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次序性盈餘與股利宣佈之資訊內涵分析

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摘要

本文旨在分析次序性盈餘與股利宣佈之資訊內涵。分析結果顯示：(1)盈餘與股利皆具重要邊際資訊內涵；(2)盈餘與股利之資訊內涵並非相互獨立；然而(3)盈餘與股利同時宣佈之資訊內涵相當於股利之邊際資訊內涵與盈餘之全部資訊內涵的總和。倘非如是，則經理人員將可藉著不同的盈餘與股利宣佈政策及形態影響投資報酬；此現象明顯的違反了效率市場假設。然而根據本文分析，資本市場對於盈餘與股利宣佈之反應具體而微。是以本分析亦可解釋何以過去有關盈餘與股利資訊內涵之研究難達一致結論的原因。未來相關研究若能考量次序性盈餘與股利宣佈之性質，或可得到相當的成果。

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Information Effects of Sequential Earnings and Dividends Announcements on Stock Returns

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Abstract

This paper analyzes the information effects of sequential earnings and dividends announcements on stock returns. The analysis indicates that (1) the marginal information contents of dividends and earnings are nontrivial; (2) the information contents of dividends and earnings are not independent from each other; and (3) the information content of the joint dividends and earnings announcements is equal to the sum of the marginal information content of dividend and the full information content of accounting earnings. This result must hold otherwise it will imply that a manager may fool the market by revealing different announcement policies and patterns; a serious contradiction to the efficient market hypothesis. The analysis also indicates that the market responds to earnings and dividend announcements in a very subtle way, which may explain why previous studies have been inconclusive. Future research with respect to the investigation of dividends and earnings announcement effects may be fruitful if the nature of sequential announcements is taken into account.

1. Introduction

It has been well-documented in literature that the information effects of dividends and earnings announcement are closely synchronized. Several

studies have been conducted to investigate the information content of dividends and earnings announcements on stock market recently. For example, Aharony and Swary [1980] provide a research methodology that attempts to isolate possible dividend effects from those of earnings. It finds that the information contents of both earnings and dividend are nontrivial. Nevertheless, it makes no attempt to investigate the corroboration effect of dividends and earnings announcements.

This issue is important because whether the dividend and earnings announcement effects are additive or corroborative has significant implications upon the efficient market hypothesis. A corroborative effect of earnings and dividends announcement effect will imply that a manager can fool the market with different announcement policies and patterns. However, empirical results have been inconclusive. Kane, Lee and Marcus [1984] conclude that there exists a corroboration effect between the joint signals of dividends and earnings announcements. Chang and Chen [1991] show that unexpected changes in earnings and dividends can independently affect the firm value without any interaction.

Those inclusive results may be due to the failure of taking into account the confounding problem of sequential announcements of earnings and dividends. In general, quarterly dividends are announced in the second month of the same quarter while earnings are announced in the first month of the next quarter. The fact that earnings announcements are always preceded by dividend announcements eventually rules out the opportunity of investigating the corroboration effect per se. Consequently, research conducted to investigate the corroboration effect between earnings and dividends announcement may produce undesirable result. On the other hand, the information content of earnings can only be partially revealed because investors are assumed to be able to infer the changes of accounting earnings from the changes of dividends announced earlier.

The purpose of this paper is to provide a thorough analysis with respect to the information effects of sequential earnings and dividends announcements on stock returns. More specifically, this paper analyzes the information effects of the following sequential dividends and earnings announcements scenarios:

(A) The effect of an earnings announcement that has been preceded by a dividend announcement.

(B) The effect of a dividend announcement that has been preceded by an earnings announcement.

(C) The effect of joint dividends and earnings announcements.

(D) The effect of a dividend announcement that has not been preceded by an earnings announcement.

(E) The effect of an earnings announcement that has not been preceded by a dividend announcement.

Researchers may find that it is difficult to investigate the full information content of dividend announcement as (B) and the effect of joint dividend and earnings announcements as (C) because the announcements of quarterly earnings are generally preceded by the announcements of quarterly dividends. Nevertheless, it should be noted that (A), (D), and (E) have very subtle empirical implications. The analysis of (A) suggests that the marginal information content of earnings is nontrivial. This analysis has been consistently supported in previous studies. On the other hand, the analyses of (D) and (E) indicate that the full information contents of dividends and earnings announcements are not independent from each others. However, the information content of the joint dividend and earnings announcement is exactly the sum of the marginal information content of dividend and the full information content of accounting earnings. This condition must hold otherwise it will imply that the management can fool the market by revealing different announcement policies and patterns.

