similar information regarding economic earnings, the second of the two announcements, be it dividends or earnings, should be less informative than had it been the first announcement. We refer to this phenomenon as "signal mitigation", and show that: (1) dividend changes which follow earnings reports are less informative than those which precede earnings reports for both large and small firms; (2) earnings reports which follow dividend changes are less informative than those which precede dividend changes only for small firms; (3) the extent of signal mitigation differs between small and large firms; (4) signal mitigation exists only when the earnings and dividend announcements convey similar messages. Our results are consistent with the Miller and Rock (1985) model as modified to allow reported earnings and dividends to be noisy measures of current economic earnings, and investors to revise their expectations of economic earnings when they observe reported earnings and dividends.

Our findings have implications for studies that examine the association between unexpected earnings and abnormal returns. Atiase (1985) and Foster, Olsen, and Shevlin (1984) have shown that earnings announcements of small firms are more informative than those of large firms. We present evidence that this result is conditional upon signal mitigation. More specifically, once dividend changes have been announced, earnings of small firms are less informative than those of large firms. The findings imply that researchers can

increase the power of their tests by controlling for firm size and signal mitigation.

Our findings have implications regarding which attributes of firm value dividend changes signal, and how nearby, related information releases impact upon the effectiveness of dividend signalling. Dividend signalling models have generally ignored the potentially mitigating effect of intervening signals. Our finding that earnings do mitigate the information content of subsequent dividends, and that mitigation is related to firm size and signal consistency suggests that dividend signalling models should be expanded to include these factors. Another implication of our findings is that assessment of the valuation effects of dividend-change announcements are probably imprecise if they fail to consider potentially mitigating effects of intervening signals, such as earnings, investment, and external financing announcements.

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## Appendix

*Announcement Effects of Earnings and Dividends in an Earnings/*
*Dividend Sequence*

The Miller-Rock model postulates the following valuation function:

$$S_1(t)=[F(I_0)+m_1(t)-I_1]+[F(I_1)+r\ m_1(t)]/(1+i) \qquad (A1)$$

where $S_1(t)$ is the value of the firm at time t and $m_1(t)$ is the investor's average assessment (at time t) of the firm's economic earnings shock, $\tilde{\varepsilon}_1$. Upon the announcement of reported earnings($t=t_1$), investors revise their expectations of $X_1$, via their revisions of $\tilde{\mu}_1$. Using the Bayesian revision rule, the mean and variance of $\tilde{\mu}_1$ become:

$$m_1(t=t_1)=h_e\ m_1+(1-h_e)\ \delta_1 \qquad (A2)$$

$$V_1(t=t_1)=h_e\ V_1 \qquad (A3)$$

where:

$$h_e=(U_\eta)/(U_\eta+V_1). \qquad (A4)$$

The proof of the revision of expectations is as follows(DeGroot 1970, p. 167):

The prior probability density function (p.d.f.) of $\tilde{\mu}_1$ satisfies the relation

$$f(\tilde{\mu}_1)\ \propto\ \exp\ [-(\tilde{\mu}_1-m_1)^2/2V_1] \qquad (A5)$$

and the likelihood function of $\delta_1$, given $\tilde{\mu}_1$, is

$$L(\delta_1\mid\tilde{\mu}_1)\ \propto\ \exp\ [-(\delta_1-\tilde{\mu}_1)^2/2U_\eta]. \qquad (A6)$$

Then, folowing the Bayes rule, the posterior p.d.f. of $\tilde{\mu}_1$ is proportional to the product of the density functions is (A5) and (A6), and the resulting p.d.f. is:

$$f(\tilde{\mu}_1\mid\delta_1)\ \propto\ f(\tilde{\mu}_1)L(\delta_1\mid\tilde{\mu}_1)$$

$$\propto\ \exp\ [-\{\tilde{\mu}_1-(h_e m_1+(1-h_e\ \delta_1)\}^2/2h_e V_1] \qquad (A7)$$

where $h_e=(U_\eta)/(U_\eta+V_1)$. In equation (A7), it is straightforward that the mean and variance of $\tilde{\mu}_1$ is the same as in equations (A2) and (A3), respectively. Bar-Yosef and Venezia (1988) present a similar model of Bayesian revision of expectations where both reported earnings and dividends are noisy signals of unobservable, future cash flows. As both $U_\eta$ and $V_1$ are non-negative, h is bounded by the unit interval.

Following Miller and Rock (1985), the effect of the reported earnings announcement, AE(EBD), is then:

$$AE(EBD) = [m_1(t=t_1) - m_1][1+r/(1+i))]$$

$$= (1-h_e)(\delta_1 - m_1) [1+r/(1+i)], \qquad (A8)$$

where i is the rate of interest.

