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Dividend smoothing and the long-run stability between dividends and earnings in Korea

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I. Introduction

§ The signaling model of dividend

- A firm's dividend policy is hypothesized to convey the information about its future prospects that is privately observed only by insiders (i.e., Miller and Rock (1985), John and Williams (1985), John and Nachman (1987), and etc.).

§ Theory

- John and Williams (1985) have demonstrated how dividends can act as a credible signal of the fundamental earnings prospects of the firm.

§ Practice

- For dividends to be a credible signal, insider should maintain a systematic relationship between expected earnings and dividends.

§ Empirical Evidence

- Dividend Smoothing - Lintner (1956) found that managers smoothly adjust firms' dividends with respect to earnings and maintain a long-run target payout ratio.

§ Dividend signaling hypotheses - signaling role of dividend

§ Dividend smoothing – credible signal.

§ Whereas dividend smoothing and dividend signaling are well-established empirical facts, the empirical evidences are based principally on information collected in the US market.

§ The dividend policies of corporations differ significantly across countries due to a variety of institutional and financial market differences(Aivazian (2003)).

§ The objective of this study is to investigate whether Korean firms follow dividend policies as in developed markets in which dividend smoothing and dividend signaling become stylized facts.

§ A common problem for studying the dividend signaling hypothesis and the dividend smoothing hypothesis

☞ focus on the signaling model of dividend (e.g. dividend announcement studies) or the smoothing model of dividend separately (e.g. partial adjustment models), but not both

§ Existing empirical tests cannot help us to distinguish between

ü dividends are explicit signals of future earnings
(the dividend signaling hypothesis)

ü dividends are smoothed with respect to earnings to be a credible signal
(the dividend smoothing hypothesis).

§ There have been no empirical attempts to estimate and verify the dividend-earnings relation reflecting both hypotheses. Existing empirical tests cannot really identify the types of mechanisms for the dividend-earnings relation (e.g. the joint considerations of signaling and dividend smoothing).

§ In this study

A cointegration model to test both hypotheses in order to provide better insight into the dividend and earning relation. This allows us to investigate not only the informational content of dividend but also the underlying factor to make dividend signal to be credible.

§ Research implementation

1)Test the informational content of dividend.

Construct a model to show the predictive relations among dividends and future earnings at the firm level. We are particularly interested in the issue of whether the model can detect a presence of inter-temporal relations between dividends and earnings.

2) Test the dividend smoothing hypothesis using a non-linear framework involving dividends and earnings stream.

Tests of the time-series implications of dividend models in a cointegrating framework offer a distinctive approach to examine the ability of each hypothesis to explain corporate dividend behavior and hence, identify the types of mechanisms for the dividend-earnings relation.

The use of the cointegration model

§ Identify the long-term equilibrium relationship between dividends and earnings. Because theoretical analysis specifies the long-run equilibrium relationship between the earnings and dividend time series in the presence of information asymmetry, the cointegration model employed in this study is regarded as a more direct test of the theoretical arguments in this area.

§ Also a test is performed to examine the relationship between this derived dividend – setting behavior of a firm and the information environment using both multivariate and univariate techniques.

II. Model

Description of the Dividend Payout Pattern

Assume that the dividend payout at time t can be described as follows.

$$DPS_t = P * (E[EPS_{t+1} | M_t, I_t])^{\beta} \quad (1)$$

$$EPS_{t+1} = EPS_t Z_t V_{t+1}, Z_t \in I_t, \text{and} \quad EPS_t \in M_t \quad (2)$$

where DPS_t is dividend per share, EPS_t is earning per share, M_t is a public information set, It is an insider's information set at time t, E is the expectation operator, Z_t is a signal of the firm's t+1 earnings observed at time t, V_{t+1} is an innovation term with mean 1, which is independent of both public and private information at time t, and P can be interpreted as a dividend payout ratio when $\beta = 1$.

Dividends are based on the earnings observable only to insiders conditioned on the true quality of a firm. If a firm maintains a constant dividend payout ratio, then β is equal to one. β less than one indicates that dividends are a concave function of expected future earnings conditioned on the insider's private information thereby implying dividend smoothing.