This paper is organized as follows. Section 2 analyzes the sequential effect of earnings and dividends announcement. Empirical implications and testable hypotheses are also developed. Section 3 discusses the econometric issues of estimating the random walk with a drift model that has been commonly employed in describing a firm's earnings process. A conclusion is given in Section 4. Appendix A illustrates the analyses of (B), (C), (D) and (E).

2. The Analyses of Sequential Effects of Dividends and Earnings

The theoretical framework of the assets valuation model states that se-

curity price can be expressed as

$$P_t = \sum_{k=1}^{T} \theta^k (D_{t+k}|\Omega_t) + \theta^T E(P_T|\Omega_t) \tag{1}$$

where

P_t: the security price given information available at time t;
$E(Z)$: the expected return from a risky asset;
θ: the discount factor, defined as $1/[1 + E(Z)]$, and is assumed to be constant over time;
$E(D_{t+k}|\Omega_t)$: the expected dividend to be paid at time $t + k$ given information available at time t; and
$E(P_t|\Omega_t)$: the expected stock price at time t given information available at time t.

Eq. (1) implicitly assumes that

1. capital market is efficient in a semi-strong form;
2. earnings and dividends are assumed to be statistically sufficient for the valuation model; and
3. information set, Ω, contains only the information induced from the dividends and/or earnings announcement made at time t, and the information set, Ω_{t-1}, contains the information available prior to the dividends and/or earnings announcement.

Equation (1) states that under the joint hypotheses of rational expectation and efficient market stock price at time t is the present value of total expected future dividends up to time T, plus the present value of stock price at time T. With the same argument, the expected stock price at time T is equal to the expected flow of dividends.

$$E(P_T|\Omega_t) = \sum_{k=1}^{\infty} \theta^k E(D_{T+k}|\Omega_t) \tag{2}$$

Substituting Eq.(2) into Eq. (1) yields

$$P_t = \sum_{k=1}^{\infty} \theta^k E(D_{t+k}|\Omega_t) \tag{3}$$

The stock price at time t given information available through time $t-1$ can be written as

$$P_{t|t-1} = \sum_{k=1}^{\infty} \theta^k E(D_{t+k}|\Omega_{t-1}) \tag{4}$$

Thus, P_t can be defined as the security price after the announcement of dividends and/or earnings, and $P_{t|t-1}$ as the security price before the announcement of dividend and/or earnings. The announcement effect is the difference between P_t and $P_{t|t-1}$.

Equations (3) and (4) indicate that the security price equals the discounted expected future dividend stream based upon available information. This paper employed the partial adjustment model and the random walk with a drift model to analyze the effect of dividends and earnings under various scenarios.[1]

The partial adjustment model can be described as:

$$D_t = a_0 + a_1 D_{t-1} + cX_t + \epsilon_t \tag{5}$$

with $E(\epsilon_t) = 0; Cov(\epsilon_t, \epsilon_s) = 0$ for $t \neq s$ and $Var(\epsilon_t) = \sigma_\epsilon^2$ where D_t is the current dividend and X_t is current accounting earnings.

The random walk with a drift model can be described as

$$X_t = u + X_{t-1} + v_t \tag{6}$$

with $E(v_t) = 0$; $Cov(v_t, v_s) = 0$ for $t \neq s$ and $Var(v_t) = \sigma_v^2$. In addition, the independence between v_t and ϵ_t is also assumed.[2]

Repeating substitution of Eq. (6) yields

$$X_{t+s} = (s+1)u + X_{t-1} + (v_{t-1}, v_t + v_{t+1}, \ldots + v_{t+s}) \tag{7}$$

[1] Lintner [1956] concluded that a firm's dividend process follows the partial adjustment model after conducting an extensive interviews with corporate executive officers. The partial adjustment model was fully supported in Fama and Babiak [1968] and was partially supported in Lee, Wu, and Djarraya [1987]. On the other hand, the random walk with a drift model has been extensively employed to describe a firm's earnings generating process.

[2] ϵ_t represents the residual dividend at management's discretion under uncertainty while v_t represents the transitory earnings innovation. The independence assumption of ϵ_t and v_t is to say that transitory earnings innovation will not affect management's dividend policy. The author appreciates this comment from an anonymous reviewer.