When dividends are announced at $t=t_2$, investors revise their assessment of the mean and variance of $\tilde{\mu}_1$, applyig the Bayesian revision rule:

$$m_1(t=t_2) = h_d m_1(t=t_1) + (1-h_d) \theta_1$$

$$= h_d [h_e m_1 + (1-h_e) \delta_1] + (1-h_d) \theta_1 \qquad (A9)$$

$$V_1(t=t_2) = h_d V_1(t=t_1) = h_d h_e V_1 \qquad (A10)$$

where:

$$h_d = (U_u) / (U_u + h_e V_1). \qquad (A11)$$

Thus, the announcement effect of the dividend on the firm's share price is:

$$AE(DAE) = [m_1(t=t_2) - m_1(t=t_1)] [1+r/(1+i)]$$

$$= (1-h_d)[\theta_1 - \{h_e m_1 + (1-h_e) \delta\}] [1+\gamma/(1+i)]$$

$$= (1-h_d)[(\theta_1 - m_1) - (1-h_e)(\delta_1 - m_1)][1+r/(1+i)]. \qquad (A12)$$

*Announcement Effects of Dividends and Earnings in a Dividend/Earnings Sequence*

When a dividend is announced ($t=t_1$) before earnings are reported ($t=t_2$), investors revise their expectations of $X_1$ via their revisions of $\tilde{\mu}_1$. Using the Bayesian revision rule, the mean and variance of $\tilde{\mu}_1$ become:

$$m_1(t=t_1) = \ell_d m_1 + (1 - \ell_d) \theta_1 \qquad (A13)$$

$$V_1(t=t_1) = \ell_d V_1 \qquad (A14)$$

where :

$$\ell_d = (U_d) / (U_u + V_1). \qquad (A15)$$

The proof of (A13), (A14), and (A15) is the same as the proof in (A2) through(A4). Following Miller and Rock(1985), the effect of the dividend announcement, AE(DBE), is then:

$$AE(DBE) = [m_1(t=t_1) - m_1] [1-r/(1+i)]$$

$$= (1 - \ell_d)(\theta_1 - m_1)[1+r/(1+i)]. \qquad (A16)$$

When earnings are subsequently announced at $t=t_2$, investors revise their assessement of the mean and variance of $\tilde{\mu}_1$, applying the Bayesian revision rule:

$$m_1(t=t_2) = \ell_e m_1(t=t_1)+(1-\ell_e)\,\delta_1$$

$$= \ell_e[\,\ell_d\,m_1+(1-\ell_d)\,\theta_1]+(1-\ell_d)\,\delta_1 \tag{A17}$$

$$V_1(t=t_2)=\ell_e\,V_1(t=t_1)=\ell_e\,\ell_d\,V_1 \tag{A18}$$

where:

$$\ell_e=(U_\eta)\,/\,(U_\eta+\ell_d\,V_1). \tag{A19}$$

Thus, the announcement effect of reported earnings on the firm's share price is:

$$AE(EAD) = [m_1(t=t_2)-m_1(t=t_1)]\,[1+r\,/\,(1+i)]$$

$$=(1-\ell_e)[\delta_1-\{\ell_d m_1+(1-\ell_d)\,\theta_1\}]\,[1+r\,/\,(1+i)].$$

$$=(1-\ell_e)\,[(\delta_1-m_1)-(1-\ell_d)(\theta_1-m_1)]\,[1+r\,/\,(1+i)]. \tag{A20}$$

*Proof of Propositions 1 and 2*

Propostion 1 can be proven as follows:

$$AE(DBE)-AE(DAE)=$$

$$[(1-\ell_d)(\theta_1-m_1)-(1-h_d)\{(\theta_1-m_1)-(1-h_e)(\delta_1-m_1)\}]\,[1+r\,/\,(1+i)]$$

$$=[(1-\ell_e)(\theta_1-m_1)\{(h_d-\ell_d)\,/\,(1-\ell_d)\}+(1-h_d)(1-h_e)(\delta_1-m_1)]\qquad[1+r\,/\,(1+i)] \tag{A21}$$

From (A11) and (A15), $h_d > \ell_d$. Thus, if the two signals are consistent in terms of the sign of signal surpise, i.e., if $(\theta_1-m_1)>0$ and $(\delta_1-m_1)>0$, AE (DBE)>AE(DAE), and if $(\theta_1-m_1)<0$ and $(\delta_1-m_1)<0$, AE(DBE)<(DAE). If the signs of signal surprise are not the same, the prediction is ambiguous. Proposition 2 can be proven in the same manner.