Substituting (2) into (1) implies that

$$DPS_t = P * (E[EPS_t Z_t V_{t+1} | M_t, I_t])^{\beta} \qquad (3)$$

Because EPSt and Zt are measurable with respect to management's time t information which is the joint of the public information (M_t) and their private signal (Z_t)

$$E[EPS_t Z_t V_{t+1} | M_t, I_t] = EPS_t Z_t E[V_{t+1} | M_t, I_t]$$

Because the random innovation term is independent of Mt and It and has mean 0, $E[V_{t+1} \mid M_t, I_t] = 1$ Hence we can express (3) as

$$DPS_t = P * (EPS_t Z_t)^{\beta} \qquad (4)$$

The degree of smoothing can be measured by the curvature of equation (4). For a Curve $DPS_t = P * (EPS_t Z_t)^b$ the curvature is given by $(1-\beta)/\mathrm{EPS}_t$. β can be estimated by taking the natural log of equation (4) to yield the following testable Relationship

$$\ln \mathrm{DPS}_t = \alpha + \beta \ln \mathrm{EPS}_t + \varepsilon_t \qquad (5)$$

where $\varepsilon_t = \beta 1n(Z_t)$ and $\alpha = 1n(P)$.

Equation (5) will be used for finding the equilibrium relationship between dividends and earnings.

Identification of Equilibrium Relationship Between Earnings and Dividends - Cointegration

§ If there exists a long-term equilibrium relationship between dividends and earnings, then the deviations from this relationship, et in equation (5) will follow a stationary process even though dividends and earnings follow non-stationary process.

§ The cointegrated variables $\ln DPS_t$ and $1nEPS_t$ exhibit a long term equilibrium relationship defined by $\ln DPS_t = \alpha + \beta \ln EPS_t + \varepsilon_t$ and ε_t is the equilibrium error, which represents short term deviations from the long-term relationship.

β, cointegrating vector is regarded as an underlying force to make $\ln DPS_t$ and $1nEPS_t$ to maintain a long term equilibrium relationship.

§ Johansen (1988) cointegration test is used

Trace statistic denoted by LR_{tr}, maximum eigenvalue statistic denoted by $l_{\max}$

III. DATA

Sample Selection and Data Collection

We select a sample of firms listed on the Korea Stock Exchange over the 26-year period from 1981 to 2006. The following sample selection criteria were employed:

1.Firms had to have at least 15 years of earnings and dividend data during the period 1980-2006, as reported in the Korea Listed Companies Association database.

2.When estimating Eq. (1), all firms with non-positive EPS or zero dividends were eliminated from the sample, in order to prevent the spurious results of dividend smoothing.

3.A further screen excluded firms with less than 15 observations for each firm characteristic variable used in the regression. From a total of 732 firms, 226 firms fulfilled these screening criteria.

<Table 1> Sample Statistics

Variable*	Mean	Standard Deviation	Min	Max
DE	0.4081	0.2228	0.0893	1.7382
SEPS	2424.0	2187.5	217.5	19656.2
SDPS	354.5578	262.2872	97.6155	2067.0100
EPS	2260.3300	1544.5800	268.643	8507.9900
DPS	468.9158	223.8762	89.0771	1606.9200
LOGD	5.6286	0.5531	3.8466	7.0639
LOGE	6.9426	0.6145	4.9195	8.4472

* Dividend payout ratio (DE) is measured by dividends per share divided by earnings per share. Earnings variability (SEPS) is measured using the standard deviation of earnings per share over a minimum of 15 years prior to 2006 and a maximum of the twenty-six years. Dividends variability (SDPS) is measured using the standard deviation of dividends per share over a minim um of 15 years prior to 2006 and a maximum of the twenty-six years. DPS is dividends per share and EPS is earnings per shar e. LOGD and LOGE stand for natural logs dividends and earnings, respectively.