Thus, the conditional expectations of X_{t+s} based on X_t and X_{t-1} are

$$E(X_{t+s}|X_t) = su + X_t \tag{8}$$

and

$$E(X_{t+s}|X_{t-1}) = (s+1)u + X_{t-1} \tag{8'}$$

respectively.

The equation system (8) indicates that the conditional expectation of future earnings can be reduced to the sum of a growth term and current earnings. Thus, equation system (8) together with equation (5) are sufficient to solve equations (3) and (4) for the estimation of dividend and earnings announcement effects under the following scenarios:

1. $E(D_{t+s}|D_t, X_t)$, conditional expectation of a future dividend based on the joint announcement of dividends and earnings;
2. $E(D_{t+s}|D_t, X_{t-1})$, conditional expectation of a future dividends based on the announcement of a current dividend;
3. $E(D_{t+s}|D_{t-1}, X_t)$, conditional expectation of a future dividend based on the announcement of current earnings;
4. $E(D_{t+s}|D_{t-1}, X_{t-1})$, conditional expectation of a future dividend before the announcement of dividends and earnings.

The dividend and earnings announcement effects can be analyzed as follows based upon the aforementioned scenarios:

Case A: $E(D_{t+s}|D_t, X_t) - E(D_{t+s}|D_t, X_{t-1})$, the effect of an earnings announcement that has been preceded by a dividend announcement.

Case B: $E(D_{t+s}|D_t, X_t) - E(D_{t+s}|D_{t-1}, X_t)$, the effect of a dividend announcement that has been preceded by an earnings announcement.

Case C: $E(D_{t+s}|D_t, X_t) - E(D_{t+s}|D_{t-1}, X_{t-1})$, the effect of joint announcements of dividends and earnings.

Case D: $E(D_{t+s}|D_t, X_{t-1}) - E(D_{t+s}|D_{t-1}, X_{t-1})$, the effect of a dividend announcement that has not been preceded by an earnings announcement.

Case E: $E(D_{t+s}|D_{t-1}, X_t) - E(D_{t+s}|D_{t-1}, X_{t-1})$, the effect of an earnings announcement that has not been preceded by a dividend announcement.

The analysis of the sequential effect of earnings announcement for case A is illustrated below. The analyses of Case B, C, D, and E are shown in Appendix A.

The one-period-ahead conditional expectation of dividend upon the joint announcement of dividends and earnings made at time t can be written as:

$$E(D_{t+1}|D_t, X_t) = a_0 + a_1 D_t + cX_t + cu \tag{9}$$

By repeating substitution, the s-periods ahead conditional expectation of dividend based on the joint announcements of earnings and dividends made at time t can be written as:

$$\begin{aligned} E(D_{t+s}|D_t, X_t) &= a_0 \frac{1-a_1^s}{1-a_1} + a_1^s D_t + \frac{1-a_1^s}{1-a_1} cX_t \\ &+ [s + (s-1)a_1 + (s-2)a_1^2 + \ldots + a_1^{s-1}]cu \end{aligned} \tag{10}$$

With the same argument, the one-period ahead conditional expectation of dividend based upon a dividend announcement that has not been preceded by an earnings announcement at time t is:

$$E(D_{t+1}|D_t, X_{t-1}) = a_0 + a_1 D_t + c(X_{t-1} + 2u) \tag{11}$$

By repeating substitution, the s-periods ahead conditional expectation of dividend based on a dividend announcement that has not been preceded by an earnings announcement at time t is:

$$\begin{aligned} E(D_{t+s}|D_t, X_{t-1}) &= a_0 \frac{1-a_1^s}{1-a_1} + a_1^s D_t + \frac{1-a_1^s}{1-a_1} cX_{t-1} \\ &+ [(s+1) + s + (s-1)a_1 + (s-2)a_1^2 \\ &+ \ldots + 2a_1^{s-1}]cu \end{aligned} \tag{12}$$

Thus, the difference between Eq. (10) and Eq. (12) represents the revision of conditional expectation about future dividend streams based upon the marginal information of earnings and can be written as:

$$E(D_{t+s}|D_t, X_t) - E(D_{t+s}|D_t, X_{t-1}) = c\frac{1-a_1^s}{1-a_1} v_t \tag{13}$$

From Eq. (3) and Eq. (4), the effect of an earnings announcement that has been preceded by a dividend announcement can be written as

$$P_t - P_{t|t-1} = \frac{\theta c}{(1-\theta)(1-a_1\theta)} v_t \tag{14}$$

Table 1 summarizes the analysis of dividend and earnings announcement effects under different scenarios. The following empirical implications can also be drawn from Table 1:

1. The marginal informational contents of both dividend and earnings are nontrivial as indicated in Case A and Case B;

2. The joint announcement of dividend and earnings has the greatest impact on price changes among all cases as indicated in Case C.

3. The effects of dividend and earnings announcements are additive rather than multiplicative from the comparison of (C), (D) and (E).

4. The effect of an earnings announcement that has been preceded by a dividend announcement (Case A) is less than that of an earnings announcement that has not been preceded by a dividend announcement (Case E).

5. The full information content of dividend announcement is not independent from earnings shock as (D), and the full information content of earnings announcement is also not independent from a firm's dividend policies as (E).

Table 1. Summary of Various Earnings and Dividend Announcements Effects

Cases	Descriptions	Announcement Effects
A	The effect of an earnings announcement that has been preceded by a dividend announcement	$\frac{\theta c}{(1-\theta)(1-a_1\theta)}v_t$
B	The effect of a dividend announcement that has been preceded by an earnings announcement	$\frac{\theta a_1}{(1-\theta a_1)}\epsilon_t$
C	The effect of joint earnings and dividend announcements	$\frac{\theta a_1}{(1-\theta a_1)}\epsilon_t + \frac{(1+a_1-a_1\theta)\theta c}{(1-\theta)(1-a_1\theta)}v_t$
D	The effect of a dividend announcement that have not been preceded by an earnings announcement	$\left(\frac{\theta a_1}{1-\theta a_1}\right)(\epsilon_t + cv_t)$
E	The effect of an earnings announcement that have not been preceded by a dividend announcement	$\left(\frac{\theta}{1-\theta}\right)\left(\frac{1+a_1-a_1\theta}{1-a_1\theta}\right)cv_t$

Notes:

1. The parameters are estimated from
   (5) $D_t = a_0 + a_1 D_{t-1} + cX_t + \epsilon_t$ and
   (6) $X_t = u + X_{t-1} + v_t$.
2. $\theta = \frac{1}{1+E(R)}$
3. $0 < a_1 < 1; 0 < c < 1$.

3. Econometric Issues of Identifying Unexpected Dividend and Earnings Shock

The measurement of market response to the announcement of dividends and accounting earnings requires appropriate models for the identification of unexpected dividend and earnings change. Unexpected earnings and dividend can be identified from Eqs. (5) and (6) based on the analysis in Section 2:

$$D_t = a_0 + a_1 D_{t-1} + cX_t + \epsilon_t \tag{5}$$

$$X_t = u + X_{t-1} + v_t \tag{6}$$

Eq. (5) is a stochastic regression model containing the lag-dependent variable on its right-hand-side. Johnston [1984] demonstrates that OLS estimators are consistent and normally distributed even without the assumption of normality for ϵ_t. The unexpected dividend change is then defined as

$$\epsilon_t = D_t - a_0 + a_1 D_{t-1} + cX_t \tag{15}$$

Accordingly, a dividend announcement is considered favorable if $\epsilon_t > 0$, neutral if $\epsilon_t = 0$ and unfavorable if $\epsilon_t < 0$.

From Eq. (6), the earnings shock can also be defined as

$$v_t = X_t - u - X_{t-1} \tag{16}$$

A common approach of estimating the drift term, u, is to take the arithmetic mean changes of the last four or five years [Albrecht, *et al.*, 1977; Collins, *et al.*, 1987; and Watts and Leftwich 1977]. However, a more appropriate approach is to employ the generalized least square (GLS) framework to estimate the drift term as follows:

Let's assume that v_t is the serially independent error term with mean zero and variance σ_v^2. Repeating substitution of Eq. (6) yields the following system:

$$X_t = X_{t-2} + 2u + v_t + v_{t-1} \tag{17}$$

or equivalently

$$\begin{aligned} X_t - X_{t-2} &= 2u + v_t + v_{t-1} \\ X_t - X_{t-3} &= 3u + v_t + v_{t-1} + v_{t-2}; \\ &\vdots \\ X_t - X_{t-s} &= su + v_t + v_{t-1} + v_{t-2} + \ldots + v_{t-s}. \end{aligned} \tag{18}$$