§ Korean firms paid 468 KRW (or 0.40 USD) per share. The average dividend payout ratio is 40.8%, which is lower than that of US firms. The lower observed payout ratio in Korea may be attributable to the different tax treatment of dividend income tax relative to the capital gains tax. Korean firms appear to have less incentive to pay dividends, as the unfavorable tax treatment of dividend income over capital gain is more serious than is the case in the US. In addition, many investors in Korea disregard dividends and consider stock price appreciation as the principal component of stock returns. Korean investor's attitude toward dividends may also contribute to lower dividend payout ratios.

§ Dividends variability (SDPS) is 354.55 while earnings variability (SEPS) is 2260.33. Earnings variability is approximately 7 times higher than dividends variability, implying the presence of dividend smoothing. Average dividend payout ratio from 1930's to 2000s is 54.3% for S&P 500 companies.

IV. EMPIRICAL RESULT

Cointegration Test Result

<Table 2> Summary Statistics for Equation ⑤

Total Sample (N=226)	Variable*	Mean	Standard Deviation	Min	Max
Cointegrating Firms (N=60)	b	0.6691	0.2070	0.1485	1.3968
Noncointegrating Firms (N=166)	R-squared	0.5949	0.2324	0.01172	0.9622

* β is the coefficient of ln(EPS) in equation (5). It measures degree of dividend smoothing. R-squared is the explanatory power of the model. Cointegration=1 if dividends and earnings are cointegrated

§ For cointegration test

- 166 firms (73.5% of the total sample) fail to reject the null hypothesis of no cointegration while 60 firms (26.5% of the total sample) reject the null concluding cointegration.

- Average values for β and R-squared are 0.67 and 58.5%, respectively.

-The average magnitude of the coefficient estimator, β , indicates that on average, a firm maintains dividend smoothing as its dividend policy.

- Average explanatory power of the model indicates that dividend changes are reasonably well represented by earnings.

Joint Test Result for the Dividend Signaling and the Dividend Smoothing Hypotheses

1. Presence of cointegration

   - The dividend signaling hypothesis suggests that there will be a long-term equilibrium relationship between dividend changes and earning changes. Therefore, if there is a deviation from the contemporaneous relationship between earning and dividends, there will be an underlying force to make them to return to the equilibrium relationship.

2. Magnitude of cointegrating vector

   - According to the dividend smoothing hypothesis, this underlying force will be a dividend smoothing. For cointegrating firms, the degree of dividend smoothing is expected to be higher than that of noncointegrating firms.

Table 3 shows the results.

<Table 3> Mean Differences of DDS Between Cointegrating firms and Noncointegrating Firms

	Cointegrating Firms (n=60)		Noncointegrating Firms (n=166)		T-statistics for Mean Differences
Variable	Mean	Std.Dev.	Mean	Std.Dev.	1.9* (P-value=0.054)
DDS	0.3742	0.1833	0.3152	0.2133	

*DDS is the degree of dividend smoothing. It is measured by 1- ß in equation (5).

§ Cross-sectional properties of cointegrating firms and noncointegrating firms implied by the dividend signaling hypothesis.

-The dividend signaling hypothesis suggests that the higher degree of information asymmetry is more likely to induce firms to maintain a long-term equilibrium relationship between dividends and earnings.

-To describe a firm's informational environments, we use listing years and firm size as proxies for the information environment.

<Table 4> Mean Differences of Informative Variables Between Cointegrating firms and Noncointegrating Firms

	Cointegrating Firms		Noncointegrating Firms		T-statistics for Mean Differences
Variable	Mean	Std.Dev.	Mean	Std.Dev.	
SIZE	18.4331	0.8799	19.0063	1.1919	-3.4 (P-value=0.0008)***
HISTORY	19.1667	2.8946	20.8072	3.1487	-3.53 (P-value=0.0003)***

* Significant at the 10% level. **Significant at the 5% level. *** Significant at the 1% level. Firm size (SIZE) is estimated by the natural logarithm of average total assets during the sample period. Listing years (HISTORY) is measured by the number of years li sted during the sample period.

Logistic Regression Result

§ Based on the dividend signaling hypothesis, cointegrating firms are hypothesized to face a greater degree of information asymmetry than noncointegrating firms.