The system in (18) can be written as

$$Y_s = uS + v_s \tag{19}$$

where

u is the parameter to be estimated; and

$$Y_s = \begin{pmatrix} X_t - X_{t-1} \\ X_t - X_{t-2} \\ \vdots \\ X_t - X_{t-s} \end{pmatrix}$$

$$S = \begin{pmatrix} 1 \\ 2 \\ \vdots \\ S \end{pmatrix}$$

$$V_s = \begin{pmatrix} v_t \\ v_t + v_{t-1} \\ v_t + v_{t-1} + v_{t-2} \\ \vdots \\ v_t + v_{t-1} + v_{t-2} + \ldots + v_{t-s} \end{pmatrix}$$

Eq. (19) represents a linear model with heteroscedasticity. The OLS estimator is biased and inconsistent. However, the GLS can be applied to estimate u, the drift, as follows: The mean of V_s is

$$E(V_s) = E(v_t + v_{t-1} + v_{t-2} + \ldots + v_{t-s}) = 0 \tag{20}$$

The variance-covariance matrix is

$$E(V_s V_s') = \sigma^2 \begin{pmatrix} 1 & 1 & 1 & . & . & . & 1 & 1 \\ 1 & 2 & 2 & . & . & . & 2 & 2 \\ 1 & 2 & 3 & . & . & . & 3 & 3 \\ . & . & . & . & . & . & . & . \\ 1 & 2 & 3 & . & . & s-2 & s-1 & s-1 \\ 1 & 2 & 3 & . & . & s-2 & s-1 & s \end{pmatrix} = \sigma^2 \Phi \tag{21}$$

Since the variance-covariance matrix Φ has been known, the GLS can be applied to estimate the parameter u as follows:

$$\hat{u} = (S'\Phi^{-1}S)^{-1}S'\Phi^{-1}Y_s \tag{22}$$

It can be shown that Φ^{-1} is an $(s \times s)$ square matrix. Its elements, ϕ_{ij}, satisfy: $\phi_{ii} = 2$ for $i < s$, $\phi_{ii} = 1$ for $i = s$,$\phi_{i,i+1} = \phi_{i+1,i} = -1$ for $i < s$, otherwise, $\phi_{ij} = 0$. Thus, $(S'\Phi^{-1}S)^{-1} = s^{-1}$ and $S'\Phi^{-1}Y_s = (x_t - x_{t-s})$. The GLS estimator of u is BLUE and can be written as[3]

$$\hat{u} = (x_t - x_{t-s})/s \tag{23}$$

The vector of earnings innovations is

$$V_t = Y_s - \hat{u}S \tag{24}$$

4. Conclusion and Extension

This paper provides a thorough analysis of information effect of sequential earnings and dividends announcements on stock returns. Several empirical implications with respect to different scenarios have been developed. Those implications can be tested in future research. Particularly, the employment of second quarter data is preferable because its confounding problem is minimum. [Atiase, 1985].

To examine the feasibility of testing the empirical implications under different scenarios developed in Section 2, a set of sample firms that met the following criteria were selected:

1. The sample firm must be listed either in the NYSE and/or in the ASE.
2. Quarterly earnings per share and quarterly cash dividends per share are available on the quarterly industrial Compustat tapes for the period I/1981-IV/1989.
3. Fiscal year ends on December 31.
4. Daily rates of return are available on the CRSP for the period 1988-1989.

[3]See Bao *et al.* [1992].

Table 2 Summary of Dividend and Earnings Announcement Dates for the Second Quarter of 1989

Description	Dividend	Earnings
Number of Observations	230	230
Means	124	208
Standard Deviation	32	11
Median	123	206
Quantiles:		
Upper/Lower	143/109	214/200
Maximum/Minimum	206/19	243/187

Notes:
The dividends and earnings announcements dates are coded sequentially from calendar dates. For example, one represents January 1, 1989, and thirty-two represents February 1, 1989, etc. The mean of dividend announcements dates is May 4th and the mean of earnings announcement dates is July 26th for the second quarter of 1989.

5. Declaration dates of quarterly dividend payments are available in the Wall Street Journal Index.

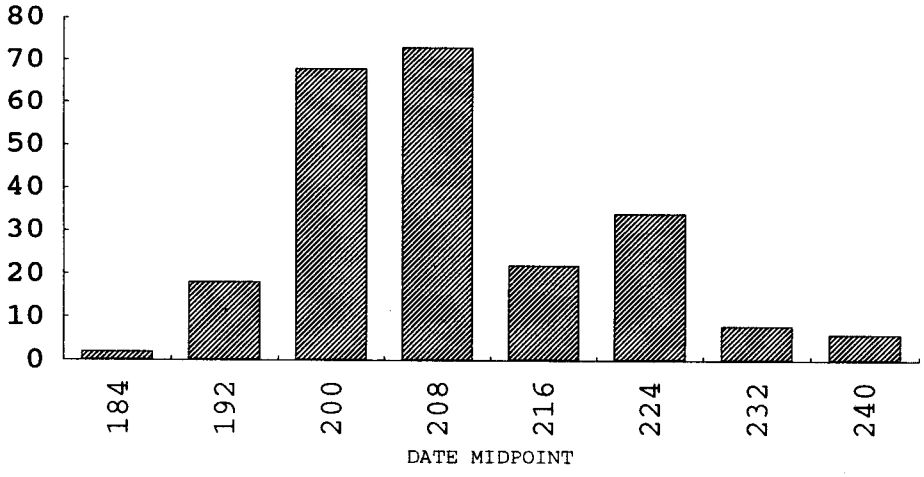
6. Announcement dates of quarterly earnings per share are available in the 1990 quarterly industrial compustat tapes.

The summary of the dividends and earnings announcement dates is reported in Table 2 and Figure 1. The announcement dates of dividends for the second quarter of 1989 are centered on May 4, 1989 with standard deviation 32 days. The announcement dates of earnings for the same quarter are centered on July 27, 1989 with standard deviation 11 days. The distributions of the second quarter dividends and earnings announcements dates are plotted in Panel A and Panel B of Figure 1.

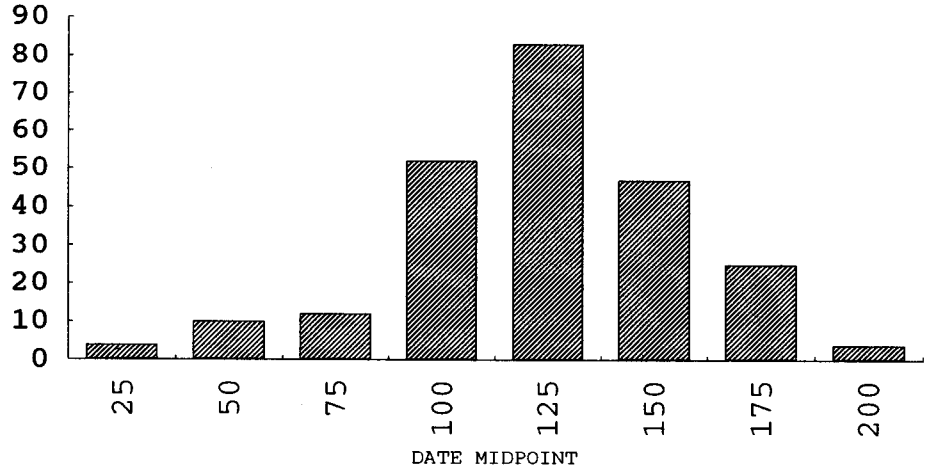
Table 2 and Figure 1 indicate that the effect of the second quarter dividend announcements may be confounded by the announcements of the first quarter earnings. In addition, the effect of the second quarterly earnings may be confounded by the announcements of the third quarter dividends. The fact that dividend announcements always precede earnings announcements for the same quarter rules out the opportunity of testing the hypotheses drawn from Case B and Case C. Consequently, empirical results of investi-

Figure 1.
Frequency Distributions of Dividends and Earnings Announcement Dates

Panel A: Dividend Announcement Dates



Panel B: Earnings Announcement Dates



gating the corroboration effect of dividend and earnings [Kane, *et al.*, 1984, and Chang and Chen, 1991] may be misleading.

Another problem associated with quarterly earnings is the seasonality. Thus, it is recommended that the X-11 Program developed by the Bureau of Census is employed to eliminate the seasonal effect of the time series data before identifying the unexpected dividend and earnings shock in future study.