§ We assign one to the cointegrating firms, and zero to noncointegrating firms. SIZE and HISTORY have a significantly negative relationship with the probability of being cointegrating firms.

§ The result – Table 5

<Table 5> Result of Logistic Regression by Using Informative Variables as Independent Variables

Dependent Variable ; Transformed Probability of Being Cointegrating firm		
Explanatory Variable	**Coefficient**	**Chi-square**
Intercept	**10.6711**	**10.9376*** **
SIZE	**-0.4628**	**7.3114*** **
HITORY	**-0.1523**	**7.7032*** **
Chi-square = 20.90* **		

* Significant at the 10% level. ** Significant at the 5% level. *** Significant at the 1% level. Firm size (SIZE) is estimated by the natural logarithm of average total assets during the sample period. Listing years (HISTORY) is measured by the number of years listed during the sample period.

§ The result implies that younger and smaller firms have a tendency to have a cointegrating relationship between earnings and dividends.

Robustness check –other considerations

<Table 6> Result of Logistic Regression by including control variables

Dependent Variable ; Transformed Probability of Being cointegrating firm				
Explanatory Variable	**Estimate**	**Error**	**Chi-Square**	**Pr**
Intercept	**11.131**	**4.1136**	**7.322**	**0.0068*** **
SIZE	**-0.4863**	**0.2313**	**4.4195**	**0.0355** **
HISTORY	**-0.1562**	**0.0589**	**7.0407**	**0.008*** **
SLACK	**-4.0825**	**2.3871**	**2.9249**	**0.0872**
GROWTH	**-1.2242**	**2.1679**	**0.3189**	**0.5723**
LEV	**-0.1817**	**0.2222**	**0.6686**	**0.4135**
SEPS	**0.2363**	**0.0911**	**6.7234**	**0.0095*** **
LARGE	**0.0234**	**0.0158**	**2.189**	**0.139**
Chi-square = 31.87* **				

* Significant at the 10% level. ** Significant at the 5% level. *** Significant at the 1% level.
Firm size (SIZE) is estimated by the natural logarithm of total assets, growth rate (GROWTH) is the average growth rate of size over a minimum of 15 years prior to 2006 and a maximum of the twenty six years, financial slack (SLACK) is the ratio of accumulated retaine d earnings to total assets, and earnings variability (SEPS) is measured using the standard deviation of earnings per share over a minim um of 15 years prior to 2006 and a maximum of the twenty-six years. Listing years (HISTORY) is measured by the number of years list ed during the sample period. The percentage of the stock held by the largest shareholders (LARGE) is used as a proxy for the concentr ation of controlling shareholders. Leverage ratio (LEV) is measure by the mean leverage ratio (total liabilities divided by total assets) f or a minimum of 15 years prior to 2006.

V. CONCLUSIONS

§ There have been no empirical attempts to estimate and verify the dividend-earnings relation reflecting both the signaling and dividend smoothing hypotheses.

§ This study proposed a cointegration model to test both hypotheses in an integrated framework in order to provide better insight into the dividend and earning relation.

§ This study pursued the following two main objectives:

1. what is the characterization of the optimal dividend payout patterns on the individual firm basis
2. what is the effect of information on the firm's dividend payout policy.

§ The results of t-test and logistic regression

- The presence of cointegration is positively related to the degree of information asymmetry, a result consistent with the dividend signaling hypothesis
- Dividend smoothing is identified as an underlying force to make dividends and earnings cointegrated.

Suggestions for Future Research –Test of Residual Theory

The residual theory holds that dividend policy is determined by the need for funds to finance investment. Dividends are a residual that reflects the amount left over from earnings after investment projects are financed by equity capital. The following cointegrating regression might be useful to see whether there is an equilibrium relationship between equity capital and dividends.

$$\text{DIVIDENDS} = \beta_0 + \beta_1 \text{EARNINGS} + \beta_2 \text{EQUITY CAPITAL}$$

Since we expect a perfect negative relationship between dividends and equity capital, the estimator of β_2 is expected to be negative 1.