Appendix A

Deriving the Dividend and Earnings Announcement Effect of Cases B, C, D and E

The third scenario, $E(D_{t+s}|D_{t-1}, X_t)$, conditional expectation of future dividend based on the announcement of earnings, can be calculated as follows:

The one-period-ahead conditional expectation of dividend upon the announcement of earnings can be written as:

$$E(D_{t+1}|D_{t-1}, X_t) = a_0(1 + a_1) + a_1^2 D_{t-1} + (1 + a_1)cX_t + cu. \qquad (A1)$$

By repeating substitution, the-s-periods ahead conditional expectation of dividend based on earnings announcement can be written as:

$$E(D_{t+s}|D_{t-1}, X_t) = a_0[(1 - a_1^{s+1})/(1 - a_1)] + a_1^{s+1} D_{t-1} +$$
$$[(1 - a_1^{s+1})/(1 - a_1)]cX_t + [s + (s - 1)a_1$$
$$+(s - 2)a_1^2 + \ldots + a_1^{s-1}]cu \qquad (A2)$$

The fourth scenario, $E(D_{t+s}|D_{t-1}, X_{t-1})$, conditional expectation of future dividend prior to dividend and earnings announcements, can be calculated as follows:

The-one-period ahead conditional expectation of dividend prior to the announcement of earnings and dividend can be written as:

$$E(D_{t+1}|D_{t-1}, X_{t-1}) = a_0(1 + a_1) + a_1^2 D_{t-1}$$
$$+(1 + a_1)cX_{t-1} + (a_1 + 2)cu \qquad (A3)$$

By repeating substitution, the s-period-ahead conditional expectation of dividend prior to earnings and dividend announcements can be written as:

$$E(D_{t+s}|D_{t-1}, X_{t-1}) = a_0[(1 - a_1^{s+1})/(1 - a_1)] + a_1^{s+1}D_{t-1}$$
$$+[(1 - a_1^{s+1})/(1 - a_1)]cX_{t-1} + [(s + 1) + sa_1$$
$$+(s - 1)a_1^2 + \ldots + 2a_1^{s-1} + a_1^s]cu \qquad (A4)$$

For Case B, the difference between Eq. (10) and Eq. (A2) represents the revision of conditional expectation about future dividend stream based upon the announcement of dividend that is preceded by earnings announcement and can be written as:

$$E(D_{t+s}|D_t, X_t) - E(D_{t+s}|D_{t-1}, X_t) = a_1^s\epsilon_t \qquad (A5)$$

$$P_t - P_{t|t-1} = [(\theta a_1)/(1 - \theta a_1)]\epsilon_t \qquad (A6)$$

For Case C, the difference between Eq. (10) and Eq. (A4) represents the revision of conditional expectation about future dividend stream based upon the joint announcement of dividends and earnings and can be written as:

$$E(D_{t+s}|D_t, X_t) - E(D_{t+s}|D_{t-1}, X_{t-1}) = a_1^s\epsilon_t + [(1 - a_1^{s+1}/(1 - a_1)]cv_t \quad (A7)$$

$$P_t - P_{t|t-1} = [\theta a_1/(1 - \theta a_1)]\epsilon_t + \{\theta(1 + a_1 - \theta a_1)/[(1 - \theta)(1 - \theta a_1)]v_t\} \quad (A8)$$

For Case D, the difference between Eq. (12) and Eq. (A.4) represents the revision of conditional expectation about future dividend stream based upon the announcement of dividend that precedes earnings announcement and can be written as:

$$E(D_{t+s}|D_t, X_{t-1}) - E(D_{t+s}|D_{t-1}, X_{t-1}) = a_1^s(\epsilon_t + cv_t) \qquad (A9)$$

$$P_t - P_{t|t-1} = [\theta a_1/(1 - \theta a_1)](\epsilon_t + cv_t) \qquad (A10)$$

For Case E, the difference between Eq. (A.2) and Eq . (A.4) represents the revision of conditional expectation about future dividend stream based upon earnings announcement that precedes dividends announcement and can be written as:

$$E(D_{t+s}|D_{t-1}, X_t) - E(D_{t+s}|D_{t-1}, X_{t-1}) = [(1 - a_1^s)/(1 - a_1)]cv_t \quad (A11)$$

$$P_t - P_{t|t-1} = \{\theta c(1 + a_1 - \theta a_1)/[(1 - \theta)(1 - \theta a_1)]\}v_t \qquad (A12)$$

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